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Euroanaesthesia 2023
The European Anaesthesiology Congress

Abstracts Programme

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Abstracts

EUROANAESTHESIA 2023

The European Anaesthesiology Congress

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European Journal of Anaesthesiology

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EUROANAESTHESIA 2023

The European Anaesthesiology Congress

GLASGOW, SCOTLAND, 3 - 5 JUNE 2023

ABSTRACT PRESENTATION PROGRAMME

Please note that all abstracts are presented as poster presentations: abstract presenters do not make a formal presentation of their abstract in a separate room, using audiovisual aids (except for the Best Abstract Prize Competition). Instead, two chairpersons will conduct, in front of each poster, a short discussion of each abstract with the presenter and the audience, for every abstract in that session. Poster presenters have been asked to stand by their poster at least 15 minutes before the start of the session and 15 minutes after, to address further questions.

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ESAIC Best Abstract Prize Competition (BAPC)

BAPC-01

Capnography monitoring during procedural sedation and analgesia: a systematic review and meta-analysis

Y.H. Woo[1], J.H. Park[1], J.W. Jeong[1], S.Y. Park[2], S.H. Kim[1]
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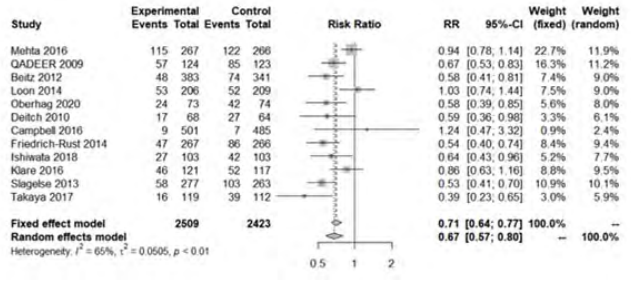
Background and Goal of Study: To evaluate the effect of capnography monitoring on sedationrelated hypoxemia during procedural sedation and analgesia (PSA)

Materials and Methods: Systematic literature review and random effects meta-analysis of randomized controlled trials (RCTs) reporting sedation-related hypoxemia incidence when adding capnography to routine pulse oximetry in patients undergoing PSA in the hospital setting were performed. Searches were conducted in PubMed, the Cochrane Library, EMBASE, KoreaMed, NDSL, and KCI without any language constraints on June 4, 2020. Screening and data extraction were conducted by two independent reviewers, and study quality was assessed using Risk of bias in randomized trials of the Cochranes Collaboration's tool (ROB2). Primary outcome variable was occurrence of hypoxemia (<90-95%). Severe hypoxemia (<85-90%), need of increased O2 supplementation, and use of assisted ventilation were secondary outcomes.

Results and Discussion: The literature search identified 820 articles, of which 12(4,932 patients) were included in the meta-analysis. Addition of capnography was associated with a significant reduction in hypoxemia (risk ratio (RR) 0.67, (95% CI 0.57 to 0.80)) and severe hypoxemia (RR 0.62, 95% CI 0.51 to 0.75) (figure). However, there were no significant reduction in the need of increased O2 supplementation (RR 0.88, 95% CI 0.75 to 1.03) or assisted ventilation RR 0.67, 95% CI 0.30 to 1.46).



Conclusion(s): Meta-analysis of 12 RCTs published showed a reduction in hypoxemia and severe hypoxemia during PSA with the inclusion of capnography monitoring.

References:

1. van Loon K, van Rheineck Leyssius AT, van Zaane B, Denteneer M, Kalkman CJ. Capnography during deep sedation with propofol by nonanesthesiologists: a randomized controlled trial. Anesthesia and analgesia 2014; 119: 49-55.

2. Beitz A, Riphaus A, Meining A, Kronshage T, Geist C, Wagenpfeil S, et al. Capnographic monitoring reduces the incidence of arterial oxygen desaturation and hypoxemia during propofol sedation for colonoscopy: a randomized, controlled study (ColoCap Study). American journal of gastroenterology 2012; 107: 1205-12

BAPC-02

Intraoperative frontal electroencephalogram substitutes for age in a predictive model of post-anesthesia care unit delirium

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Background and Goal of Study: Post-operative delirium is associated with significant morbidity and mortality. Abnormal electroencephalogram (EEG) signals, seen in awake and anesthetized states, have been identified as potential predictors of post-operative delirium. There is a need for clinical predictive models of post-operative delirium that incorporate both patient-specific risk factors and intraoperative factors such as EEG activity.

Materials and Methods: Prediction accuracy was assessed for two multivariable predictive models of post-anesthesia care unit delirium constructed from data previously collected in a prospective, multicenter observational study of the association between intraoperative EEG patterns and delirium.

One model included intraoperative frontal EEG data and one did not. Data cleaning yielded 649 subjects with 77 variables for the non-EEG model and 490 subjects with 97 variables for the EEG model.

The data were randomly divided into sets of training and testing data. Training data were subjected to stepwise selection using multivariable logistic regression analyses with bidirectional stepwise elimination followed by purposeful selection using Akaike Information Criterion.

Overall model performance was compared via Akaike Information Criterion (AIC), with the assumption that lower values indicate lower out-of-sample prediction error and higher generalizability.

Results and Discussion: Purposeful selection of training data yielded 9 significant contributor variables in the non-EEG model (age, gender, history of stroke/neurodegenerative disease, anesthesia duration, emergence duration, propofol use, adjunct ketamine or nitrous oxide use, and succinylcholine use); and 6 significant contributor variables in the EEG model (gender, pre-existing renal or hepatic comorbidity, anesthesia duration, emergence duration, adjunct ketamine or nitrous oxide use and absolute alpha power).

Evaluation of the models showed that the EEG Model performed favorably compared to the non-EEG Model (AIC: 410, 570; respectively).

Conclusion(s): Intraoperative EEG significantly predicts risk of postoperative cognitive complications. Absolute alpha power in the frontal EEG can substitute for pre-existing patient characteristics in a predictive model, potentially offering a clinically useful marker of cognitive and physical frailty independent of chronologic age.

Acknowledgements: The authors thank Xiao Shi for statistical work and help constructing the model.

BAPC-03

Dexmedetomidine improves cognitive impairment by promoting hippocampal neurogenesis via the BDNF/TrkB/CREB signaling pathway in hypoxic-ischemic neonatal rats

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Background and Goal of Study: Hypoxic ischemic brain damage (HIBD) is a leading cause of neurological deficits in human neonates, including long-term cognitive impairment. Recent studies have demonstrated that the disruption of hippocampal neurogenesis plays a crucial role in the development of cognitive impairment after neonatal HIBD. Dexmedetomidine (DEX) has been shown to have positive effect on neurogenesis in various forms of brain injury. However, the role of DEX-mediated hippocampal neurogenesis in HIBD neonates and its underlying molecular mechanisms are unclear.
Therefore, we hypothesize that DEX improves cognitive impairment by promoting hippocampal neurogenesis via the BDNF/TrkB/CREB signaling in hypoxic-ischemic neonatal rats.
Materials and Methods: We induced HIBD in rats using the Rice–Vannucci model. DEX (25ug/kg, i.p.) was given immediately after HIBD. High-throughput RNA sequencing was performed to determine the the differentially expressed genes in hippocampus. Western blot was used to examine expression levels of BDNF, TrkB, phosphorylated (p)-TrkB, CREB and phosphorylated (p) – CREB in hippocampus. Immunofluorescent staining was used to detect hippocampal neurogenesis levels. Behavioral test was performed with Morris water maze (MWM). Moreover, we further confirmed our finding by using pathway inhibitor ANA-12.
Results and Discussion: The present study confirmed that the BDNF, a crucial factor for neurogenesis, and the biological process of neurogenesis were significantly downregulated in neonatal HIBD rats by RNA-sequencing. Then, we found that DEX treatment could increase the BDNF protein expression and the phosphorylation of its downstream molecules TrkB, CREB, as well as promote hippocampal neurogenesis in neonatal HIBD rats. Importantly, our study identified that pathway inhibitor ANA-12 could reverse the ability of DEX to promote hippocampal neurogenesis and impair the ability of DEX to alleviate cognitive impairment caused by HIBD.
Conclusion(s): Our study demonstrated that BDNF/TrkB/CREB signaling as one of the direct molecular mechanisms of DEX-mediated hippocampal neurogenesis in neonatal HIBD rats, highlighting a novel therapeutic target for cognitive impairment caused by HIBD.
Acknowledgements: This work was supported by the National Natural Science Foundation of China (Grant nos. 82001166).

BAPC-04

Analyzing big data: could the ROX index predict risk for intubation in a surgical patient receiving NIV/CPAP?

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Background and goal of study: The ROX index is defined as the ratio of SpO_2 measured by pulse oximetry/FiO_2 to respiratory rate. It is used as predictor of the need for intubation in patients receiving HFNC oxygen therapy, but not yet validated for NIV/CPAP ventilation. The goal of this study is to determine if the ROX index could predict risk for intubation in surgical patients receiving NIV/CPAP mask ventilation.
Materials and Methods: Patient data was extracted from freely available AmsterdamUMC ICU database containing data from a 32-bed mixed surgical-medical academic ICU with 1 billion clinical data points related to 23106 admissions between 2003 and 2016. We selected patients that were non-invasively mechanically ventilated and extracted their demographic data (age, sex, BMI) and SOFA score at admission, as well as ROX index from 2 hour window mean values of SpO_2, RR and FiO_2 for the first 12 hours of ventilation.
Results and Discussion: From 20106 patients, a cohort of 1075 NIV patients using CPAP/PS modes were identified. We excluded patients that received NIV ventilation after an episode of intubation (n=47) and patients that were intubated more than 24 hours after NIV episode (n=53). Final dataset consisted of 975 patients, 190 were intubated within 24 hours NIV ventilation start. Patient demographic data was similar between intubated and non-intubated group (Table 1).

Variable	Not intubated (n=785)	Intubated (n=190)	p value
Age, years	64.5 (54.5, 74.5)	64.5 (54.5, 74.5)	0.190
Male (n, %)	468 (59.6)	114 (60.0)	0.999
BMI, kg/m2	26.0 ± 5.2	25.6 ± 4.0	0.282
Initial SOFA score	8.0 (5.0 , 10.0)	9.0 (7.0 , 11.0)	<0.001

Values are mean ± SD, median (Q1, Q3) or n (%)

Table 1. Patient demographic data

ROX index	Not intubated (n=785)	Intubated (n=190)	p value
ROX 0-2 h	7.5 (5.3, 10.1)	7.2 (5.0 , 10.4)	0.432
ROX 2-4 h	8.2 (5.7 , 11.4)	7.6 (5.1 , 10.2)	0.359
ROX 4-6 h	8.4 (5.6 , 11.46)	6.1 (4.6 , 9.7)	0.020
ROX 6-8 h	8.2 (6.2 , 11.2)	5.5 (4.1 , 8.0)	0.002
ROX 8-10 h	8.1 (6.2 , 11.6)	7.0 (4.3 , 9.4)	0.037
ROX 10-12 h	8.5 (6.2 , 11.5)	6.4 (4.1 , 7.2)	0.014
Duration of NIV ventilation, hours	4.9 (2.2 , 12.9)	2.5 (1.1 , 6.9)	<0.001
Length of stay, hours	140.0 (59.0 , 322.0)	283.0 (143.5 , 578.0)	<0.001
Mortality (n, %)	411 (52.3)	95 (50.0)	0.615

Values are mean ± SD, median (Q1, Q3) or n (%);
BMI - body mass index, NIV - noninvasive ventilation, ROX - ratio of oxygen

Table 2. ROX index values and outcomes

Statistically significant difference was found in ROX index distribution between groups for time periods of 4-6 h, 6-8 h, 8-10 h and 10-12 h as presented in Table 2. Performance of ROX index to predict intubation gave AUROC for 0-2 h: 0.518, 2-4 h: 0.473, 4-6 h 0.679, 6-8 h: 0.697, 8-10 h: 0.585, 10-12 h: 0.789 as shown in Figure 1.

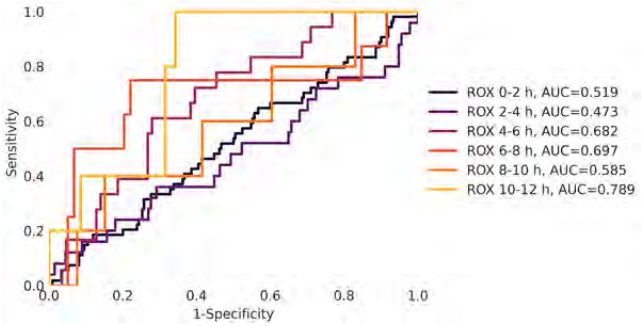

Figure 1. ROC curves for ROX index

Conclusion(s): Analysing a large database of surgical patients, we found that ROX index significantly correlates with the need for intubation after 4 hours of NIV/CPAP ventilation. ROX index could be a good predictor for intubation in surgical patients receiving NIV CPAP/PS ventilation.

BAPC-05
Evaluation of a software system for guideline-based premedication in anaesthesia

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Background and Goal of Study: Guidelines for preoperative evaluation support the physician in his or her decision-making process [1].
Adherence to guidelines enables structured patient care, improves medical quality and results in patient benefit [2].
The aim of the study was to determine guideline adherence in the preoperative consultation by anaesthesiologists as part of a project to introduce a software-based decision support system.
Materials and Methods: After ethical approval of this prospective cohort study, data were analyzed from 204 adult patients who underwent elective noncardiac surgery at TUM University Hospital between 06/2021 and 06/2022.

Patient characteristics (n = 204[1])							
Gender		**BMI**	**ASA**		**Surgery risk[2]**		
Female	Male		III	IV	low (< 1%)	medium (1 - 5%)	high (> 5%)
99 (49%)	105 (51%)	25 (22, 29)	200 (98%)	4 (2.0%)	21 (10%)	131 (64%)	52 (25%)

[1]Numbers are presented as n (%) or median (IQR), [2]30-day risk of cardiovascular death and myocardial infarction

Table 1.

All patients were premedicated twice in a cross-over design and randomly assigned to the "software first" or the "conventional first" group. The software contained the recommendations of the European Society of Anaesthesiology (ESA) [1] and the national German society [2].
Results and Discussion: Compliance with the guideline recommendations, missing or unnecessary apparative and laboratory examinations are shown in table 2.
As is apparent in the table, more elaborate examinations showed poorer adherence rates. This concerns especially ESA level 1A recommendations (see table below) which refer to echocardiography. Reasons for poor adherence can be manifold and need to be further investigated.

ESA Recommendation Level[1]	1A	1B	1C	2A	2B	2C
Recommended and DONE	2 (25.0%)	8 (61.5%)	161 (84.3%)	209 (57.7%)	279 (73.8%)	171 (71.0%)
Recommended and NOT done	6 (75.0%)	5 (38.5%)	30 (15.7%)	153 (42.3%)	99 (26.2%)	70 (29.0%)

[1]Numbers are presented as n (%)

Conclusion: To ensure comprehensive preoperative evaluation, better guideline adherence should be aimed for. A guideline-based software can help to uncover these deficits.
References:
1. De Hert, S., et al., Eur J Anaesthesiol, 2018; 35(6): 407-465
2. Geldner et al., Anästh Intensivmed 2017; 58: 349-364

Characteristic	ECG	Echocardio-graphy	Pulmonary function test	Non-invasive cardiac stress testing	Carotid doppler	Coronary angio-graphy	Blood glucose	HbA1c	Serum electro-lytes	Renal values	Coagula-tion values	Hemo-globin	Leuko-cytes	Platelet count	Serum bilirubin
Recommended and DONE	354 (86.1%)	66 (49.6%)	15 (16.1%)	4 (9.8%)	3 (21.4%)	1 (16.7%)	77 (50.3%)	10 (6.5%)	319 (100.0%)	454 (99.8%)	207 (98.6%)	340 (100.0%)	9 (100.0%)	186 (100.0%)	27 (81.8%)
Recommended and NOT done	57 (13.9%)	67 (50.4%)	78 (83.9%)	37 (90.2%)	11 (78.6%)	5 (83.3%)	76 (49.7%)	143 (93.5%)	0 (0.0%)	1 (0.2%)	3 (1.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (18.2%)
NOT Recommended but DONE	17	18	16	10	6	5	15	0	47	50	47	28	195	43	98

[1]Numbers are presented as n (%), absolute numbers of unnecessary examinations are given as "NOT Recommended but DONE". Overlapping conditions can lead to more than one recommendation per patient.

Table 2. Guideline recommendations and adherence rates (ESA and German national guidelines combined)[1]

BAPC-06
Age-related changes in pulmonary atelectasis formation during inhalation vs intravenous induction in pediatric anesthesia

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Background and Goal of Study: Respiratory complications are a common cause of adverse events in pediatric anesthesia and atelectasis formation during general anesthesia in children occurs in 68-100% of the cases. Children have a highly compliant chest wall with a reduced ability to counteract the elastic recoil of the lung tissue. Mask induction is performed in pediatric anesthesia but it is still unclear if this can have an effect on the development of atelectasis.
The aim of this study is to investigate the impact of different ages on dysventilation and atelectasis formation during anesthesia induction in children and whether it is differently affected by inhalation and intravenous technique.
Materials and Methods: Prospective observational study. Children, with no past history for chronic diseases, scheduled for elective surgery were considered eligible. Lung ultrasound (LUS) was performed right after induction in 12 lung areas. Patients underwent either inhalation or intravenous induction. Wilcoxon rank-sum test was used to compare the LUS scores between inhalation and intravenous induction. Disventilation was defined as a score>=2 (multiple B lines); atelectasis was defined as a score >= 4 (subpleural consolidations).
Both outcomes were tested for correlation with age with chi-squared test and studied in multivariable analysis with clinically relevant variables.
Results and Discussion: 248 patients were enrolled. Scores of lung areas were significantly different between inhalation and intravenous group ($p<0.001$). Disventilation was significantly correlated with age ($p< 0.001$). Inhalation induction correlated with disventilation (OR 2.21; $p=0.042$). Univariable x analysis for atelectasis was significant for inhalation induction (OR; 2.25, $p=0.008$).
Our findings show a non-negligible incidence of lung disventilation and or lung atelectasis right after induction,with a higher incidence in young children, whose thorax elasticity is higher, correlating with inhalation induction. We hypothesize a recruitment manoeuvre could be useful. Mask induction has been already associated with a higher risk of respiratory complications. During this time, the reduced muscular tone is a potential factor for atelectasis formation. Still, our findings show that mask induction is significant as an adding factor for posterior areas dysventilation.
Conclusion(s): We show a higher OR for lung dysventilation and or lung atelectasis in children undergoing inhalation induction.

General Anaesthesiology

01AP01-01
A simulation study with Smart Pilot View® to compare dosing adaptations according to age between residents and anaesthesiologists for propofol, sufentanil and sevoflurane

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Background and Goal of Study: We compared the dosing practice of residents and anesthesiologists for anaesthetizing young versus old patients, and simulated whether the dose adjustments resulted in relevant differences of combined anesthetic drug potency. We used Smart Pilot View® (SPV, Dräger) to calculate several quantitative measures of anesthetic potency, adjusted to the drug administration history and patient demographics.

Materials and Methods: After ethics committee approval, a survey was conducted in four Belgian hospitals, inquiring for dosing intentions of residents and anaesthesiologists to manage a similar laparoscopic procedure for two ASA1 patients, only differentiated by age (18 versus 80 years) and sex. Sufentanil, propofol, rocuronium and sevoflurane were the only drugs allowed. SPV calculates the effect-site concentrations of propofol (Ce_{PROP}), sufentanil (Ce_{SUF}) and sevoflurane (Ce_{SEVO}), the probability of tolerance to laryngoscopy (P_{TOL}) and the noxious stimulation response index (NSRI) (1). We compared all measures at induction, intubation, incision and the end of surgery, within and between groups using appropriate T-tests ($p<0.05$).

Results and Discussions: 44 residents and 31 anaesthesiologists answered the survey (26% response rate). All patients reached near maximal P_{TOL} and NSRI at all time points (figure below). Compared to anaesthesiologists, residents titrated towards higher Ce_{PROP} and Ce_{SUF} in young patients at induction and intubation. The age dependent dose reduction found in both groups did not lead to significantly reduced $P_{TOL,}$ which was still near maximal in elderly.

Residents		Ce_{PROP}	Ce_{SUF}	Ce_{Sevo}	P_{TOL}	NSRI
Peak value after induction	18 years	9.91 (1.18) $	0.31 (0.15) $ *		99.43 (0.76) $*	3.29 (2.19) $*
	80 years	7.36 (2.21) $	0.24 (0.05) $ *		97.20 (3.22) $	8.34 (5.69) $
Incision	18 years	0.96 (0.18) $ *	0.23 (0.12) $ *	2.34 (0.41) $*	99.58 (0.60) $*	2.52 (2.20) $*
	80 years	0.46 (0.15) $ *	0.18 (0.04) $	1.69 (0.21) $	99.68 (0.29) $*	2.34 (1.44) $*
Anaesthesiologist						
Highest or lowest value after Induction	18 years	9.70 (1.12) $	0.26 (0.08) $ *		98.92 (1.92) $*	4.51 (3.85) $*
	80 years	7.58 (1.40) $	0.20 (0.06) $ *		96.16 (4.18) $	10.14 (6.51) $
Incision	18 years	0.88 (0.15) $ *	0.19 (0.06) $ *	2.32 (0.60) $*	98.04 (4.28) *	5.10 (7.11) *
	80 years	0.43 (0.11) $*	0.15 (0.05) $	1.77 (0.33) $	98.66 (3.40)*	4.19 (5.71)*

$ $p<0.05$ between young and elderly; * $p<0.05$ between residents and anaesthesiologists; intubation and end of surgery are not shown.

Conclusions: Dose reductions in elderly do not lead to a reduced P_{TOL} compared to young patients, suggesting that large proportions of both age groups remain at risk for excessive drug effects.

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01AP01-02
Avoiding unplanned pregnancy: contraception and sugammadex

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Background and Goal of Study: Sugammadex is a modified-gamma-cylcodextrin used for the reversal of aminosteroid neuromuscular blockade. Due to it's rapid reversal effect it has seen increasing use across the UK since it's release. It has a lesser known side-effect of reducing the effectiveness of hormonal contraceptives requiring additional contraception after it's administration to avoid an unplanned pregnancy1.

The aim of this study was to stablish if this side-effect is becoming more widely known and keeping pace with the increasing use of sugammadex, as well as if this is translating to effective communication of this essential information with patients.

Materials and Methods: We surveyed our departments practising anaesthetists for their understanding of this interaction. Alongside this we completed a 2-year retrospective analysis of all women of childbearing age who were given sugammadex.

Results: 78% of our 46 respondents were aware of it, and the majority of them were able to describe some forms of contraception affected and the advice needed but not in full. Only 4% correctly identified all forms of contraception affected and just 24% were able to describe the advice they would need to provide in detail.

We identified 62 female patients (average age of 34) of childbearing age who had received sugammadex during our 2 year study period. The recording of contraceptive status was variable, and in 47% of our patients it was unknown. A significant proportion of those with their contraception recorded (30%) were using a form of hormonal contraceptive that is affected by sugammadex. Overall, 50% of our cohort were felt to be eligible for advice regarding the reduced effectiveness of their contraception but only 1 person was counselled about this.

Discussion and Conclusion: We hope this work highlights the need for departments to address this issue and develop robust methods for ensuring that women are provided with this essential information. Following on from this work we are generating a patient information leaflet and creating departmental guidelines for clinicians and theatre staff to ensure that this information is communicated effectively to patients.

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01AP01-03
An algorythm to estimate the speed of recovery from rocuronium induced neuromuscular blockade, a prospective observational study

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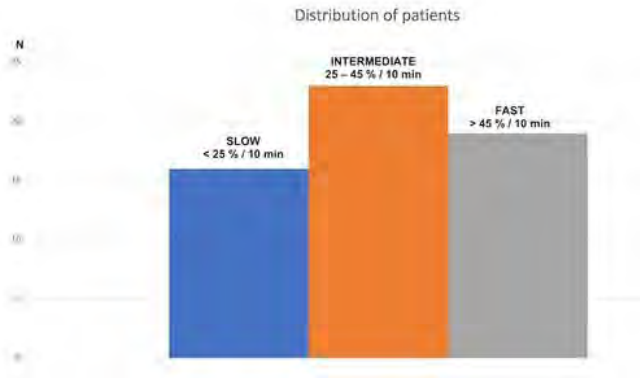
Background and Goal of Study: Duration of action of neuromuscular blocking (NMB) agents have a wide interindividual variability. Quantitative measurement of the train of four ratio (TOF) gives us an accurate measurement at a precise timepoint, but does not give information about the remaining time needed for a full recovery. Dubois et al have shown that early and late parameters describing the offset of NMB agents are highly intercorrelated (1).
In this prospective, observational study, we described an algorythm capable of estimating the time needed to reach a TOF ratio ≥ 0.9 based on the first detectable TOF ratios during spontaneous recovery.
Materials and Methods: After Institutional review board approval, ClinicalTrials.org registration (NTC03550664) and written informed consent, we included 100 patients undergoing anesthesia with a single 0.6 mg/kg bolus dose of rocuronium. Parameters of NMB, post-tetanic count, then TOF and final TOF ratio were continuously recorded by TOFScan (Idmed, France). The first 14 TOF ratios > 0 were used to estimate the speed of recovery specific to each patient in % of TOF ratio recovery/10 min. This value allowed a first categorization of the patient as slow, intermediate or fast recovery. Thereafter this parameter is continuously updated taking into account the TOF ratios of the ongoing spontaneous recovery to further finetune the estimated recovery speed.
Results and Discussion: 58 patients with a perfect NMB recovery profile without any artefact were included for analysis. Different curve fittings were used to reproduce the recovery curve. Finally, linear interpolation was found to be the most satisfying, with a high degree of correlation and simplicity of use. This value allowed to classify the patient as slow, intermediate or fast recovery.



Conclusion: This new parameter may expand the information driven from continuous quantitative neuromuscular monitoring allowing to better anticipate patients individual speed of recovery. To be used as an additional decision support, however, these first results need to be confirmed in subsequent studies using different cohorts.
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01AP01-04
Masui sex-dependent pharmacokinetic model for remimazolam had same EC_{50} in both sexes at extubation after general anaesthesia, whereas the other two sex-independent models had different EC_{50}s between males and females

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Background and Goal of Study: Remimazolam (Rmzl) is novel short acting benzodiazepine anesthetic with rapid onset and recovery. Recently published Masui model included sex, age, ASA-PS as well as adjusted BW (body weight) as covariates[1], whereas Doi[2] and Schüttler[3] models only have BW as covariate. We retrospectively compared the impact of sex difference on EC_{50} at extubation among 3 PK models in surgical patients under Rmzl anaesthesia.
Materials and Methods: Patients who received general anaesthesia with Rmzl, remifentanil, and rocuronium for 6 months from Oct. 2020 were enrolled. The patients who received flumazenil or who were kept intubated after operation were excluded. The Rmzl administration was left to the anaesthesiologist in charge.
The muscle relaxation was appropriately monitored and controlled. Processed EEG was monitored and the estimated Rmzl concentration by Doi model was displayed during anaesthesia with on-line link to syringe pump.
Second-by-second precise histories of infusion pump for Rmzl, time to extubate were collected from anaesthesia recording system. Three PK models were used to calculate effect site concentration (Ce) with NONMEM® (ICON plc). The EC_{50}s and slopes were estimated using a Sigmoid Emax model.
Sex was estimated as a significant covariate in the model. Prism® (GraphPad Software) was used for the model development. Data are presented as typical value (95%CI). $P < 0.005$ was considered statistically significant.
Results: 49 males(M) and 48 females(F) were enrolled. The Doi and Schüttler models had different EC_{50}s (μg/mL) at extubation: 0.191 (0.189 - 0.193) for M and 0.226 (0.223 - 0.228) for F ($P<0.001$), and 0.143 (0.141 - 0.145) for M and 0.132 (0.129 - 0.134) for F ($P<0.001$), respectively. The Masui model had single EC_{50}, 0.192 (0.190 - 0.194) for both sex ($P = 0.022$).
Discussion: The Masui PK model with 10% higher total clearance in F than in M[1] indicated no pharmacodynamic difference between sex. As the Doi and Schüttler models were developed using samples from M, the Ce in F might be inappropriate. The lower EC_{50} in F than in M in the Schüttler model may be due to the fact that a lower BW tends to show lower Rmzl concentrations at the dose per BW.
Conclusion: Sex dependent Masui model indicated no pharmacodynamic difference between males and females.
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01AP01-05
Feasibility of a Bayesian based advisory tool for target-controlled infusion of propofol using qCON as control variable

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Background and Goal of Study: CePROP can be linked to the drug effect as measured by the processed EEG monitor and can be quantified using the sigmoidal "E-max" model. Displaying this pharmacodynamic relation on an advisory display will offer the clinician quantitative information on the optimal target concentration (Ct) for a given cerebral drug effect. Bayesian adjustment of this E-max model using prior information, based on measurements, could provide advices on these optimal targets.
This study aims to investigate the accuracy of a newly designed Bayesian-based, patient-individualized, pharmacodynamic advisory system to optimize propofol administration using an EEG derived index as a controlled variable (= intervention group) and to compare this to a "standard-of-care" propofol administration, defined as an EEG-guided effect-compartment controlled propofol administration without the input of the advisory system (=control group).
Materials and Methods: 100 patients scheduled for elective surgery were included in this single blinded randomized controlled trial and randomized over a control and intervention group in a 1:1 ratio. In the intervention group the advisory screen was made available, whereas it was blinded in the control group. The settings of the target-controlled infusion pumps could be adjusted at any time by the clinician. qCON was used as anaesthetic EEG monitor. The time of qCON between the desired range 35-55 was used as main parameter. Induction parameters and recovery times were secondary end points and coefficient of variance of qCON and CeProp was calculated in order to survey the extent of variability in relation to the mean of the population.
Results and Discussion: The desired range of qCON between 35-55 was maintained in 84% vs. 90% (N.S.) of the case time for control versus intervention group, respectively. No significant differences were established for the secondary end points. Coefficient of variation for CePROP was higher in the intervention group, showing a higher variability of the data in the intervention group.
Conclusion(s): The Bayesian-based CePROP advisory system applied in this trial enabled the anesthesiologist to titrate qCON between 35 and 55 for 90 % of the case time. Significant differences with the control group were hard to establish, most likely due to a very well performing control group.

01AP01-06
Comparison of the recovery profile of sufentanil and remifentanil in total intravenous anaesthesia. A systematic review and meta-analysis of randomised controlled trials

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Background and Goal of Study: Remifentanil is a short-acting opioid and can be administered in high doses during surgery without the risk of delayed postoperative recovery. Concerns about hyperalgesia and the shortages of remifentanil lead anaesthetists to consider long-acting opioids for total intravenous anaesthesia (TIVA). Sufentanil is a more potent opioid with a longer context-sensitive half-life than remifentanil but can promote good postoperative analgesia due to its residual effect. This meta-analysis aimed to compare the recovery profile of remifentanil and sufentanil administered in association with propofol for TIVA.
Methods: With a registry in PROSPERO (CRD42022366691), this review was conducted according to PRISMA guidelines. A systematic literature search was performed in the PubMed, CENTRAL, and Web of Science databases for randomised controlled trials (RCTs) comparing continuous infusion of sufentanil and remifentanil as part of TIVA in adults undergoing noncardiac surgery. The RoB2 tool and the GRADE approach to assess the quality of evidence were analyzed.
The primary outcome was time for tracheal extubation. Secondary analyses included the need for postoperative rescue analgesia, the incidence of respiratory depression, and postoperative nausea and vomiting (PONV).
Results: Seven RCTs including 403 participants were eligible for analysis. Sufentanil resulted in a significant increase in the time to extubate (MD= 4.29 min; 95% CI: 2.33 to 6.26; P= 0.001; I^2 = 78.73%) and a reduction in the need for postoperative rescue analgesia (log OR= -1.07; 95% CI: -1.62 to - 0.52; P= 0.005; I^2 = 26.81%). There were no significant differences between sufentanil and remifentanil for PONV (log OR= 0.50; 95% CI: -0.10 to 1.10; P= 0.10; I^2= 0%) and respiratory depression (log OR= 1.21; 95% CI: -0.42 to 2.84; P= 0.15; I^2 =0%).

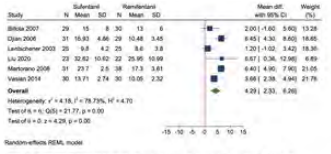

Figure 1. Forest plot of time for tracheal extubation comparing sufentanil and remifentanil, in combination with propofol.

Figure 2. Risk of Bias

Conclusion(s): In combination with propofol for TIVA, sufentanil delays the time of tracheal extubation compared with remifentanil but is associated with a reduced need for postoperative rescue analgesia. However, no significant differences were observed between the two opioids in terms of postoperative respiratory depression or PONV.

01AP01-07
In-vitro effect of Propofol on blood cholinesterase activities

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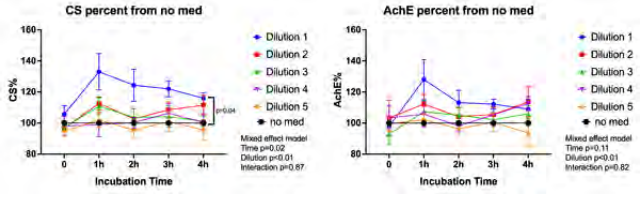
Background and Goal of Study: In previous research, we found that using Total Intravenous Anesthesia decreases the activity level of acetylcholinesterase (AChE) and Butyrylcholinesterase (BChE)[1]. There is little known regarding the effect of Propofol on Ache or BChE[2],
We aimed to assess the in-vitro effect of Propofol on serum AChE and Butyrylcholinesterase BChE.
Materials and Methods: In-Vitro drug- dosage study, serum samples were taken from healthy donors incubated with serial dilutions or Propofol, following five different incubation periods (0, 1, 2, 3, and 4 - hours). AChE and total cholinesterase activity levels were assayed in triplicates using an adaptation of the Ellman assay with or without a specific ButyrylCholinestersase inhibitor (tetraisopropylpyrophosphoramide (iso-OMPA, Sigma).
The Propofol dilutions started at the level needed for induction of anesthesia (5 mcg/ml) and were serially diluted (2.5, 1.25, 0.625, 0.3125 mcg/ml). PBS without serum and serum without medication were internal and negative controls.
Results and Discussion: Our results show that Propofol increases the activity of AchE and BchE only in the highest dilution (5mcg/ml) and mainly for the short time of incubation (under 2 hours), AChE mean 0.016±0.003 Cholinergic Status (CS) mean 0.054±0.008 compared to serum with no medication (P-value 0.0057), In the lower concentrations there was no significant difference, but the trend is toward an increase in the level of activity AChE mean 0.014±0.003 Cholinergic Status (CS) mean 0.044±0.003 compare to serum with no medication (P-value 0.091).



Conclusion: We showed that in-vitro Propofol increase the activity of AchE and CS and might affect the use of medication hydrolyzed by cholinesterases.
References:
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01AP01-08
Effect of alkalinized lidocaine 2% on post-intubation complications when inflated in the endotracheal tube's cuff: a prospective randomized controlled trial

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Background and Goal of Study: Coughing, sore throat and dysphonia are common complications after endotracheal intubation due to irritation of the tracheal mucosa. A few studies have shown that injecting intracuff alkalinized lidocaine could reduce the incidence of the above. Our study aimed at evaluating the effect of intracuff alkalinized lidocaine on post-intubation complications in comparison to intracuff air and intracuff N/S.
Materials and Methods: This is an ongoing (November 2022–March 2023) prospective single-blind randomized controlled trial. Fifty-nine patients ASA I–III, undergoing elective operations under general anaesthesia of approximately 50-300 minutes duration were enrolled so far. Patients were randomized to 3 groups receiving ETT intracuff air (Group A), intracuff N/S 0.9% (Group B) or intracuff alkalinized lidocaine hydrochloride (L-HCL) (Group C). Ninety minutes prior to intubation, endotracheal tube cuffs were prefilled with air, N/S 0.9% or L-HCL 2% plus $NaHCO_3$ 4.2% respectively and were emptied just before intubation. After intubation, cuffs were inflated with air (Group A), N/S 0,9% (Group B) or 2ml L-HCL 2% plus $NaHCO_3$ 4.2% (Group C) until there was no air leak thus achieving cuff pressure 25-30mmH_2O. The primary outcome was incidence of cough around extubation time. Coughing episodes at 15min and 60min after extubation were recorded as well as sore throat, dysphonia and PONV, as secondary outcomes, reported by patients 15min, 1h and 24h after extubation. STATA13.1, regression analysis, analysis of variance and chi square test were used for statistical analysis.
Results and Discussion: There was no difference between groups in demographics. Incidence of cough around extubation time in group C was less frequent (Mean: 0.95±1.03) than in group A (Mean 1.25±0.97) and B (Mean 1.4±1.1), but it was not statistically significant (p=0.36 and p=0.65 respectively). However, the occurrence of sore throat 60min [OR:-1.33, 95%CI:(-2.53, -0,12), p=0.03] and 24h [OR:0.70, 95%CI(0.16, 1.23), p=0.01] and dysphonia 15min [OR:0.59, 95%CI(0.10, 1.08), p=0.02] after extubation in group C were statistically significant showing a decrease compared to group A. No significant difference was observed in PONV. Further patient enrollment is needed for assessment.
Conclusions: ETT's cuff inflation with alkalinized lidocaine leads to a decrease in frequency of postoperative sore throat and dysphonia but had no statistically significant impact on coughing or PONV.

01AP01-09
Do residents and anaesthesiologists adapt the dose of rocuronium according to age and do they predict the train of four percentage adequately at the end of surgery?

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Background and Goal of Study: We explore differences in titration habits for rocuronium between residents and anaesthesiologists, both in young and elderly patients of different sexes. We use simulated effect-site concentrations of rocuronium (Ce_{ROC}) and model derived train of four percentages (TOF%)[1] to compare whether age related dose adjustments also result in significant difference of TOF% effect. We also compare whether inadequate estimations of TOF% at the end of surgery affects the use of antagonists for rocuronium?

Materials and Methods: A survey was conducted in four Belgian hospitals, inquiring for dosing intentions by residents and anaesthesiologists to manage a laparoscopic procedure in four identical ASA1 patients, apart from sex and age (respectively 18 and 80 years). Smart Pilot View® (SPV, Draeger, Lübeck, Germany) calculates the corresponding Ce_{ROC} and the population average TOF% is calculated according to Kenichi[1] at induction (maximal values), intubation, incision and at the end of surgery. T test defined significant difference ($p<0.05$) within and between groups ($p<0.05$).

Results and Discussion: 44 residents and 32 anaesthesiologists responded (=25% response rate). Main results are found below. Residents reduce their rocuronium dose in elderly more consistently compared to anaesthesiologists but without evoking a difference in TOF% at induction, intubation nor incision. The model calculated TOF% at the end of surgery (> 90%in all patients) is underpredicted by (on average) two categories in both groups leading to an inappropriate use of antagonists in almost all cases.

	ROC DOSE (induction) (mg, mean (SD))	MAXIMAL CE_{ROC} (induction) (µg/ml, (mean (SD))	MINIMAL TOF% (induction) (%, mean (SD))	Ce_{ROC} (end of surgery) (µg/ml, (mean (SD))	TOF% (end of surgery) (%, mean (SD))	ESTIMATED TOF%-CATEGORY[§] BY RESPONDERS (end of surgery) (mean (SD))	CATEGORICAL[§] PREDICTION ERROR BY RESPONDERS (mean (SD), number of categories above (>0) or below (<0) the model derived TOF%)	FRACTION OF RESPONDERS IN FAVOUR OF USING A ROC ANTAGONIST (0=NO, 1=YES)
RESIDENTS								
N=55; CASE 18 y	33,4 (6,5)*	3,00 (0,56)*	0,38 (0,89)	0,74 (0,14)*	102,89 (5,77)	3,02 (1,47)	-1,98 (1,47)	0,76 (0,43)*
N=21; CASE 80 y	19,3 (6,3)*	2,65 (0,57)*	1,45 (2,45)	0,66 (0,14)*	104,62 (1,96)	2,95 (1,56)	-2,05 (1,56)	0,95 (0,22)*
ANAESTHESIOLOGISTS								
N=37; CASE 18 y	35,0 (6,9)	3,12 (0,61)	0,37 (1,04)	0,76 (0,15)	102,09 (6,50)	2,41 (1,89)	-2,59 (1,89)	0,68 (0,47)
N=23; CASE 80 y	33,7 (7,46)	2,95 (0,58)	0,76 (1,77)	0,72 (0,14)	103,60 (3,10)	2,22 (2,11)	-2,78 (2,11)	0,87 (0,34)

* p<0.05 between age groups; Data for intubation and incision are not shown, §: TOF% categories: 0 = TOF count < 4; 1 = TOF% <10%; 2 = TOF%: 11-50%; 3 = TOF%: 51-70%; 4 = TOF%: 71-90%; 5 = TOF%>90%; ROC: rocuronium; N = number of responders; SD: standard deviation; Ce_{ROC}: effect-site concentration of rocuronium (according to Wierda); TOF%: Kenichi model derived Train of Four percentage[1].

Conclusion(s): Titration habits can be improved in both groups. Using bedside predictions of Ce_{ROC} and TOF% might be a helpful tool to assist training and decision making.

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01AP01-10
Comparison of the bispectral index and slow-wave activity in propofol anaesthesia

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Background and Goal of Study: The bispectral index (BIS) is a clinically used population-based electroencephalographic (EEG) depth of anaesthesia measure. Recently, its algorithm was reverse-engineered [1].

Slow-wave activity saturation (SWAS) is a potential individualised, brain-based loss of perception maker [2].

In this study, we aimed to compare the BIS with SWAS using a previously published dataset [3].

Materials and Methods: 32-channel EEG was collected in N=16 healthy volunteers slowly induced to 4µg/ml estimated propofol effect-site concentration. Data were downsampled to 128Hz and re-referenced to TP9 to emulate the BIS montage. Fz-derived spectrogram was computed in Matlab, slow-wave activity found as mean 0.5-1.5Hz power, and a sigmoid dose-response curve fitted [2].

A time window was rejected as artifactual if its gamma power (30-48Hz) >−10dB. Five BIS values were extracted for each subject using an emulator [1]: mean BIS during 10min awake baseline, BIS at loss of responsiveness (LOR), BIS when SWAS was achieved, mean BIS during 10min at peak propofol, and BIS at return of responsiveness (ROR). These were compared using repeated-measures ANOVA with post-hoc Tukey's tests. Within-subject variability of BIS during 5min at SWAS was also examined.

Results and Discussion: BIS value changed significantly during the experiment (Figure 1A; RANOVA $P<0.001$). BIS dropped from 86±7 awake to 76±9 at LOBR ($P=0.012$), 49±4 at SWAS ($P<0.001$), 49±9 at peak concentration (n.s.), rising to 86±12 at ROBR ($P<0.001$; subsequent stages compared). BIS at SWAS was correlated with slow-wave power at SWAS (Pearson r=-0.62, $P=0.019$). Within-subject BIS values fluctuated due to high-frequency noise (Figure 1B).

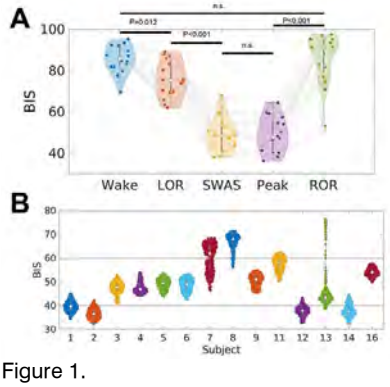

Figure 1.

Conclusion(s): Despite SWAS being a well-defined physiological state, BIS was variable at SWAS, both within-subject due to noise and between subjects depending on the individual's slow-wave power plateau. SWAS may thus more closely reflect the underlying neural state.

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01AP01-11
Can we prevent delirium in elderly patients proposed for elective surgery if we use ketamine or lidocaine? A randomized, double-blind, placebo-controlled study

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Background and Goal of Study: Postoperative delirium is associated with worse outcomes after surgery in elderly patients. It is a real challenge to achieve the goal of preventing and treating postoperative delirium.
Ketamine is an intravenous anesthetic that can reduce postoperative pain. The systemic administration of lidocaine is associated with beneficial effects in terms of analgesia and postoperative recovery of the patients. Our trial aimed to assess and compare the effect of intravenous infusion of lidocaine or ketamine on the incidence and severity of postoperative delirium following elective surgery in elderly patients.
Materials and Methods: 96 patients with ASA I-III, > 60 years, scheduled to undergo elective surgery, were included in our study, a prospective, double-blind, randomized controlled study. We randomly allocated the eligible subjects in three equal groups (n=32): Group K(S-ketamine - a bolus of 0,25mg/kg, with an infusion rate of 0,1 mg/kg/h), Group L(lidocaine-a bolus of 1.5 mg/kg, with an infusion rate of 1.5 mg/kg/h), and Group S (the control group who receives 50 mL normal saline). All drugs are identical in appearance, packaged in identical 50 mL syringes labeled: study medications. We infused the loading dose of study drugs within 10 minutes before induction and the maintenance dose continuously at a constant rate until skin closure.
Our primary outcome was the incidence of POD within 4 days after surgery. The severity and duration of POD, postoperative pain and incidence of adverse events were evaluated as secondary outcomes. Collected data were analyzed using Student's t-test with a significance level of $p<0.05$.
Results and Discussion: There was a significant difference in POD incidence between the placebo and lidocaine groups ($p=0.02$). We did not find significant differences among the three groups in maximum pain scores ($p=0.72$) or median opioid consumption ($p=0.64$). Adverse events did not differ significantly across the three groups($p=0,73$).
Conclusion(s): The administration of lidocaine to older adults during elective surgery is proper for reducing postoperative delirium. The administration of ketamine did not show evidence of reducing postoperative delirium or opioid consumption and might cause harm by inducing negative experiences. We need more studies to evaluate the association of specific perioperative medications with the risk of postoperative delirium in elderly patients.

01AP02-01
Perioperative characterization of a CRS/HIPEC re-intervention population from a Portuguese Tertiary Oncologic Center

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Background, Goal of Study: The cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS/HIPEC) is widely spread among hospitals but re-intervention for relapsed disease is still exceptional and the reports about outcomes and perioperative management are still scarce in literature. With this study we sought to describe the characteristics of the population submitted to re-intervention in our tertiary oncologic center.
Materials/Methods: Retrospective data collection of all patients submitted to re-intervention CRS/HIPEC for relapsed abdominal disease in our institution from January 2016 to December 2020. Categorical and continuous variables are described according to their classification; Mann-whitney U and Kruskal-Wallis tests were performed to compare continuous and categorical variables.
Results/Discussion: In 5 years, 31 re-interventions were performed, 23 (74,2%) in woman and the mean age 59,03 (SD 12,67) years. 28 (90,3%)patients were ECOG 0, only 1 was ECOG 2 . The median P-POSSUM score for morbidity was 39,2% (IQR 21,9) and for mortality was 7,6% (IQR 6).
All cases received general anesthesia with or without thoracic epidural.
All patients completed 60 minutes of intraperitoneal chemotherapy being transferred, after the surgery, to a level 2 or 3 care unit where the median time of stay was 2 days. The median overall length of hospital stay was 11 (IQR 13) days.
Whilst in the hospital and until 30 days after discharge, 18 (58,1%) patients registered at least one adverse event. The most severe event of each patient was accounted and classified according to CTCAE v.5, resulting in 2 (11,1%) grade I, 9 (50%) grade II, 5 (27,8%) grade III and 2 (11,1%) grade IV events.
There were no deaths on the first year after discharge.
There was no relation between the P-POSSUM score for morbidity and the occurrence of adverse events ($p=0,572$) neither for the severity of them ($p=0,272$)
Conclusion: The HIPEC/CRS surgery is a very aggressive procedure, and the fitness of the patients must be assured. The patients to be submitted to re-intervention are judiciously selected, and this is reflected on the characteristics of our population. Scoring tools are becoming irreplaceable allies to assess the surgical risk and guide anesthesiologists to provide safer care, nevertheless, in our study, this risk of morbidity and mortality seems to be overestimated, being one possible explanation the judicious selection of the patients and the center high volume.

01AP02-02
Impact of anesthesia method on immune response and mortality in patients undergoing surgery for cancer

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Background and Goal of Study: Recent evidence suggests that inhalation anesthesia (IA) is associated with higher cancer mortality than total intravenous anesthesia (TIVA), possibly due to a modulation of the immune response. The aim of this study was to determine the impact of anesthesia techniques on selected parameters of patient immunity considering the evidence of relationship between the anesthesia methods and immune status and, consequently, the risk of breast cancer recurrence.
Materials and Methods: We performed a meta-analysis of clinical studies published in PubMed, Google Scholar, and Cochrane databases, aimed at assessing the impact of anesthesia on the postoperative immune status and overall survival in patients undergoing breast cancer (BC) surgery. 6 randomized and 12 retrospective cohort studies were included (a total of 637 patients with immune status assessment (50.2% in the TIVA group) and 26469 patients with data on survival (39,6% TIVA),). Data on leukocyte counts, matrix metalloproteinases (MMP) 9 and 3, interleukins (IL) 6 and 10 levels, neutrophil-lymphocyte ratio (NLR) values, 3- and 5- year overall survival (OS) data were retrieved. Data were analyzed using the RevMan v.5.3 tool (Nordic Cochrane Center, Cochrane Collaboration). RoB-2 tool was chosen to assess the risk of bias.
Results and Discussion: Patients after breast cancer surgery who underwent TIVA had significantly lower white blood cell counts (standardized mean difference (SMD)=–0.32; 95% CI: –0.58 to –0.06; I2=58%, P=0.020) and MMP-9 (SMD=–0.35; 95% CI: –0.67 to –0.03; P=0.030; I2=0%) in the postoperative period compared with patients receiving IA. No significant differences in the levels of MMP-3, IL-6, IL-10, and NLI values were found between the two groups. A meta-analysis of 9 retrospective cohort studies and 1 MRCT showed a detrimental effect of IA on 3-year OS in surgical oncology (Hazard Ratio (HR): 1.73 (1.36; 1.96)I2 = 64.01, overall effect analysis P<0.017). Analysis of 5-year OS failed to spot any differences (P = 0.441), although it did not remove any doubts about the possible negative effect of the use of IA in surgical oncology.
Conclusion(s): The patients who underwent breast cancer surgery under TIVA had lower blood leukocyte counts and levels of MMP-9, compared with those operated under IA. However, data from meta analysis of mostly retrospective cohort trials not to allow make an unambiguous conclusion about the advantages of TIVA in cancer surgery.

01AP02-03
Ultrasound guided peripheral venous cannulation in patients undergoing elective surgery under general anesthesia

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Background and Goal of Study: Obtaining peripheral venous access is the key condition for performing surgery under general anesthesia. However, performance using a technique based on anatomical landmarks can be burdened by first-attempt failure in up to 50% of cases. Therefore, we performed a prospective randomized clinical study to compare the success rate and safety of ultrasound-guided peripheral venous catheter (PVC) insertion to the superficial venous system of upper extremities with the conventional cannulation technique in the operating room. We hypothesized ultrasound-guided method is associated with a higher success rate of the first cannulation attempt than the conventional technique.
Materials and Methods: Patients undergoing elective surgery in general anesthesia were randomized to ultrasound-guided PVC insertion (Group A) or to the conventional PVC placement (Group B). The primary outcome was to compare PVC insertion success rate for the first attempt between both groups. The outcomes of the study were monitored till the second postoperative day or the extraction of PVC. The usual methods of descriptive statistics were used for the analysis.
Results and Discussion: A total of 613 adult patients were enrolled. The success of the first cannulation attempt was significantly higher in the group A compared to the group B (group A: 90.6 %, group B: 84.5 %, p=0.039) while the overall success rate was 100 % in both groups. The time required for PVC insertion was significantly shorter in the group B than in the group A (Group A 432,8 s and Group B 303 s, p<0,001).
Conclusions: Ultrasonographic guidance of PVC insertion at the operation theatre in the patients undergoing major surgery was associated with a higher success rate of the first cannulation attempt in our cohort of patients, but at the cost of a slight prolongation of the procedure.

01AP02-04
Existing practice of perioperative care of patients undergoing colorectal surgeries in a tertiary care cancer hospital and compliance with eras guidelines: an audit

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Background and Goal of Study: Enhanced recovery after surgery (ERAS) protocol in colorectal surgery has shown reduced postoperative complications and hospital length of stay (LOS). We aimed to audit existing practice of perioperative care in colorectal surgeries and find out the adherence to ERAS protocol

Materials and Methods: We collected data from medical records of 104 patients who underwent colorectal surgery in a tertiary care cancer hospital of eastern India from January 2022 to June 2022. Data were retrospectively collected, which included, demographic data, adherence to individual elements of ERAS pathway, postoperative complications, and length of hospital stay. The LOS was defined as duration of stay in the hospital from day of surgery to discharge.

Complications were defined according to the Clavien-Dindo classification. Categorical variables are presented as absolute numbers and frequencies. Continuous variables are presented as mean +/- standard deviation (SD) or median with interquartile range (IQR).

Results and Discussion: The median LOS was 9 days [(IQR): 8-11]. Around 20% patients had Clavien Dindo (CD) grade I, 44.2% CD grade II and 1.9% CD grade III complications. We found 100% adherence to ERAS elements like preadmission counselling; preoperative optimisation; prehabilitation; prophylactic antibiotic; intraoperative multimodal analgesia, hypothermia prevention, PONV prophylaxis and postoperative glycaemic control.

More than 90% adherence was found in no sedative premedication, preoperative thromboprophylaxis, short acting anesthetic, early mobilization and enteral feeding.

Conclusion(s): The audit revealed that compliance to most of the ERAS elements were satisfactory, however some components need modification for better adherence to ERAS guidelines and improved patient outcome

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01AP02-06
Impact of intraoperative diuresis during hyperthermic intraperitoneal chemotherapy time in the incidence of acute kidney injury in cytoreductive surgery

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Background and Goal of Study: Acute kidney injury (AKI) associated with cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS + HIPEC) has a significant impact in the morbidity and mortality of this procedure.

Our aim was to examine the association of diuresis during HIPEC-time and the incidence of AKI according to KDIGO criteria in patients who underwent CRS+HIPEC.

Renal protection is recommended to avoid nephrotoxicity, including high diuresis output during the HIPEC phase.

Materials and Methods: After IRB approval, an ambispective study was performed evaluating patients undergoing CRS + HIPEC from 2011 to 2020. In our hospital, the anaesthetic technique is standardized including renal protection by increasing fluid infusion and forcing diuresis during the HIPEC period. Postoperative renal function was assessed using serial serum creatinine measurements and was based on serum creatinine changes from pre-operative values, according to KDIGO classification.

Results and Discussion: We evaluated 471 patients, ASA I-III, 70% women with a mean age of 56±11,7 years. Median (Interquartile range) of the peritoneal carcinomatosis index (PCI) was 11(6-22). HIPEC time was 30 min in 23.4% of patients, 60 min in 56% of cases and in a 20.6% of patients HIPEC time lasted 90 min. AKI was observed in 70 patients (14.9%); KDIGO Stage (KS) 1: n=34; KS 2: n=15; KS 3: n= 21). Urine output (UO) during HIPEC-time in patients with AKI was 620 (380-810) vs. 760 (560-1000) mL in patients without AKI, p=0.001. HIPEC time was similar in both groups: 60.8±19.5 vs. 58.3±19.9 min in patients with and without AKI, p=0.34.

Patients who received cisplatin presented AKI in a higher proportion 25% vs. 9%. In this group, patients with AKI also had lower UO, p=0.001. Patients with AKI had higher PCI 17.86 vs. 13.85, p=0.004. However, there was no difference in UO during HIPEC-time in patients with higher PCI.

Conclusion: AKI during CRS/HIPEC was associated with a lower urine output (UO) during HIPEC-time and with the use of cisplatin. Our data suggest that promoting higher urine output (UO) during HIPEC-time may be protective against AKI during CRS/HIPEC.

01AP02-07
Can elderly patients adapt to the hemodynamic requirements of cytoreductive surgery and hyperthermic intraperitoneal chemotherapy?

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Background and Goal of Study: Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) is an established treatment of patients with peritoneal carcinomatosis (PC). The procedure is associated with important morbidity and mortality and optimal treatment is essential to prevent complications, particularly in at-risk populations such as the elderly patient.
The aim of this study was to evaluate the impact of CRS + HIPEC on hemodynamic parameters in elderly patients compared to patients <65 years.
Materials and Methods: After IRB approval, from May 2016 to November 2020, 155 consecutive patients who underwent CRS-HIPEC were prospectively enrolled, among which 46 were elderly (30%). Goal-directed haemodynamic management was applied in all patients with endpoints based on cardiac index (CI), stroke volume index (SVI), central venous oxygen saturation (ScvO2) and mean arterial pressure (MAP).
Invasive haemodynamic measurements were performed using transpulmonary thermodilution and a ScvO2 catheter at predefined time points (baseline, before HIPEC, 30 min post-HIPEC, 60 min post-HIPEC and at the end of surgery). Statistical analysis: Student t-test; Chi-square test; repeated measures ANOVA
Results and Discussion: The mean age in elderly was 69±3.5 vs. young group: 52.8±9.4 years, p=0.001, there were no differences in gender, ASA, HIPEC-time and peritoneal cancer index (PCI) between both groups. Anaesthetic time was shorter: 9.8±1.7 vs. 10.5±2 h, in the elderly vs. young group. At baseline CI and SVI were lower (2.15±0.45 vs. 2.66±1.29 ml.m-2, p= 0.009; 33±7 vs. 37±8 ml, p=0,014; and the systemic vascular resistance index (SVRI) higher (2674±814 vs. 2269±584, dynes-sec/cm-5.m-2, p=0,001 in the elderly vs. young group.
Throughout the surgery there were no differences in haemodynamic parameters between both groups except in the global end-diastolic volume index (GEDVI) that was higher in the elderly from pre-HIPEC to the end of surgery.
The elderly group received less fluid: 4690±1112 vs. 5385±1494 ml, p=0,005. There were no differences in the need for vasopressors (p=0.37) or major postoperative complications in both groups (15% vs. 19%, p=0.8).
Conclusion(s): Our findings suggest an adequate hemodynamic adaptation of the elderly during CRS-HIPEC compared to younger patients. In the population evaluated, age was not associated with a higher proportion of serious postoperative complications.

01AP02-08
The effects of goal-directed fluid therapy and epidural analgesia in decreasing cisplatin-induced acute kidney injury in hyperthermic intraperitoneal chemotherapy surgeries

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Background and Goal of Study: Cisplatin is widely used as the regimen of hyperthermic intraperitoneal chemotherapy (HIPEC). Cisplatin-induced acute kidney injury (AKI) after HIPEC surgeries was a common but fatal complication, with an incidence of approximate 15-32%, according to previous reports. Surgical stress and inappropriate fluid administration may decrease intraoperative renal perfusion and contribute to the occurrence of cisplatin-induced AKI. To mitigate surgical stress and inappropriate fluid administration, we developed an anesthetic protocol that incorporates intraoperative epidural analgesia and goal-directed fluid therapy (GDFT) into the anesthetic care of HIPEC surgery patients. The occurrence of cisplatin-induced AKI after HIPEC surgeries was investigated.
Materials and Methods: We retrospectively collected patients underwent HIPEC surgeries from the database of Wan Fang Hospital, an affiliated hospital of Taipei Medical University and a tertiary center in Taipei, Taiwan. The protocol of HIPEC was hyperthermia at 42 degrees Celsius for 60 minutes followed by cisplatin-based intraperitoneal chemotherapy. In addition to general anesthesia, all patients received intraoperative lumbar epidural analgesia and GDFT. For GDFT, intraoperative fluid administration was conducted to maintain a stroke volume variation of less than 15%. RIFLE criteria were applied for the diagnosis of AKI. (Table.1)

Category	GFR criteria	UO criteria
Risk (R)	Increased creatinine level x 1.5 or GFR decrease > 25%	UO < 0.5 mL/kg/h x 6 h
Injury (I)	Increased creatinine level x 2 or GFR decrease > 50%	UO < 0.5 mL/kg/h x 12 h
Failure (F)	Increased creatinine level x 3 or GFR decrease > 75% or creatinine level > 4 mg/dL	UO < 0.3 mL/kg/h x 24 h or anuria x 12 h
Loss (L)	Persistent acute renal failure or complete loss of renal function for > 4 weeks	
ESRD (E)	ESRD for > 3 months	

Table.1 RIFLE classification for acute kidney injury

Results and Discussion: A total of 40 patients undergoing HIPEC surgeries with cisplatin were included, among which 22 patients are female. The average age is 60.6 years old, and the average BMI is 23.1. Of note, among the 40 patients, only three patients (7.5%) developed AKI within one week after surgery. These data indicated that HIPEC surgery patients using intraoperative epidural analgesia and GDFT were associated with a decreased incidence of cisplatin-induced AKI.
Conclusion(s): In HIPEC surgeries with cisplatin, GDFT and epidural analgesia can decrease the incident rate of AKI.

01AP02-09
Opioid-free anaesthesia and postoperative analgesic requirements after breast cancer surgery: a case series study

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Background and Goal of Study: Various analgesic modalities are adopted for perioperative analgesia in breast cancer surgeries. Opioid-free and opioid sparing techniques are gaining popularity due to lack of opioid-dependent undesirable effects, including respiratory depression, urinary retention, nausea and vomiting, constipation, itching, opioid-induced hyperalgesia, tolerance, addiction, and immune system disorders.

We aim to investigate the impact of opioid-free anaesthesia (OFA) versus conventional general anaesthesia (CGA) on postoperative analgesic requirements after breast cancer surgery (lumpectomy/mastectomy, with or without axillary lymph node dissection).

Secondary objectives include comparative perioperative evaluation of cognitive function, intraoperative haemodynamics, postoperative adverse events and hospital length of stay.

Materials and Methods: This case series study is part of a prospective clinical study regarding OFA and serves as a pilot sample. Twenty participants were randomly allocated to receive either OFA or CGA. OFA was achieved via continuous intravenous infusion of a mixture of lidocaine, ketamine and dexmedetomidine[1]. The Hospital Scientific Committee approved this study and written informed consent was obtained from all patients. The Student's t-test (or its non-parametric equivalent Mann-Whitney U) and the Fisher's exact test were used for comparison of continuous and categorical variables, respectively

Results and Discussion: The population was homogenous concerning baseline characteristics ($p>0.05$). No differences were detected in surgical, anaesthesia and extubation times, as well as hypotensive episodes and the use of vasopressors intraoperatively ($p>0.05$). Analgesic requirements did not differ between groups for the first 24 hours postoperatively. Numerical Rating Scale (NRS, 0-10) scores at 1 and 6 hours after surgery, both at rest and at deep breath, were statistically greater in the OFA group ($p<0.05$), though clinically insignificant as scores for both groups were <3/10.

No anaesthesia-related adverse events were encountered for both groups and no differences were recorded in hospital length of stay. Finally, the Mini-Mental State Examination (MMSE), both pre- and postoperatively, was similar between groups ($p>0.05$).

Conclusion(s): Our findings suggest that an opioid-free general anaesthesia protocol was not inferior to conventional general anaesthesia in terms of postoperative analgesic requirements and safety.

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01AP02-10
Pilot study comparing Clearsight noninvasive cardiac output and transpulmonary thermodilution cardiac output in patients undergoing hyperthermic intraperitoneal chemotherapy

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Background and Goal of Study: Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) is associated with huge hemodynamic and cardiac function changes related with increased body temperature and increased intra-abdominal pressure. The ClearSight system measures blood pressure non-invasively and determines cardiac output by analysing the continuous pressure waveform.

We performed a pilot study to test the equivalence of cardiac output (CO) measured with the ClearSight system (CSCO) and transpulmonary thermodilution cardiac output measured with the VolumeView™ catheter (VVCO) in patients undergoing CRS-HIPEC.

Materials and Methods: After IRB approval, patients undergoing CRS-HIPEC were evaluated. In our institution, the intraoperative volume therapy and hemodynamic management was guided by invasive transpulmonary thermodilution technique (Volume-View). In addition, patients were monitored with the ClearSight system. A data pair for the comparison included the invasive CO values (VVCO) and the matching non-invasive CSCO values. Main outcomes included a Bland-Altman analysis of the systematic bias and standard deviation (SD) and the upper and lower limits of agreement (LOA), in addition to the percentage error (PE).

Results and Discussion: In this pilot study we included data from four patients. A total of 490 paired VVCO and CSCO measurements were analysed, including 150 paired data which were obtained during the HIPEC phase. Mean SD bias for CO during pre-HIPEC and HIPEC phase were -0.2 (1.05) L/min and -0,8 (0.88) L/min respectively. Upper and lower LOAs were −2.26 l/min and 1.8 l/min and –2.56 l/min and 0.91 l/min respectively. The PE was 42% and 24.6% respectively.

Conclusions: Our findings suggest that CSCO and VVCO measurements have a low systematic bias in both phases of surgery. However, the mean PE during the cytoreductive period is higher than the predefined value of 30%, in contrast to the results in the HIPEC phase, with a value under 30%. Inclusion of future patients and analyses of a larger number of paired data will facilitate defining the benefit of ClearSight system in CRS-HIPEC.

01AP02-11
Efficacy and safety of remimazolam compared with propofol for general anesthesia in elderly patients underwent laparoscopic cholecystectomy - a randomized controlled study

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Background and Goal of Study: Remimazolam is an ultrashort-acting sedative, which has a fast onset and offset of sedation and a short half-life compared with other benzodiazepines, and more stable hemodynamic profiles compared with propofol.
However, there is a lack of sufficient evidence for the efficiency and safety of remimazolam for adequate anesthetic depth and intraoperative stable hemodynamics in elderly patients. Therefore, we evaluated the differences in anesthesia characteristics and perioperative hemodynamic profiles in elderly patients receiving total intravenous anesthesia, using either remimazolam or propofol.
Materials and Methods: After obtaining IRB approval and the patient's informed consent, 45 patients aged over 65 years with an ASA PS of I-III were randomly assigned to two groups receiving remimazolam (groupR, n=22) or propofol (groupP, n=23).
In group R, remimazolam was initiated at 6 mg/kg/h until achieving loss of consciousness (LoC) and was maintained at 1 mg/kg/h with a maximum infusion rate of 2 mg/kg/h.
In group P, propofol 1.0 -1.5 mg/kg was injected for 1 min and was maintained at 100 μg/kg/min. The maintenance infusion rate was adjusted to maintain an appropriate anesthetic depth until the end of surgery.
The primary outcomes were the time of LoC and the time of eye-opening (EO) after the stop of remimazolam or propofol infusion. The anesthetic depth scores and the hemodynamic profiles were recorded during the perioperative period. We analyzed data using the Student t-test, $\chi 2$ or Fisher's exact test, and one-way analysis of variance, appropriately. p values <0.05 were considered statistically significant.
Results and Discussion: The time of LoC was slower in group R (110.1 s, 95%CI; 96.4 to 123.8 s) than in group P (68.9 s, 95%CI; 53.5 to 84.3 s) ($p < 0.001$). The time to EO was longer in group R (10.4 min, 95%CI; 8.7 to 12.2 min) than in group P (7.9 min, 95%CI; 6.3 to 9.5 min) ($p = 0.03$). No significant differences in perioperative hemodynamic profiles were observed between groups. No significant differences in intraoperative anesthetic depth score were observed between groups.
Conclusion: In elderly patients, remimazolam does not have as fast onset time and recovery time as propofol, but it has a similar effect to propofol in maintaining hemodynamic and anesthetic depth. In addition, the perioperative safety of remimazolam in elderly patients is similar to propofol.

01AP03-01
High exposure to waste anaesthetic gases is associated with DNA damage in healthcare professionals

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Background and Goal of Study: Occupational exposure to waste anaesthetic gases (WAGs) is thought to exert adverse effects in operating room personnel. Considering the controversial findings related to genetic damage in healthcare professionals, we hypothesised that a high exposure to WAGs in the workplace is associated with genetic instability. Thus, the main objective of this study was to assess WAG exposure and to evaluate DNA damage in healthcare professionals.
Materials and Methods: After approval from the local Ethical Committee, this observational study was conducted in a Brazilian public university hospital. Buccal cells were collected from 90 healthcare professionals mainly exposed to WAGs sevoflurane and isoflurane, and 90 matched-controls. DNA damage was evaluated by using the buccal micronucleus cytome (BMCyt) assay to detect micronucleus (MN), a genetic instability marker. Coded slides were stained, two thousand differentiated cells per subject were analysed, and MN frequency was presented per thousand. The concentrations of WAGs were determined during inhalational anaesthesia in the breathing zone of the professionals, by using a portable infrared spectrophotometer, and the values were expressed in parts per million (ppm). Student's t test was applied for comparisons of age and body mass index between groups whereas the chi-square test was used to compare the sexes. MN marker was analysed by the generalized linear model using the Poisson test.
Results and Discussion: There were no significant differences between groups regarding demographic and anthopometric data ($p > 0.05$). The exposed group showed higher frequencies of MN when compared to the control group ($p = 0.01$). The mean concentrations of WAGs were 7 ± 4 ppm for isoflurane and 9 ± 7 ppm for sevoflurane; these values were greater than exposure limits recommended by international regulations.
Conclusion(s): This cross-sectional study showed that high occupational exposure to WAGs is associated with genetic instability. Considering that exfoliated oral cells are target of WAGs and BMCyt assay is a minimally invasive method to detect genetic instability/biomarker of effect (MN), we suggest that BMCyt analysis should be employed to monitor possible toxic genetic effects due to occupational exposure. Reducing occupational exposure to WAGs is relevant to minimise the observed effects on exposed health workers.
Acknowledgements: FAPESP and CNPq.

01AP03-02
An audit of awareness surrounding perioperative anaphylaxis among theatre healthcare providers

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Background and Goal of Study: Perioperative anaphylaxis is a life-threatening emergency occurring in 1 in 10,000 anaesthetics. The 6th National Audit Project of the Royal College of Anaesthetists (NAP 6) focused on perioperative anaphylaxis. Key institutional recommendations included the provision of training to staff in the management of perioperative anaphylaxis, as well as introducing anaphylaxis treatment and investigation packs.

Materials and Methods: A 10 question survey was designed and circulated to anaesthetists and anaesthetic nurses working in a Model 3 hospital with 7 theatres catering to adult, obstetric and paediatric patients. The questions were drawn from the significant findings and recommendations of the NAP 6 project as well as the Association of Anaesthetists guidelines for the management of perioperative anaphylaxis.

Results and Discussion: We had 58 respondents to our prospective audit; 12 consultant anaesthesiologists, 23 non-consultant anaesthesiologists and 23 anaesthetic nurses. There was good awareness of the most common trigger with 71% correctly identifying antibiotics. 34.5% were aware that Teicoplanin has the highest incidence of perioperative anaphylaxis. 32.75% correctly identified hypotension as the most common presenting feature. 27.5% knew to commence CPR with a systolic of <50mmHg and 34.5% identified correctly the initial volume of IV crystalloid to bolus. 44.8% were aware of the correct timing of serum tryptase levels post event. 44.8% knew where to find a protocol for the management and investigation of anaphylaxis in the department.

Teicoplanin features in our local surgical prophylaxis guidelines as the alternative to penicillin for those with an allergy. We will need to underline the importance of a thorough allergy history. Our survey results show a likely benefit to the introduction of training and treatment packs for perioperative anaphylaxis.

Key findings from NAP 6 included a delay in initiating CPR with very low blood pressure and inadequate volume resuscitation, which was reflected in the responses of our survey. Uncertainty was also noted with regard to locating a protocol for management of anaphylaxis and the timing of serum investigations.

Conclusion: Our survey and interventions highlight an anaesthetic emergency and aim to improve patient safety in our department. We plan to rectify the above by the introduction of treatment & investigation packs and departmental education, with re-audit scheduled.

01AP03-03
Audit on Sharps disposal by anesthetists in the operation room at Tawam Hospital

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Background and Goal of Study: Needle stick injuries (NSIs) have imposed an occupational hazard in healthcare workers causing morbidity and mortality from blood borne infections. It was found that around 33.8% of NSIs occur in the operating room and around 58.4% of NSIs happen during disposal of sharps. Accidental occupational infections among anaesthetists from infected patients impose a potentially fatal risk which can be significantly reduced by practicing universal precautions.

We performed this audit to assess the current knowledge and attitude on sharps disposal of the Operation Room (OR) staff and to implement more appropriate and safe disposal methods with a view to improve staff and patient safety.

Materials and Methods: It was a multidisciplinary prospective audit conducted over two weeks in the main operation room at Tawam Hospital. Data was collected by completing a proforma. The proforma was paper free to support the environment.

The questions were aimed to assess staff awareness regarding sharps disposal policy, their opinion on the current practice and the introduction of a portable sharps bin. The participants in the audit included anesthesia nurses, technicians and anesthetists.

Results and Discussion: A total of 42 responses were reviewed. Data revealed that more than 97% are aware of Tawam hospital/ International guidelines on sharps disposal policy. Around 80% felt that we are practicing safe sharps disposal in our operative room.

However, around 88% believe that it would be safer to have portable sharps bin at the point of use. 30% responders choose taking the sharps to the sharps container and dispose carefully as the correct statement, while 70% choose having the sharps container at the point of use.

These results reflect the need to adopt a safer disposal of sharps. We plan to present these results by having a multidisciplinary meeting involving all OR staff to create awareness about sharps disposal guidelines. We intend to re-audit to measure the satisfaction of introduction of portable sharps disposal bins.

Conclusion(s): Appropriate handling of sharps improves both staff and patient safety. There is an opportunity to improve knowledge regarding appropriate sharps disposal.

Although many respondents are aware of the guidelines, a significant number also feel it would be safer to have a portable sharps disposal bin. We suggest implementing such a change to achieve our aims and provide a safe atmosphere for our staff and patients.

01AP03-04
Anaesthetic adverse event flashcard training

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Background and Goal of Study: Safe conduct of anaesthesia requires the team to manage unexpected life-threatening events. We believe that delivering multidisciplinary education can improve the successful management of anaesthetic emergencies and patient safety in the peri-operative setting.
We introduced a Quality Improvement(QI) project at the Royal Infirmary of Edinburgh(RIE) to deliver short, regular teaching episodes for the whole theatre team.
Materials and Methods: In May 2022 our department started a QI project where each week, a new adverse event theme was discussed in theatres with flashcards. During the morning theatre brief the "theme of the week" was announced and the anaesthetists led an interactive discussion outlining the topic and the whereabouts of drugs/equipment required.
The AAGBI Quick Reference Handbook[1] was used as reference for the flashcard content. The flashcards were displayed in all 29 operating theatres, recovery and interventional radiology theatre for quick consultation and swapped each week. Each flashcard had a QR code for a survey for the staff to complete questions regarding the improvement of their knowledge & confidence after the training. The flashcards and the survey were designed with Microsoft® PowerPoint and Forms, respectively. This project was registered with the RIE anaesthetic and theatres QI team and the resources made available to all staff.
Results and Discussion: Ten themes were chosen: anaphylaxis, bronchospasm, failed Intubation, malignant hyperthermia, local anaesthetic toxicity, cardiac arrest, laryngospasm, high neuraxial block, major haemorrage and circulatory embolus.
We collected 13 feedback forms from seven anaesthetists, four nurses and two others. After the training, 12 out of 13 highlighted feeling more prepared to face adverse events and knowing where to locate drugs/equipment.
We were subsequently approached by the interventional radiology staff and asked to replicate this teaching format in their area. Co-operating with the theatre education team, we promptly distributed the flashcards to that department and other areas impressed by this format of education. We aim to extend this project to other hospitals within NHS Lothian and in Scotland.
Conclusion: This project has highlighted the value of team training in the successful management of anaesthetic adverse events.
Reference:
1. https://anaesthetists.org/Home/Resources-publications/Safetyalerts/Anaesthesia-emergencies/Quick-Reference-Handbook

01AP03-05
Continued feedback as a key to sustained reduction in fresh gas flow during inhalational anaesthesia. An update on 22 years of fresh gas flow data

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Background and Goal of Study: The environmental footprint of inhalational anaesthetics is well recognised. Steps to reduce this impact include using agents with lower impact, such as sevoflurane, minimising fresh gas flow (FGF) during volatile anaesthesia, and use of intravenous anaesthesia (TIVA), although there are concerns about residual waste from TIVA.
We have tracked FGF during sevoflurane anaesthesia for 22 years. We always included data from the entire case, not just the maintenance phase, and have shown that higher FGF in the early phase of anaesthesia has a significant effect on overall consumption (1).
In 2021, with a rebound in TIVA use following restoration of propofol supplies, and a rise in mean FGF from 840 ml/min in 2018 to 965ml/min in 2020, there was concern that trainees might not be skilled in administering inhalational anaesthesia. Since then we have undertaken more regular detailed analysis of the FGF and TIVA data and provided regular (bi-monthly) feedback and commentary to our Department.
Materials and Methods: Christchurch Hospital is a tertiary hospital in the South Island of Aotearoa New Zealand serving a regional population of 600,00. Our various data logging approaches are described elsewhere(1). Since 2018 we have used Insights from GE-Healthcare, initially in 10 theatres, expanding to 20 theatres in 2020. These theatres cover a full range of specialities including paediatric, cardiac, neuro, orthopaedic and general surgery. Pooled data are analysed in R and R studio with FGF expressed as a time-weighted mean.
Results and Discussion: For the 6 months June to Nov 2022, our mean FGF was 752 ml/min when sevoflurane was in use. Mean consumption was 13ml of sevoflurane. No desflurane was used in 2022 (6 cases in 2021).
TIVA is used in 60% of cases (2018 32%).
Despite increasing use of TIVA, our mean FGF has decreased by 20% since 2020 (970ml/min). Our data suggests cases with trainees working alone, out of hours use lower mean FGF seen in matched cases in-hours.
Conclusion(s): Our mean FGF remains low despite increasing use of TIVA. Ongoing discussion of FGF and best practice volatile anaesthesia is associated with continued reduction in FGF and trainees who are competent practitioners of both TIVA and inhational anaesthesia.
Reference:
1. Kennedy, R. R., French, R. A.,et al. The effect of fresh gas flow during induction of anaesthesia on sevoflurane usage: A quality improvement study. Anaesthesia. 2019;74:875-882

01AP03-06
Software use in staff planning of anesthesiologic care facilities

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Background and Goal of Study: The requirements for fair and legally compliant duty scheduling are complex.[1] Software-supported duty and staff scheduling makes work easier for duty schedulers and increases staff satisfaction.[2]
We here present survey results on the frequency of software use for duty and staff scheduling.
Materials and Methods: Decision-makers in German anesthesiology departments answered a questionnaire in October 2021 about digitization and software use in annual, vacation, duty, daily and weekly scheduling. Analysis was carried out using Microsoft Excel and R (version 4.1.2). Differences in the frequency of software use between outpatient and inpatient facilities were detected using Fisher's exact test.
Results and Discussion: 48% of respondents in the outpatient and 75.2% in the inpatient sector use software for staff scheduling. Overall, software applications for staff scheduling, documentation and working time recording are the most frequently used. Automated duty scheduling is least utilized in both sectors. Large outpatient facilities use software more often than small ones ($p<0.001$) and there are no significant differences between large and small hospitals for inpatient facilities.

Facility	Annual scheduling	Vacation scheduling	Duty scheduling	Daily/weekly scheduling	Total software use
outpatient	29,7%	35,7%	39,4%	42,6%	48,0%
inpatient	46,1%	65,9%	69,5%	43,4%	75,2%

Table: Overview of the use of software to support particular areas for staff scheduling in outpatient and inpatient facilities.

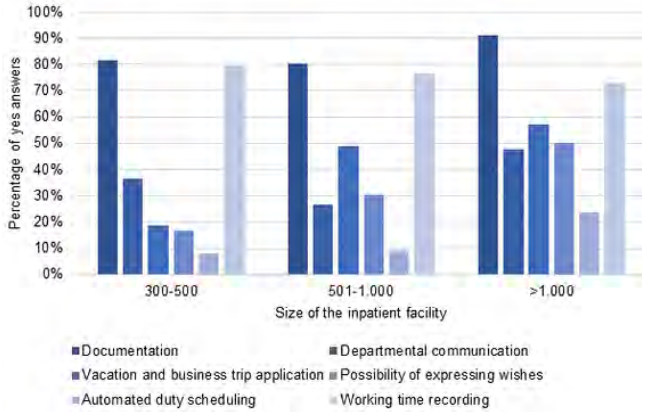

Figure 1. Application of software areas for staff scheduling in inpatient facilities based on the number of beds.

Conclusion(s): The result shows that the use of software for staff scheduling is significantly higher in the inpatient sector than in the outpatient sector. Around a quarter of hospitals and more than half of all outpatient facilities do not use any digital option for scheduling and duty roster design.
References:
1. Schuster, M. et al (2003). Anästhesiologie & Intensivmedizin, 795-802.
2. Ramolla, T. (1999). Anästhesiologie & Intensivmedizin, 499-504.

01AP03-07
Incidence and characteristics of intra-operative cardiac arrest in a Swiss university hospital: a retrospective observational single-centre study

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Background and Goal of Study: Intraoperative cardiac arrest is a special form of in-hospital cardiac [1]. Scare evidence on the incidence of intraoperative cardiac arrests is reported to be between 2-10 per 10,000 procedures for paediatric patients and 0.5-3 per 10,000 for adult patients. Unfortunately, there is no Swiss data published.
Thus, we aimed to investigate the age-adjusted incidence of cardiac arrest patients in the operating room. Furthermore, the cardiac arrests' association with patients' characteristics (sex, age, ASA physical status), the urgency of the procedure, and the type of surgery are reported.
Materials and Methods: After ethics committee approval (BASEC 2021-02330) and trial registration (NCT05316779), this retrospective observational single-centre study screened all patients with cardiac arrest during anaesthesia care from 1 January 2014 to 31 December 2021. Cardiac arrest was defined as the delivery of at least five chest compressions and/or defibrillation. We included all reported cardiac arrests in the operating room. We excluded all patients with a cardiac arrest outside the operating room and procedure-related cardiac arrest (e.g., extracorporeal circulation).
Results and Discussion: We screened 243,982 anaesthesia procedures, and 209 met the inclusion criteria. Most patients (n=144, 68.9%) were male. Median [Q1; Q3] patients' age was 68.9 [57.8;79.5] years, including six (2,9%) patients <1 y, seven (3,3%) patients between 1-15 y, and 196 (93,8%) ≥16y of age. Nearly two-thirds of patients with cardiac arrest had an ASA physical status ≥4 (n=139, 66.5%), compared to ASA <4 patients (n=70, 33.5%). More than half of the cardiac arrests occurred during emergency procedures (n=108, 51.7%), compared to elective (n=93, 48.3%). Over two-thirds of the cardiac arrests (n=145, 69.4%) happened during non-cardiac surgery.
Conclusion(s): The overall incidence of intraoperative cardiac arrest was 8.6 (95%-CI: 7.4–9.8) per 10,000 procedures. Incidence for patients <1y of age was 12.5 (95%-CI: 4.6–27.1), for children between 1-16y of age 2.2 (95%-CI: 0.8–4.8), and patients >16y of age 9.3 (95%-CI: 8.0–10.7) per 10,000 procedures, respectively, which is a comparable incidence to published data. Risk factors for a cardiac arrest were identified as: male, cardiac surgery, ASA physical status ≥4, and emergency procedures (the higher the urgency, the higher the risk). Our findings justify regular training for anaesthesia personnel in advanced life support in adults and children to keep

up guideline-conform resuscitation competencies, which have been shown to increase patient survival. Out of this data, we aim to investigate the aetiology and the circumstances of the patient's cardiac arrest and their long-term neurological favour survival.

Reference:
1. Fuchs, A., Käser, D., Theiler, L. *et al.* Survival and long-term outcomes following in-hospital cardiac arrest in a Swiss university hospital: a prospective observational study. *Scand J Trauma Resusc Emerg Med* 29, 115 (2021). https://doi.org/10.1186/s13049-021-00931-0

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01AP03-08
Perioperative "call for help" - a novel anesthesia patient registry in a tertiary surgical center

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Background: Modern anesthesia care is defined by improvements in patient safety, with an increased focus on the management of acute perioperative adverse events. A "call for help" (CFH) in anesthesia can be defined as a situation that overwhelms the resources and/or personnel, thus requiring additional and immediate assistance. Data on such events within the operating room (OR) are lacking. We aimed to create a registry to identify, document, and characterize events of CFH in a tertiary surgical center in Israel.

Methods: Prospective, observational, single-center quality-improvement study. Between February and November 2022, all cases of CFH during the perioperative period at the Tel Aviv Medical Center were documented using an original e-form implemented in the department's electronic anesthesia record system. Caregivers were encouraged and reminded to self-report incidents.

The study included all workstations where anesthesia service is provided including operating rooms, recovery units, endoscopy suites, ambulatory care, and imaging facilities.

Results: In total, 92 events of CFH were recorded during the study period. Median [interquartile range (IQR)] patient age was 47 [27, 70] years, 41% were females, and median [IQR] ASA score was 2 [2, 3]. Most (72%) cases were elective. A total of 83 events occurred in an OR setting. The most common etiologies were respiratory (35%), cardiac (32%), and airway problems (19%). CFH was most frequent during the maintenance phase of anesthesia (47%). There was no difference in the rate of events between residents and senior anesthesiologists. Most commonly, CFH events did not result in a change in the anesthetic plan nor a change in patients' postoperative placement.

Most events recorded in post-anesthesia care units (PACU) were associated with a respiratory etiology (56%). No events were recorded in non-operating room scenarios including angiography and endoscopic units.

Conclusions: Our preliminary results offer a comprehensive analysis of emergent perioperative calls for help in a large tertiary center serving a large diverse patient population. The majority of reported CFH events in the operating room setup were associated with a respiratory etiology. Further research is required to better characterize such events and their role in preventing adverse surgical events.

01AP03-10
Simplified pre-anaesthetic assessment in elective otorhinolaryngology and oral surgery patients

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Background and Goal of Study: Pre-anaesthetic assessment of patients undergoing minor surgical procedures may be based on a questionnaire and a screening of medical records. In Denmark, this can be done using the electronic health record system. The aim of this quality assurance study was to evaluate if this method of pre-anaesthetic assessment resulted in an unacceptable high proportion of cancelled surgeries, defined as more than 3%.

Materials and Methods: We included patients scheduled for specific minor otorhinolaryngologic, oral or maxillofacial elective surgeries at Copenhagen University Hospital Rigshospitalet, Denmark between 1 March 2021 and 12 September 2022. A health questionnaire was used to identify patients in need of preoperative optimization, additional information or preparation, and the medical records were also screened. Patients received written information about the anaesthetic procedure and were offered a face-to-face interview, if needed. On the day of surgery the anaesthetist evaluated if the pre-anaesthetic assessment was inadequate and if the procedure was cancelled. Patients rated their satisfaction with the information they had received regarding their anaesthesia on a scale from 1 (unsatisfied) to 5 (very satisfied). Proportions are reported with 95% confidence interval, where relevant.

Results and Discussion: We included 300 patients. The vast majority of patients were ASA status I or II, 63 % and 34.3 %, respectively. No cancellations took place (95 % CI: 0.0 % - 1.2 %) but delays occurred in 8 cases, corresponding to 2.7 % (95 % CI: 0.0 % - 4.5 %). In 21 cases the airway management plan was changed to video laryngoscopy after airway assessment (7.1 % (95 % CI: 4.1 % - 10.0 %)). A patient satisfaction score of 4 or 5 was found in 80 % of all cases, but no patient satisfaction score was available in 12 % of cases.

Conclusion(s): Pre-anaesthetic assessment of patients based on a questionnaire and a screening of medical records resulted in less than 3 % cancelled minor surgeries and our quality aim was reached. Patients were generally satisfied with this approach.

01AP03-11
Hearing loss in anesthesia: impact of MRI noise and its potential role in work-fatigue and job burnout, a multicentered Mexico city survey

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Background and Goal of Study: Noise-Induced hearing loss is a neurologic sensory deficit caused by long-term noise exposure. Auditory consequences have been related to occupational noise exposure, however, studies in non-medical population demonstrate that occupational noise is among the most influential factors in the occurrence of work-fatigue. In low-middle income countries such as Mexico, MRI anesthesia is conducted without auditory protection while the anesthesiologist remains inside the MRI room. We aimed to demonstrate the pivotal role of chronic MRI noise exposure in the development of auditory symptoms, work-fatigue, insomnia and anxiety that could lead to job burnout.

Materials and Methods: Having previously measured the MRI noise decibels, at the most common anesthesia stand points in the three study centers. An adapted and translated to Spanish USA Occupational Hearing Loss Questionnaire 06-2015 was applied to 40 anesthesiologists, 18 had availability of auditory protection in their work centers, 22 did not. Questionnaire was applied every 20-35h of >85dB noise exposure, for 10 months or until significant symptoms appeared. If so, subjects were directed to further auditory loss and burnout screening. R of Spearman was used as a statistical method, further analysis was made to establish the level of agreement. A multiple regression test was performed to establish the odd ratio that affects work-fatigue.

Results and Discussion: Of the 40 participants, 2 were lost. Results showed evidence of good agreement($r=0.654$) between hours of exposure and work-fatigue($p<0.05$). Significant correlations($p<0.05$) between insomnia($r=0.659$) and anxiety($r=0.650$, $p<0.05$) were also noted. Tinnitus had a negative correlation. Unprotected physicians experienced tinnitus, work-fatigue, insomnia and anxiety as early as 7 months, and were at higher risk of job burnout after symptoms. In Mexico, auditory protection is often absent, therefore future randomized studies are needed to further explore the physical, psychological, and economic burden of this dangerous practice.

Conclusion: Tis work shows the auditory induced phenomena and mental health dysregulation associated with unprotected MRI anesthesia. Even though ASA is clear about the importance of auditory protection equipment, efforts must continue to persuade low-middle income countries' authorities to surpass economic detractors and set up auditory protection for the anesthesiologists in all MRI suites.

01AP03-12
Physiological, psychological and safety-related effects of perioperative fasting practices in adults: protocol of a systematic review of clinical evidence

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Background and Goal of Study: Current fasting guidelines were developed to minimize the incidence of perioperative pulmonary aspiration and make anesthesia safer. However, there is a lack of evidence that prolonged fasting regimens decrease the risk of aspiration. Furthermore, recent publications have highlighted the adverse effects of prolonged fasting, such as hemodynamic and metabolic alterations, potentially supporting a more liberal approach to preoperative oral intake. This protocol outlines a systematic literature review on the safety-related, physiological and patient experience-related effects of perioperative fasting practices in adult patients. The review will be conducted by the ESAIC Adults Perioperative Fasting Task Force.

Materials and Methods: The study protocol (PROSPERO CRD42022370040) included a comprehensive search of MEDLINE (OvidSP), EMBASE (OvidSP), CINAHL, Web of Science, Cochrane Database of Systematic Reviews (CDSR) and Cochrane Central Register of Controlled Trials (CENTRAL) to identify randomized controlled trials, prospective and retrospective studies assessing the effects of perioperative fasting. All searches were restricted to studies published in English, from 2010 till current. The literature search was executed by a professional librarian. Literature screening will be carried out independently by two reviewers with conflict resolution by a third reviewer. We will assess risk of bias in accordance with the Cochrane Handbook for Systematic Reviews of Interventions. If a sufficient number of studies with similar interventions and outcomes are identified, the authors will conduct a meta-analysis. Heterogeneity will be statistically assessed using a χ^2 test and I^2 statistic. If there is significant heterogeneity, a random effects model will be used; otherwise, a fixed effects model will be employed. In case the meta-analysis is not possible, data will be presented, and quality assessed individually per outcome.

Results and Discussion: To date, we have identified 8679 initial results which are undergoing screening. The findings of this study will be submitted to a peer-reviewed journal for publication.

Conclusion(s): This review will identify the evidence on the effects of different fasting regimens and inform the development of clinical recommendations.

Acknowledgements: We would like to appreciate Simone Silvestrini's collaboration with the group.

01AP04-01
A suspected central anticholinergic syndrome with generalized tonic-clonic seizure after general anesthesia

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Background: Central anticholinergic syndrome (CAS) is related to the activity of cholingergic nerve conduction, and is a condition due to partial to generalized suppression of cholingergic activity in the central nervous system. It can lead to a variety of symptoms including delayed recovery from anesthesia, slowed recovery of consciousness, impaired ability to respond to the anesthesiologist's orders, limb spasticity, seizure, tachycardia, coma, and mydriasis. An accurate diagnosis can be made after all other causes have been excluded, including anesthetic agents, and by recovery of symptoms after administration of physostigmine, which can cross the blood brain barrier.
Case report: A 60-year old male patient received spine surgery under general anesthesia with deflurane-remifentanil. The operation was performed for 1 hour 50 minutes without any special event. But, the patient did not regain consciousness for more than 1 hour after waking. About 1 hour 30 minutes after the operation, the patient recovered self respiration, but he underwent generalized tonic clonic seizure for a duration of less than 1 minute. The patient was transfered to ICU and underwent brain CT, MRI scan and EEG test. The results were unremarkable. 16 hours after admission to the ICU, mental status began to improve and was fully recovered 8 hours thereafter. The patient was discharded without any neurologic sequelae.
Discussion: In this case report, the patient underwent delayed recovery from anesthesia and episode of generalized tonic clonic seizure, characteristics consistent with CAS by feature and natural course.

01AP04-02
Anaphylactic shock during hydatid cyst surgery, a diagnosis to keep in mind

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Background: The incidence of perioperative anaphylaxis is estimated to be 1:11.000. The most common causes are antibiotics (48%) and neuromuscular blocking agents (25%). Cystic echinococcosis is a zoonotic disease with potential risk of anaphylaxis.
Case report: A 27-year-old male with hepatic hydatidosis was proposed for laparoscopic cystectomy. The patient was premedicated with midazolam, anesthesia was induced with propofol, fentanyl and rocuronium, and the trachea was intubated. Two grams of cefazolin and 4 grams of dexamethasone were administered without incidence, anesthesia was maintained with sevoflurane. When the cyst was punctured and filled with 3% saline serum, a severe hypotension developed (50/35 mmHg), followed by a tachycardia of 110 bpm and SVRI drop to 1300 dynes·sec·cm^{-5}·m^2. Initially, fluid resuscitation and norepinephrine were administrated, but the shock was refractory. A diagnosis of anaphylactic shock was suspected, hence surgical manipulations were stopped and treatment with epinephrine and corticosteroids was added. Two boluses of 100 μg of epinephrine were administrated, followed by a continuous infusion of 0.1 μg/kg/min. After 10 minutes, hemodynamic status improved and a bolus of 100 mg of hydrocortisone was administrated. Due to persistent hemodynamic instability, the surgery was postponed. The patient was extubated in the next hour and vasoactive drugs were withdrawn in the next 3 hours.
Discussion: In this case, the distributive shock appeared after a long time from the administration of induction drugs, exactly coinciding with the puncture of the cyst. In previous studies, the incidence of anaphylaxis in hydatid cyst surgery was around 1.7% (1); the mechanism of these reactions is complex, and includes hypersensitivity reaction type I and complement activation. Management of anaphylaxis involves stopping potential causal stimuli, massive fluid resuscitation, administration of epinephrine and glucocorticoids.
Reference:
1. Neumayr A et al. Justified concern or exaggerated fear: the risk of anaphylaxis in percutaneous treatment of cystic echinococcosis-a systematic literature review. PLoS Negl Trop Dis. 2011;5(6):e1154. PMID:21695106
Learning points: Hydatid cyst anaphylaxis is rare and reporting of such cases is crucial, particularly in the context of increasing migration from endemic countries. Awareness of the possibility of anaphylactic shock, good venous access and early resuscitation are key to a successful outcome.

01AP04-03
General anesthesia using propofol infusion for implantation of implantable cardioverter defibrillator in a pediatric patient with Andersen-Tawil syndrome: a case report

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Background: Andersen-Tawil syndrome (ATS) is a very rare genetic disease, which is caused by variants in the KCNJ2 and characterized by a triads of episodic flaccid muscle weakness, ventricular arrhythmias, and physical anomalies. When general anesthesia is required, the clinical triads of ATS patients presents various challenges for anesthesiologists.
Case report: An 11-year-old girl who had a history of recent periodic muscle weakness, and micrognathia was diagnosed with ATS. It was decided to implant ICD due to recurrent ventricular tachycardia (VT) with symptoms. Sinus tachycardia, ventricular bigeminy, prolonged QT interval, and prominent U waves were presented on initial electrocardiogram (ECG). After applying total intravenous anesthesia using 2% propofol and remifentanil, ECG changed sinus bradycardia during a few minutes. ECG returned to initial appearance after successful endotracheal intubation, and titrations of anesthetics without any other procedures. There was no critical event such as VT during operation. We used sugammadex about 4mg/kg for emergence. The patient was transferred to intensive care unit after extubation, and was discharged without complications.

Discussion: ATS patients commonly have the potentials of difficult airway. Anesthesiologists should prepare various kinds and size of airway instrument, video laryngoscope, and fiberoptic bronchoscope. Choice of anesthetics is important because various medications administered may further increase the corrected QT, and QT prolongation can lead to life-threatening persistent VT and sudden death. Propofol infusion had an excellent effect for reducing the frequency of ventricular ectopy. [1] The use of local anesthetics including epinephrine should be cautious, and the recent control of symptom and, status of treatment should be checked. If ATS patient has muscle weakness, anesthesiologists should take into consideration delayed recovery from neuromuscular block.

References: 1. Airey KJ, Etheridge SP, Tawil R, Tristani-Firouzi M. Resuscitated sudden cardiac death in Andersen-Tawil syndrome. Heart Rhythm 2009;6(12):1814-7.

Learning Points: Anesthesiologists should consider the potential difficult airway, drugs which can precipitate QT prolongation, and fatal cardiac arrhythmia, and delayed recovery from neuromuscular in ATS patients.

01AP04-05
Dexmedetomidine induced polyuria during Opioid Sparing Anesthesia: a case report

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Background: Dexmedetomidine is a common drug used in OFA and OSA protocols. We present a case of dexmedetomidine administration in terms of OSA for a gastrectomy procedure, where an unusual adverse effect of dexmedetomidine infusion was observed, that of polyuria.

Case report: A 55-year-old female, ASA III, was scheduled for an elective subtotal gastrectomy due to adenocarcinoma. She was 58kg, 162cm with a medical history of hypothyroidism (receiving thyroxine) and sessions of immunotherapy and chemotherapy. Past surgeries: hernia repair, abdominal hysterectomy. Additional medications: omeprazole 40 mg, alprazolam 0.125mg, duloxetine 30mg. All the appropriate preoperative assessment was performed according to ESAIC guidelines. On the day of the surgery, despite our suggestion, the patient denied the placement of epidural catheter. Standard ESAIC monitors as also nociception monitoring (Analgesic Nociception Index, ANI®, MDoloris, France) were applied. Induction was performed with midazolam 1mg, fentanyl 100mcg, propofol 120mg and Rocuronium 50mg. ENT was placed uneventfully and dexamethasone 8mg, omeprazole 40mg and ketamine 30mg were administered. Arterial line, central venous line and urinary catheter were placed without any complications. Maintenance of anaesthesia was performed with sevoflurane 1.25-2% (MAC 0.8), lidocaine infusion 0.5-1.5 mg/kg/h and dexmedetomidine infusion 0.1-1mcg/kg/h which were titrated to target ANI values between 50-70. Before incision fentanyl 100mcg were administered. 2 hours after induction, due to hemodynamic instability (MAP<60mmHg), noradrenaline infusion was started (max 0.1mcg/kg/min). By that time, the patient received 1500ml of crystalloids and the urine output was 900ml. Regular ABG analysis indicated a gradual reduction of Hb (min 7.4mg/dl) thus one pack RBC was transfused. At the end of the surgery a total of 6.5 lt of crystalloids were administered with a total of 3.5lt urine output (9 ml/kg/h). ABG was normal. Urine dipstick test was normal. Extubation was uneventful and the patient was transferred to the ward.

Discussion: Through the process of elimination, we concluded that the intraoperative polyuria was caused by the dexmedetomidine infusion. Our assumption is supported by several case reports published in literature.

Learning points: Since dexmedetomidine is a valuable medication in both intraoperative and ICU setting, clinicians should be alert to the potential risk of polyuria when using it.

01AP04-06
Dexmedetomidine: anesthetic approach in severe pulmonary hypertension

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Background: Monitored Anesthesia Care (MAC) is allowed to perform certain procedures safely, mainly avoiding disadvantages of airway manipulation.[1] Dexmedetomidine has unique pharmacologic properties that make it attractive for MAC, namely its analgesic-sparing property that allows cooperative sedation under respiratory unimpaired function.[1]

Case report: male, 45yo, ASA IV, with metastatic lung cancer since 2017, previously submitted to cervical radiotherapy to reduce pain and volume of a left supraclavicular mass (obstruction in main pulmonary artery). Other health conditions include a chronic pericardial effusion and chronic respiratory failure requiring oxygen therapy. He was scheduled for urgent left thigh abscess drainage. The preanesthetic assessment revealed a frail patient with severe dyspnea and polypnea, demanding a semi-sitting position (45-60 degrees). Additional complementary diagnostic exams showed: PaO2/FiO2 ratio of 181 mmHg and severe pulmonary hypertension (gradient RV-PA 98 mmHg). We performed a MAC using dexmedetomidine perfusion (0,7 ug/kg/h) and Ketamine bolus doses (15 mg). Surgery lasted 1 hour and was uneventful. He was transferred to the PACU, where he maintaining good pain control and hemodynamic stability.

Discussion: Maintenance of intact respiratory drive, ensuring patient comfort and optimal analgesia is the main goal of sedation.[2-3] In this case, dexmedetomidine was chosen to improve oxygenation by decreasing pulmonary vascular resistance, secondary to release of nitric oxide for the endothelial cells; on the other hand, dexmedetomidine hemodynamics effects (bradycardia and hypotension), can be counterbalanced by ketamine, due to its sympathetic stimulation action.

References:
1. Andreas K.,et al."Monitored Anesthesia Care with Dexmedetomidine." Survey of Anesthesiology, vol. 54, no. 5, Oct. 2010, pp. 255–256.
2. Meng, J., et al. "Effect of Dexmedetomidine on Postoperative Lung Injury during One-Lung Ventilation in Thoracoscopic Surgery." BioMed Research International, vol. 2020, 5 Oct. 2020, pp. 1–8.
3. Bayer J., et al. "Thoracic Trauma Severity Contributes to Differences in Intensive Care Therapy and Mortality of Severely Injured Patients: Analysis Based on the TraumaRegister DGU®." World Journal of Emergency Surgery, vol. 12, nr 1, 2 Sept. 2017.

Learning points: Dexmedetomidine perfusion can be a safety option in patients with multiple severe health conditions.

01AP04-07
Urgent surgery in a patient on dual antiplatelet therapy: what to do?

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Background: Cardiovascular (CV) events are a major cause of morbidity and mortality. Antiplatelet medications are first-line therapy in preventing CV thrombotic events. The perioperative team must design an optimal strategy to manage these medications based on each patient's risk of thrombosis and surgical bleeding.[1]
Case report: A 73-year-old male was hospitalized due to a proximal humerus fracture with indication for surgical repair. He was submitted to an elective percutaneous coronary intervention in the prior 30 days and was taking aspirin and clopidogrel. Personal history of hypertension, dyslipidemia, obstructive sleep apnea, peripheral arterial disease, iron-deficiency anemia, Mobitz type II block with permanent pacemaker and ischemic heart disease with acute myocardial infarction (MI) at 42 years of age. As it was an urgent surgery with high hemorrhagic risk in a patient with high thrombotic risk, the case was discussed with the orthopedic and cardiology departments. It was decided to delay the surgery and suspend clopidogrel for 4 days, maintaining aspirin. In the preoperative period, a detailed anesthetic evaluation was made and an electrocardiogram and blood analysis were performed. The echocardiogram findings were normal. The surgery was performed under general anesthesia combined with interscalene brachial plexus block. Clopidogrel was reintroduced 6 hours after the procedure, which was uneventful. In the postoperative period, he was admitted to an intermediate care unit and serial assessments of troponin and natriuretic peptide were made. He had no relevant bleeding or thrombotic events.
Discussion: In a patient with high thrombotic risk proposed for a surgery with high hemorrhagic risk, it is generally recommended to discontinue clopidogrel for 5 days, maintaining aspirin and reintroducing clopidogrel as soon as the hemostasis conditions are guaranteed. Maintaining dual antiplatelet therapy in this case would be a risk factor for blood loss during the intraoperative and postoperative period, aggravating preexisting anemia and potentially worsening myocardial ischemia (type 2 MI).
References: 1. Oprea AD, Popescu WM. Perioperative management of antiplatelet therapy. Br J Anaesth. 2013;111Suppl1:i3-17.
Learning points: Perioperative management of dual antiplatelet therapy is complex and requires a team-based approach to risk stratification. Both continuation and discontinuation of antiplatelet therapy can be associated with significant risks.

01AP04-09
Development of a open source, computer based Target Controlled Infusion simulator

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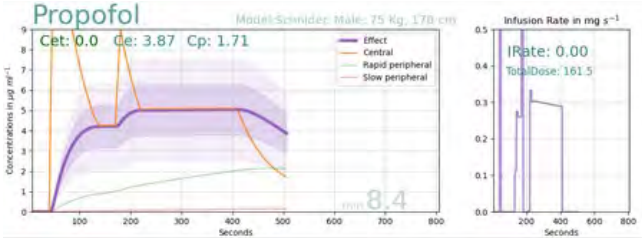
Background: Target Controlled Infusion (TCI) is a reliable and widely method used for intravenous anesthesia delivery. Understanding its principles and potential risks can be difficult though. Several computer based tools are or have been available for training but either are no longer maintained or no updates have been published. Our goal is to build an up to date, open source, computer based simulator that can be easily distributed and understood by users.
Case report: We wrote a program in the Python programming language based on previously reported algorithms(1) describing how to achieve a target concentration with a continuous infusion of a drug following a three compartment model. Through a graphic user interface the user can start one or two virtual pumps with pharmacokinetic/pharmacodynamic data for propofol (Schnider and Eleveld), remifentanil (Minto) or sufentanil (Gepts). The image shows what the user sees and interact with. The simulated data can be downloaded.



Discussion: The pharmacokinetics of most of the commonly used intravenous anesthetics are best explained with a three compartment model. This lies behind the need to continuously decrease the administration rate of the drug during an anesthetic. Evidence shows that this is safer achieved through TCI delivery systems(2). Therefore it is important that the clinician has a thorough understanding of both the pharmacological principles and how pumps work.
To our knowledge, our TCI simulator is the only one at present that shows drug distribution in all compartments for a variety of drugs and models. Its interactive design makes easier experimenting and understanding.
References:
1. Bailey JM, Shafer SL. A simple analytical to the three compartment pharmacokinetic model suitable for computer controlled infusion pumps. IEEE Trans Biomed Eng 1991; 36:522-5
2. Pandit JJ et al. 5th National Audit Project on accidental awareness during general anaesthesia. Br J Anaesth 2014; 113: 549-559
Learning points: Our TCI pump simulator helps to understand the pharmacological principles behind TCI and how delivery systems operates.

01AP04-10
Sedation versus general anesthesia for percutaneous treatment of patent foramen ovale

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Background and Goal of Study: To compare the postoperative results of percutaneous closure of patent foramen ovale (PFO) under general anesthesia (GA) versus sedation according to three variables: anesthesia time, immediate complications, and time from surgery to discharge in a series of 22 cases.
Materials and methods: Between November 2019 to March 2022, percutaneous closure of PFO was performed in 30 patients. A review of the clinical history of this cases was made, 8 did not meet the inclusion criteria, so the analysis of the described variables was done in 11 (47.8%) patients who underwent the procedure under GA and 11 (52.1%) under conscious sedation (grade 3 on the Ramsay scale) plus local anesthesia, for a total of 22 cases analyzed. In the GA group, 7 (63.6%) were males and 4 (36.4%) females, while in the sedation group 7 (63.6%) were females and 4 males (36.4%). The mean age in the general anesthesia group was 52.1 years and in the sedation group was 65. For PFO closure, Gore Cardioform devices were used in 8 (72.7%) and Amplatzer in 3 (27.3%) of the patients who were under GA, while 6 (54.5%) and 5 (45.5%) of the patients under sedation received Gore Cardioform and Amplatzer Cribiform respectively.
Results and Discussion: The mean time under anesthesia of the GA group was 120 minutes, while that of the patients under sedation was 68 minutes. In the group of patients under GA, 6 (54.5%) had immediate postoperative complications, 5 had mild pain at the femoral puncture site and 1 had an hematoma that did not require invasive treatment; no patient under sedation presented complications during this period. The time from the intervention to discharge in the general anesthesia group was 31.6 hours, while in the sedation group was 26 hours.
There were no records of discomfort or pain during the intraoperative period in the sedation group and the surgeons stated that they found no technical differences. No patient in either group required transfer to the intensive care unit.
Conclusions: Sedation is an adequate and equally safe anesthetic technique with respect to GA for PFO percutaneous closure. From our results it is worth highlighting the absence of the immediate complications in the sedation group, this could be the result of the addition of local anesthetic infiltration at the puncture site; despite this finding, more studies are needed to conclude whether sedation is a superior anesthetic technique to general anesthesia for this procedure.

01AP04-11
Comparison of postoperative nociception outcomes between NoL-guided and standard intraoperative analgesia based on fentanyl in patients undergoing elective surgery with general anaesthesia

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Background: Nociception is the physiological response to surgical stimuli during general anesthesia (GA). Different forms of chronic postoperative pain result from peripheral and central neural pain circuit sensitization involving neuroinflammatory mechanisms. This sensitization could be ameliorated by adequately adjusting intraoperative analgesia. Recently developed Nociception Level Index (NoL®) shows convenient features and promising results from previous studies.
This study aims to compare the utility of NoL® against standard care to guide intraoperative pain management assessing postoperative pain (VAS opioid consumption), changes in quantitative sensory thresholds (QST), and inflammatory markers related to nociception.
Methods: 100 patients with ERB approval and informed consent, 18-60 years, undergoing elective surgery, sevoflurane-based GA, and fentanyl analgesia, were randomly assigned to one of two study groups. NOL-gruop intraoperative analgesia guided by NoL index (n=51) and Control-group: standard intraoperative analgesia (n=49). Baseline NoL threshold, QST, and neuroinflammatory markers were assessed, postoperative opioid consumption, and VAS up to 12h were recorded. QST at 2h postoperative and inflammatory markers at 2h and 12h postoperative were performed. Sample size of 45 patients/group was determined for a 30% difference on primary outcome (opioid consumption) between groups assuming 15 mg morphine equivalents average consumption (α=0.05, Power=0.8). Descriptive statistics, comparisons with t-test or Wilcoxon rank test, Chi-square as appropriated. A $p < 0.05$ was considered significant. Analyses in RStudio (R 4.1.1) and PRISM 9.
Results: Demographics and intraoperative fentanyl consumption were similar between groups. Postoperative morphine equivalent consumption and VAS values were similar between groups (Figure1). QST analysis showed no significant differences between groups. Also, inflammation biomarkers analysis showed similar changes between groups.
Conclusion: NoL index to control nociception in this study, neither reduces intraoperative opioid consumption nor improves postoperative pain control. Changes in sensory modalities and inflammation related to hyperalgesia neither show advantages compared to standard care. Rutinary use of the NoL index to guide intraoperative fentanyl administration is not supported.
Reference:
Espitalier F et al. J Clin Anesth. 2021;75:110497. Meijer F et al. Br J Anaesth. 2020;125(6):1070-1078.

01AP04-12
Paracetamol-induced anaphylactic shock: report of a rare and unexpected case

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Background: Anaphylaxis is an emergency that leads to increased perioperative morbidity and mortality. The most common etiologic agents are neuromuscular relaxants and antibiotics. Anaphylactic reactions to paracetamol are very rare events with only a few cases described. Its cause-effect relationship is difficult to establish and only a few are investigated.

Case report: We present a case of a 82-year-old male patient, ASA II, with history of obesity, hypertension, dyslipidemia. He was proposed for neurolysis of the median nerve, under sedo-analgesia and local anesthesia. The patient denied any history of drug allergy.

After standard ASA monitoring in the operating room, the patient started intravenous paracetamol before the start of surgery. 5 minutes after, he suddenly felt unwell, with generalized rash, tachycardia, hypotension and rhythm changes in the ECG.

The infusion of paracetamol, the only drug given to the patient, was immediately suspended. Patient then presented with altered state of consciousness followed by cardiorespiratory arrest in ventricular fibrillation. There was a high suspicion of anaphylactic shock due to paracetamol - grade IV of Ring and Messmer scale.

Advanced life support was immediately started with spontaneous recovery of circulation after 3 cycles, both at shockable rhythm. He was intubated and transferred to the intensive care unit for post arrest care.

After a deeper investigation, it was found that he had already been admitted to an emergency room with anaphylaxis induced by oral paracetamol. Patient was referred to Immunoallergology. Anaphylactic shock was recorded on the hospital platform and reported to the national drug regulator authority.

Discussion: With this case we intend to emphasize that anaphylaxis can be induced by common drugs in clinical anesthetic practice. For this reason, in the preoperative period we have to search and question for possible allergic reactions to drugs.

Intraoperatively and postoperatively, the anesthesiologist should always be aware of the monitoring and patient's clinic, as well as having a high degree of suspicion for the diagnosis of anaphylaxis.

It is important to have a protocol involving Anesthesiology and Immunoallergology for the etiological investigation through serum tryptase levels (0h, 2h and 24h), skin tests for allergies and follow-up by the Immunoallergology team.

Learning points: Anaphylaxis can be induced by any drug and the anesthesiologist should always be prepared.

01AP05-01
Establishing machine-learning model based on preoperative consultation data to assist physician in evaluation of American Society of Anesthesiologists Physical Status Classification – a deep learning model

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Background and Goal of Study: Examples of the American Society of Anesthesiologists physical status (ASA PS) classification system increase consistency. Although these examples increase correct assignment, the effect on automatic classification models needs investigation. This study aims to build an automatic classification model. We propose that models trained on revised classes according to the examples may be more accurate than models trained on the classes originally classified by anesthesiologists.

Materials and Methods: After obtaining IRB approval, we retrospectively collect electronic health records from Jan 1st 2016 to Dec 30th 2020. Patients who were older than 18 years old undergoing surgery with general or neuraxial anesthesia were included.

Cases were excluded if they have ASA classes 5, 6 or missing data. Input data include age, gender, height, weight, commodities, laboratory data. Labels were ASA classes before or after manually reviewed and corrected based on ASA examples. 20% of the dataset was held out as a testing set.

Four machine learning models, (Logistic regression, XGBoost, Random Forest, and Deep neural network) were used for training. The model performance was compared with 5-fold cross-validated area under the receiver operating characteristics curves (AUC), hold-out AUC and the ordinal mean squared error (MSE).

Results and Discussion: A final cohort of 122,257 patients was recruited, where 9288 patients were selected randomly from the cohort to have ASA classes corrected. The random forest classifier has the highest hold out AUC (Table 1; original AUC: 0861; manual-review AUC: 0.900). The increased AUC indicates better prediction of ASA classes using manual-reviewed classes.

Model	5-fold CV AUC*	Holdout AUC*	Ordinal MSE
Manual (n=9288)			
Logical regression	0.890 + -0.004	0.865	0.530
Xgboost	0.985 + -0.001	0.878	0.291
Random Forest	0.984 + -0.001	0.900	0.291
Deep Learning	0.960 + -0.001	0.877	0.420
Original (n=122,257)			
Logical regression	0.866 + -0.000	0.819	0.675
Xgboost	0.989 + -0.000	0.842	0.234
Random Forest	0.989 + -0.000	0.861	0.249
Deep Learning	0.981 + -0.001	0.810	0.355

* macro, ovr

Table 1.

Conclusion: The classification model based on manual-reviewed classes outperformed models based on original classes.

01AP05-02
e- ASA: an automatic anesthetic risk scale for endoscopy procedures

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Background and Goal of Study: It is essential to assess the anesthetic risk of patients who require sedation for any type of procedure.Endoscopies have advanced in complexity and, in turn, the patients who have to undergo these procedures present greater morbidity and mortality.

With the aim of improving patient safety and the best distribution of resources in relation to anesthetic risk, our team has created an instrument to assess anesthetic risk based on artificial intelligence, called “e-ASA algorithm”.

The aim of the study is to explore the performance of the e-ASA to predict physician related ASA .

Materials and Methods: Based on 18722 patient’s interventions, our team has developed an automated analytics framework for a preoperative risk algorithm that uses existing clinical data in electronic health records related to age, sex and comorbidities apart from other information related to toxic habits.

This is a cross-sectional study including patients who were undergo scheduled endoscopy in Galdakao-Usansolo Hospital. Anesthesiologist calculated the ASA at the bed-side previous to endoscopy and later, and the analyst calculated the e-ASA for the same patients.

For the statistical analysis, first we did a descriptive analysis of the variables using frequencies and percentages for categorical variables, and mean and standard deviation for continuous variables. The ASA indicator was estimated using XGBoost classification models.

First, a binary classification XGBoost model was used for the separation between low risk (ASA I/II) and high risk (ASA III/IV) patients. Then, new binary classification XGBoost models were developed to refine the prediction and determine the actual ASA indicator.

Results and Discussion: In the initial classification model (ASA I/II and ASA III/IV), the recall was 0.80, precision 0.57, Cohen’s Kappa 0.41 and AUC 0.78. In the case of low risk rating model (ASA I and ASA II), this values were 0.72, 0.90, 0.27 and 0.79; and in the case of high risk rating model (ASA III and ASA IV), 0.44, 0.13, 0.08, and 0.60.

Conclusion(s): We constructed an automated predictive model for machine-learning algorithm with high discriminatory ability for assesing the surgical risk similar to clinicians.

Reference:

Bihorac A. MySurgeryRisk: Development and Validation of a Machine-learning Risk Algorithm for Major Complications and Death After Surgery. Ann Surg. 2019 Apr

01AP05-03
Cyclic pulmonary recruitment study in abdominal robot surgery under deep neuromuscular blockade

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Background and Goal of Study: Laparoscopic abdominal surgery is one of the most frequent surgical procedures. However, the insufflation of pneumoperitoneum, altogether with surgery performed in Trendelenburg position and the anesthetic act itself, favor the appearance of atelectasis and deterioration of respiratory dynamics.

Performing the cyclical pulmonary recruitment maneuver under deep neuromuscular relaxation should produce an improvement in oxygenation and pulmonary dynamic compliance in patients undergoing robotic abdominal surgery.

Materials and Methods: 32 patients undergoing robotic abdominal surgery with pneumoperitoneum insufflation and Trendelenburg position under deep neuromuscular blockade, period 12/04/20 to 01/30/21, oxygenation, ventilation and dynamic compliance were assessed at the beginning and at the end of surgery before and after performing the pulmonary recruitment maneuver by stepwise PEEP increase. Likewise, evaluation of the ideal PEEP and the hemodynamic effects of the pulmonary recruitment maneuver.

Results and Discussion: Pulmonary recruitment maneuvers under deep neuromuscular blockage significantly improved the parameters of oxygenation, ventilation and dynamic compliance. The incidence of hypotension requiring vasoconstrictor treatment was 12.5%.

Conclusion(s): Unless contraindicated and under strict hemodynamic monitoring, performing recruitment maneuvers before and after the application of pneumoperitoneum + Trendelenburg improves oxygenation, ventilation, the CO2 gradient, and compliance.

References:

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01AP05-06
Optimal muscle tension management does not improve surgical conditions in patients undergoing laparoscopic cholecystectomy: a randomized control trial

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Background and Goal of Study: The strategy of optimal muscle tension management (OMT) comprises intraoperative targeted neuromuscular block and its quick reversal at the end of surgery. While monitoring of neuromuscular block and its reversal using sugammadex are out-of-pocket services in Taiwan, they are not part of our routine anesthetic practices.

We therefore evaluated whether OMT management improves surgical conditions over routine management of neuromuscular block and its reversal during laparoscopic cholecystectomy.

Materials and Methods: In this single-center, randomized, surgeon- and patient-blind study, 70 patients scheduled for laparoscopic cholecystectomy were allocated to receive OMT (rocuronium to keep train-of-four count at zero and sugammadex reversal) or routine anesthetic practice (rocuronium at the anesthesia providers' discretion and neostigmine reversal). General anesthesia was maintained with sevoflurane to achieve bispectral values between 40 and 60. Pneumoperitoneum pressure was initiated at 12 mmHg and adjusted according to the surgeon's evaluation. The primary outcome was the quality of the surgical field reported by the single surgeon on a 4-point rating scale from excellent to poor.

Results and Discussion: The OMT management did not improve surgical conditions compared with routine anesthetic practice without OMT: median rating scale [interquartile range] 2 [1-2] vs 2 [1-2], respectively ($p=0.21$). Duration of surgery (79.5 [66-103] min vs 75 [58-109] min, $p=0.60$), time from the end of surgery to airway extubation (6 [4-7] min vs 5.5 [4-9] min, $p=0.64$), and pain scores at the post-anesthesia care unit (4 [3-5] vs 4 [3-6], $p=0.94$) were not significantly different.

Conclusion(s): The OMT management did not improve surgical conditions over routine practice without OMT in patients undergoing laparoscopic cholecystectomy during sevoflurane anesthesia. (*NCT:* 04165057).

01AP05-07
Artificial intelligence in anesthesia and intensive care: preliminary survey data

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Background and Goal of Study: There are often conflicting opinions about artificial intelligence (AI), especially in healthcare. For this reason, aims of this survey were to investigate how well artificial intelligence is known in anesthesia, intensive care unit (ICU) and pain management; to know the main concerns about it and understand what actions can be taken to achieve an adequate implementation in clinical practice.

Materials and Methods: This voluntary survey was carried out on behalf of the Board of Directors of ESAIC and SIAARTI (from December 28, 2022). The ESAIC and SIAARTI secretariats emailed the survey link to their members. The survey consisted of 39 items and less than 10 minutes were required to complete it.

Results and Discussion: 220 respondents; mean age 46.53 years. 58.2% were male and 55.9% had more than 16 years of work experience. The major part of respondents' working activity was anesthesia, followed by intensive care and pain management. The geographical distribution includes people working worldwide. The general knowledge of these technologies turned out to be very good with 94.1% of the colleagues that had heard of AI and 81.8% that had heard of machine learning (ML). 76.4% and 68.6% had heard of AI and ML in anesthesia, 70.0% and 60.5% had heard of AI and ML in intensive care while only 31.8% and 30.5% had heard of AI and ML in pain management.

Interestingly, 95.9% believed that training can lead to a greater use of these technologies. 90.0% of respondents declared themselves available to attend these courses and for the 81.4% of participants these new technologies will not replace their work. Potential main uses in clinical practice resulted to be prognostic models predicting mortality and complications; models of support for the doctor in therapeutic choices for the patient and diagnostic support models.

For what concern the obstacles that are slowing down the implementation of AI in clinical practice, ethical and legal issues influence the use of these technologies for 76.4% of colleagues. Similarly, 80.9% of them would have been more incentivized to use these tools in the presence of clearer legislation.

Conclusion(s): The general approach of anesthesiologists, intensivists, and pain management clinicians towards AI and telemedicine is globally positive. However, ethical and legal issues and the lack of explainability of certain algorithms are the main deterrent to the application of AI in clinical practice.

01AP05-08
Sedation depth monitoring during endoscopic procedures using a novel in-ear electroencephalogram (EEG): an exploratory investigation

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Background and Goal of Study: While moderate sedation is mainly used for endoscopic procedures, there are no devices for monitoring it properly, as Bispectral index (BIS) monitors currently commonly used for general anesthesia, is less accurate with moderate sedation. Furthermore, in Japan, endoscopists adjust sedation without anesthesiologists and administer medication empirically based mainly on vital signs and so on.
Thus, a device that is simple to use and can objectively evaluate sedation depth is desired. In this study, we investigated the possibility of sedation depth evaluation in endoscopic procedures using an in-ear-EEG, which is currently under development.
Materials and Methods: We recorded the EEG of 10 patients undergoing upper gastrointestinal endoscopic procedures at our hospital from April to June 2022. During the procedures, Richmond Agitation-Sedation Scale (RASS) was recorded as the true depth of sedation, as well as BIS.
We constructed two machine learning models: one to predict the depth of sedation backward from the EEG for the entire procedure (full-time model), and the other to estimate the subsequent depth of sedation in real time using 15 minutes of data at the beginning of the procedure (real-time model). For the full-time model, 90% was used for training and 10% for validation, while in the real-time model, we used the remaining time for validation.
We evaluated two outcomes for each patient: First, the accuracy of binary classification of patients as being sedated to RASS -4 or below, as predicted by the recorded EEG. Second, the correlation coefficient of the actual and predicted likelihood of RASS from the EEG, and of RASS and BIS over time.
Results and Discussion: The mean procedure time was 92.4±32.9 minutes. For the full-time model, it was possible to classify with 81.68% accuracy as to whether the patient was sedated or not, and the correlation coefficient with predicted RASS was 0.67, which was higher than with BIS of 0.44($t(9)=4.53, p=0.001$). Six patients had valid data for the real-time model.
The accuracy of real-time model was 70.97%. The correlation coefficients of real-time analysis were 0.46 for the predicted RASS, and 0.40 for BIS. These results indicate that in-ear EEG can predict the depth of sedation with the same degree of accuracy as BIS.
Conclusion: In-ear-EEG enabled us to monitor the depth of sedation, showing that it has the potential to estimate the real time sedation depth as accurately as BIS.

01AP05-09
Influence of pneumoperitoneum on acid-base disturbances during robot-assisted laparoscopic surgery

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Background and Goal of Study: Robotic-assisted surgery (RAS) requires lower pneumoperitoneum to establish a functional operating field, but it may induce acid-base derangements. Our goal was to investigate variations of plasmatic or urinary strong ion difference (SID) alterations during RAS.
Materials and Methods: In 21 anesthetized and paralyzed patients we measured respiratory mechanics, gas exchange, hemodynamics, plasmatic and urinary acid-base equilibrium variables [1] during RAS 30 minutes after induction of general anesthesia (Baseline), after pneumoperitoneum induction (Pneumoperitoneum) and after pneumoperitoneum withdrawal (End).
Results and Discussion: Plasma apparent SID (39.4±2.2 *vs* 39.9±2.3 *vs* 38.3±4.0, $p=0.467$) and pH (7.39±0.04 *vs* 7.40±0.04 *vs* 7.38±0.05, $p=0.467$) did not significantly differ within the study, while effective SID was significantly greater during pneumoperitoneum (36.5±4.3 *vs* 39.3±4.0 *vs* 35.6±5.2, $p=0.005$), probably because of an higher arterial carbon dioxide partial pressure (44±4 *vs* 46±5 *vs* 42±8, $p=0.021$). Urinary SID decreased during pneumoperitoneum (48.8±26.1 *vs* 33.6±23.8 *vs* 48.1±20, $p=0.027$), in association with a reduced urinary sodium output (132±52 *vs* 106±51 *vs* 113±51, $p=0.025$).

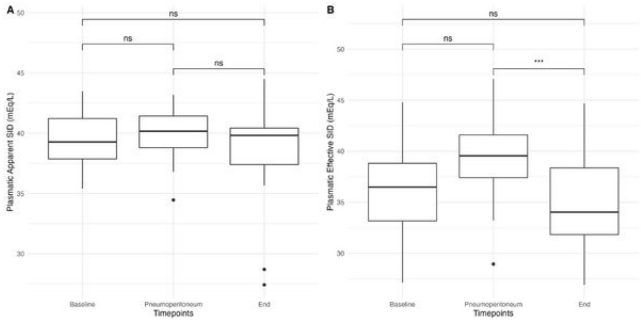

Figure 1. Time-course of plasmatic apparent (A) and effective (B) strong ion difference during the study.

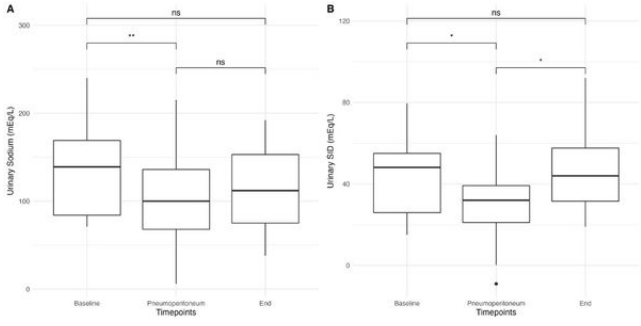

Figure 2. Time-course of urinary sodium concentration (A) and urinary strong ion difference during the study.

Conclusion: During RAS, pneumoperitoneum induced reduction of urinary SID by inducing sodium retainment, with no clinically significant effect on plasmatic acid-base equilibrium.

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01AP05-10
Comparison of perioperative pain in robot-assisted vs laparoscopic radical cystectomy with a multimodal analgesia approach

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Background and Goal of Study: According to various studies, robotic surgery seems to reduce intraoperative opioid consumption but has failed to show a reduction in postoperative pain when compared to the laparoscopic approach. Literature concerning both approaches is very limited for radical cystectomy.
The aim of this study is to assess intraoperative opioid consumption and postoperative pain in robot-assisted radical cystectomy (RARC) and laparoscopic radical cystectomy (LRC).
Materials and Methods: An observational cohort study including oncological patients in an ERAS programme with intraoperative multimodal analgesia (intravenous perfusion of 1.5 mg/Kg/h lidocaine, 10 mg/Kg/h magnesium sulphate and 0.3 mcg/Kg/h dexmedetomidine) who underwent RARC or LRC with ileal conduit and ileal neobladder between 2019 and 2022 was performed. Demographic data of both groups was collected (ASA classification, age, gender, BMI).
Primary outcomes were opioid requirements and pain score through numerical rating scales (NRS). We also collected incidence of postoperative nausea and vomiting (PONV), postoperative ileus, and requirement of parenteral total nutrition (PTN). Daily opioid use was converted to morphine sulphate equivalents (MSE) to facilitate comparison. Statistical significance was set at p-value <0.05.
Results and Discussion: A total of 44 patients were included (20 patients in LRC group and 24 patients in RARC group). No significant differences were observed in the demographic data between both groups except for ASA (LRC group had a higher rate of ASA III patients: 72% vs 32% while RARC group had 12% ASA IV vs 5% in LRC group). NRS in RARC and LRC were similar (1.11± 2.08 in LRC vs 1.43 ± 1.95 in RARC, p= 0.61 at 24h; 1.06 ± 1.92 LRC vs 0.96 ± 1.66 in RARC; p=0.86 at 48 h, and 0.67± 1.33 LRC vs 1± 1.78 RARC at 72h, p= 0.51). Intraoperative MSE were significantly lower in RARC (44.22± 16.58 mg LRC vs 33.85 ± 10.37 mg in RARC; p=0.02) but no differences in postoperative MSE, PONV, ileus nor in need for PTN were found.
Conclusion(s): Despite a reduction in intraoperative opioid consumption in RARC, postoperative pain is similar for both techniques (RARC and LPS). Intraoperative lower MSE in the RARC group did not imply a difference in PONV, ileus or need for TPN. To the best of our knowledge this is the first study to compare pain scores between LRC and RARC.

01AP05-11
Is robot assisted radical cystectomy a good alternative to laparoscopic radical cystectomy in bladder cancer?

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Background and Goal of Study: Minimally invasive surgery such as laparoscopy has replaced open surgery in many procedures during the last two decades. The recent development of robot assisted radical cystectomy (RARC) is becoming very popular as some studies have found that it reduces blood loss and postoperative complications compared to laparoscopic cystectomy (LRC).
The aim of our study was to compare both techniques in terms of kidney injury, postoperative complications, intraoperative blood loss, readmission rate and length of hospital stay (LOS).
Materials and Methods: A prospective cohort study including patients in an ERAS programme who underwent elective oncological RARC or LRC with ileal conduit or ileal neobladder between 2018 and 2022 was performed. Demographic data of both groups was collected (ASA, age, gender, BMI). Kidney injury was assessed by postoperative creatinine and KDIGO classification while postoperative complications were collected as CCI (comprehensive complications index). Blood loss was measured as visible millilitres and transfusion rate. Statistical significance was set at p <0.05.
Results and Discussion: 42 patients in LRC group and 26 in RARC were included. Both groups were comparable in age, BMI, and gender. Surgery time was significantly longer in RARC (368.4 ± 53.4 min vs 274.8 ± 50.7 min; p<0.01). Although not statistically significant, postoperative creatinine was greater in LRC group than in RARC group (1.4 ± 0.9 vs 1.3 ± 0.7 mg/dL at 24h; 1.6 ± 1.1 vs 1.2 ± 0.6 mg/dL at 48h and 1.6 ± 1.2 vs 1.1 ± 0.6 mg/dL at 72 h postoperative). KDIGO stages I-II were greater in RARC group (80.7% vs 61.9 %), while stage III and IV were higher in LRC group (28.5% vs 15.3% and 4.8% vs 0% respectively).
Blood loss and transfusion rate were not significantly different (respectively p=0.89 and p=0.97). LRC had slightly higher CCI (28.0 ± 27.3 vs 20.8 ± 17.7; p= 0.3. LOS appeared to be longer in LRC (18.2 ± 17.3 days vs 12.6 ± 5.7; p=0.12) as well as readmission date (33.3% vs 11.5%).
Conclusion(s): Despite not reaching statistical significance, it appears RARC is a safe procedure with no differences in postoperative complications or blood loss compared to LRC.
We found a tendency to reduce postoperative kidney injury, LOS and readmission rate in RARC that could make RARC an attractive technique. However, our results have to be confirmed in larger future studies.

01AP06-01
Malignant Hyperthermia: characteristics of 182 suspected patients from a French diagnosis and follow-up center

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Background and Goal of Study: Malignant Hyperthermia (MH) is a rare but potentially lethal complication of General Anesthesia (GA). In France, MH-patient care is structured around four national centers: Paris, Lille, Grenoble and Marseille. The lack of a national, MH-specific, patient database and the French legislation on genetic data make epidemiological surveys of the disease difficult, both in terms of clinical presentation and genetic analysis. We studied the characteristics of patients referred to the Paris center for suspected MH.

Materials and Methods: We performed a retrospective, descriptive study based on the medical records of patients referred to the study center for suspected MH over the last 40 years. The primary aim was to describe this population of suspected cases.

We also compared the clinical features and lab results of patients whose MH susceptible status was confirmed, with those for whom the diagnosis was finally excluded.

Results and Discussion: 182 MH-suspected patients were included in this work. Among them, 121 were males (66%), and 77 (42%) had had at least one uneventful GA prior to the event. Volatile anesthetics agents were administered in 139 (76%) patients, along with Suxamethonium in 43 (23.6%) patients.

The most frequent clinical symptoms were hypercapnia in 102 (56%), hyperthermia in 97 (53%) and muscle rigidity in 47 (25%). In vitro contracture Test (IVCT) were performed in 58 (32%) patients, and yielded abnormal results in 12 (21%).

Genetic analysis was performed in 55 (40%), and a validated (www.emhg.org/genetics), causal mutation was found in 36 (54%) patients. The mutated gene was RYR1 in 35 (97%). Among the 182 referred patients, 93 (51%) had conclusive results allowing to decisively classify them as MH-susceptible or otherwise. Sixty (33%) patients were positively diagnosed as MH-susceptible.

Conclusion(s): This is one of the first French epidemiological study of malignant hyperthermia patients. Clinical symptoms and genetic findings allowed positive diagnosis in a third of the patients.

A nation-wide study could help in refining the data and developing knowledge about the topic to the betterment of patient healthcare in this rare condition.

01AP06-02
Obturator reflex circuit breaker: an idea to avoid obturator reflex

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Background and Goal of Study: Obturator reflex is one of the most feared complications of the transurethral bladder surgery, as it can result in bladder perforation. Also known as obturator jerk, the reflex occurs because of the stimulation of the obturator nerve by electrocautery.

We put forward an idea that the reflex can be detected and the power to the electrocautery can be cut off to prevent the complication. In this study we aimed to use electromyography (EMG) sensors in the detection of the obturator reflex.

Materials and Methods: After the Investigational Review Board approval (05.04.2019/*No:*09.2019.402), two male patients scheduled for transurethral resection of bladder tumor (TURBT) under spinal anesthesia were included in the study. During the operation, EMG measurements from the leg adductor muscles were made, and the responses of deviation from baseline due to electrocauterization were also recorded. Obturator reflexes observed and electrophysiological responses in this situation were also recorded. Written informed consents have been obtained from the patients.

Results and Discussion: The first patient developed a visible obturator reflex 10 times within three minutes. However, none of these were reflected in the EMG recordings due to artifacts. The second patient did not develop obturator reflex.

Various methods have been used to prevent the obturator reflex, including various transurethral resection systems, using laser instead of diathermy, classical and transvesical obturator nerve block [1-5]. Use of muscle relaxants is still considered the gold standard in preventing the obturator reflex.

Conclusion(s): Electrophysiological measurements made with EMG in the evaluation of the obturator reflex that may occur in transurethral bladder surgery are of no value due to the intense artifacts that occur during the cauterization procedure. Use of systems to prevent electrocautery artifacts may make these measurements more useful.

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01AP06-03
Qualitative analysis of nitrous oxide's subjective effects

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Background and Goal of Study: Nitrous oxide (N2O) is best known as laughing gas although its effects are far wider. Quantitative studies on subjective effects of N2O have had conflicting results, as N2O has remarkable variability in its effects ranging from sedation to stimulation (1) and pleasantness to unpleasantness (2).

All N2O effects are not therefore pleasurable and due to its wide use, this effects many patients. Aim of this study was to examine the subjective effects of N2O with qualitative content analysis.

Materials and Methods: 20 healthy male volunteers received 20 minutes of 50% N2O. Data consists of free-form text answers to an open-ended question of N2O's subjective effects. This data was analysed with classical qualitative content analysis, which aims to produce a conceptual description of a phenomenon without predetermined categories. (3)

Results and Discussion: Analysis produced two themes. First theme is that N2O is mind-altering and the second that N2O produces sensory overload, where existing enhances and non-existing appears. Mind-altering capabilities could be further divided into dreamlike states and heightened emotions.

Dreamlike states produced a variety of dreams spanning from transcendental experiences to surreal. Euphoria was just one of the emotions N2O produced, whereas fear was represented both in scary dreams and fears of losing control.

Sensory overload describes how different sensations seem to blend into one another, which distorts perception, accentuates external noises and increases bodily sensations. This sensory overload highlights the importance of a calm, noise-free environment during clinical use of N2O with minimal monitoring, as these sensory inputs are heightened.

Conclusion(s): Subjective effects of N2O can be significant and confusing to the participant, as profound fear, scary and transcendental dreams occur. Subjective effects of N2O should be studied qualitatively in different populations and settings, as experiences are likely to vary.

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01AP06-04
Hospital stocking levels of dantrolene for the treatment of malignant hyperthermia: a survey of five European countries

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Background and Goal of Study: The only treatment widely available for the rare life-threatening condition malignant hyperthermia (MH) is dantrolene. European MH Group (EMHG) guidelines state that facilities using halogenated inhalation anaesthetics and/or suc-

Dantrolene stocking Country (respondents)	Dantrolene in stock	Stock 1–17 vials	Stock 18–35 vials	Stock 36–47 vials	Stock 48+ vials	Fully restock after use	Median number of MH cases reported in previous 3 years[f]	Fully restock after expiry	Agreements in place to enable access to additional dantrolene A: Yes, with other hospitals B: Yes, with other pharmacies C: No	Dantrolene restocking processes Country (respondents)	Restocking is an informal process, after confirmation of usage or expiry by colleagues	Restocking is a fully automated, immediate process	Restocking occurs: A: When vial stocks are below a certain number B: Regularly after fixed periods of time C: With shared responsibility D: When budget allows
Total (n=152)	Total 97% (147/152)	Total 19%	Total 26%	Total 18%	Total 33%	Total 72%	Total 2	Total 79%		Total (n=137)	Total 50%	Total 25%	
Germany (n=30)[a] 20 pharmacists 10 anaesthetists	97% (29/30)	13%	20%	27%	37%	67%	1	91%	A=50% C=37% B=13%	Germany (n=28)	57%	25%	A=7% B=4% C=7% D=0%
UK (n=32)[b] pharmacists	100%	19%	41%	9%	31%	54%	5	48%	A=72% C=16% B=13%	UK (n=28)	32%	29%	A=11% B=21% C=0% D=7%
France (n=30)[c] pharmacists	100%	27%	30%	23%	20%	83%	1	84%	A=47% C=40% B=13%	France (n=28)	61%	25%	A=7% B=7% C=0% D=0%
Italy (n=30)[d] pharmacists	93% (28/30)	20%	20%	7%	47%	65%	2	83%	A=73% C=23% B=3%	Italy (n=26)	54%	19%	A=19% B=8% C=0% D=0%
Spain (n=30)[e] pharmacists	93% (28/30)	17%	20%	27%	30%	89%	1	94%	A=70% C=17% B=13%	Spain (n=27)	44%	19%	A=19% B=7% C=4% D=0%

[a] Out of 3006 hospitals in Germany; 1.0% of total[b] Out of 1921 hospitals in the UK; 2.8% of total

[c] Out of 2989 hospitals in France; 1.0% of total

[d] Out of 1065 hospitals in Italy; 1.0% of total

[e] Out of 771 hospitals in Spain; 1.0% of total

Above numbers according to the OECD in 2020: https://stats.oecd.org/index.aspx?queryid=30182

[f] We believe these reported numbers to be an overestimated response bias, as pharmacists do not directly treat patients. EMHG guidelines: all centres should stock 36 vials of dantroleneGerman guidelines: 36–48 vials; www.ai-online.info Anästhesiologie & Intensivmedizin Aktiv Druck & Verlag GmbH | ISSN 0170-5334 I 02330 Sonderdruck S1-Leitlinie: Therapie der malignen Hyperthermie 59. Jahrgang | April 2018

UK guidelines: 48 vials; Royal College of Emergency Medicine and National Poisons Information Service Guideline on Antidote Availability for Emergency Departments (July 2022) APPENDIX 1: Stocking Guidance

French guidelines: 18 vials (additional 18 vials should be easily accessible at a centralised storage location); Circular DGS/DH/SQ 2 n° 99-631 of 18 November 1999 concerning the treatment of pre-anaesthetic malignant hyperthermia SP 2 26 3172

NOR: MESP9930569C.

Italian guidelines: 48 vials; Prevenzione, Gestione e Trattamento dell'Ipertermia Maligna Standard, Prevenzione e Gestione dell'Ipertermia Maligna – versione 02 Pubblicato il 15/10/2020, www.siaarti.it/standardclinici

Spain: no specific guidelines.

01 AP06-04 Table 1 Dantrolene stocking in five European countries

cinylcholine should hold 36 vials of dantrolene, but evidence suggests stock levels are sub-optimal.[1] The recommended starting dose is 2.5 mg/kg, and doses of up to 10 mg/kg may be needed.[1] Even short delays to administering dantrolene can lead to complications.[2]

Materials and Methods: To investigate dantrolene stocking processes and reasons for shortfalls relative to EMHG guidelines, we commissioned IPSOS to conduct interviews with 150 HCPs based in centres using potential MH trigger agents, recruited via an online panel and emailed invitations. The panel consists of many centres, without known bias towards any centre/specialism.

Results and Discussion: Most centres (97%) stock dantrolene, but 47% stock less than the EMHG minimum guidance of 36 vials. Although 99% restock after use, only 75% restock the full amount, mainly due to agreements for emergency supplies from elsewhere (41%), low probability of MH (36%) and high cost (14%).

A mean of 1.5 cases/centre/year was reported, on which basis stocks are calculated. In 50% of centres, restocking is informal, after HCPs confirm use/expiry; in 25% restocking is done through automated ordering. Only 13% set stocking levels by European guidelines; most use national, hospital or HCP recommendations. Table 1 lists details by country.

Conclusion(s): Dantrolene stocking and restocking levels are often lower than EMHG guidelines recommend. Given the importance of adequate stock for the timely and complete treatment of MH, this could increase risks of negative outcomes.

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01AP06-05
Underbody contact carbon-fiber versus forced-air warming to prevent hypothermia during gynaecological laparoscopic surgery: a randomized trial

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Background and Goal of Study: Inadvertent perioperative hypothermia is a common side effect in patients undergoing surgery, and active warming is recommended. Forced-air and resistive systems, mainly overbody, are so far the most commonly used in our daily practice and also the most studied. However, many different blankets are available, designs are heterogeneous, and results appear controversial.

The goal of this study was to compare core body temperature after laparoscopic surgery using a forced-air heating system versus a carbon-fiber electric blanket, both underbody systems.

Materials and Methods: This is a single-centre, randomized, parallel-group, and open clinical trial. We recruited consecutive patients undergoing elective major laparoscopic surgery for gynaecological cancer with an expected operative time of at least 2 h.

Thirty patients were randomly assigned to 2 groups: Group A: Covidien® forced-air blanket (n=15); group C: WARMTAC™ electric contact blanket (n=15). Body temperatures were continuously measured using an oesophageal thermometer and recorded every 15 minutes during the procedure. Warming rescue (extra air blanket) was used in case of temperature $\leq$ 35ºC. The primary outcome was the difference in oesophageal temperature between forced-air heating system and carbon-fiber electric blanket measured at the end of surgery. Categorical variables were compared with Chi-square or Fisher exact test, as appropriate, and quantitative variables with Student t-test. Temperature trajectories were compared using mixed models.

Results and Discussion: No differences between groups were observed for temperature at the end of surgery. Trajectories of temperatures were different (Fig. 1). However, mean temperature was always above 36 Cº in both groups. Warming rescue was needed only in one patient in the contact blanket group.

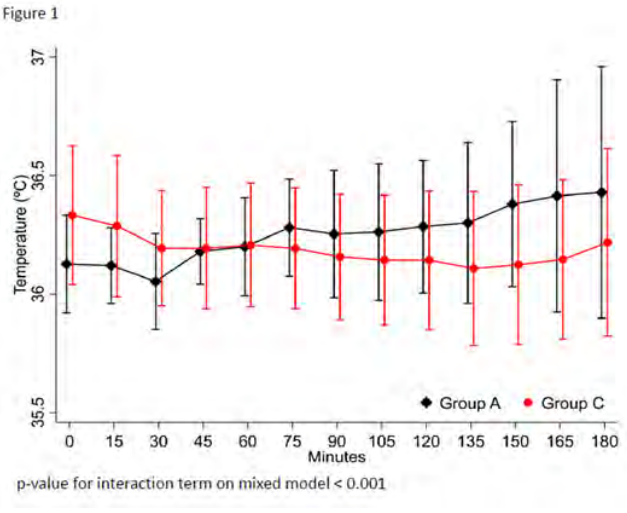

Figure 1.

Conclusion: Forced-air heating system and carbon-fiber electric blanket, both underbody systems are similarly effective in preventing intraoperative hypothermia.

01AP06-06
The use of TIVA vs inhalational anesthesia; comparison of anaesthesia practice in the UK and the UAE

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Background and Goal of Study: In the growing field of anesthesia, there has been an increasing popularity for the use of total intravenous anesthesia (TIVA) for induction and maintenance of anesthesia. Literature has shown that TIVA offers superior outcomes as compared to Sevoflurane, such as less incidence of PONV, reduced recovery time, and reduces postoperative agitation in the paediatric population.

This study aims to compare the anesthetic practice and perspectives of anesthetists on the use of TIVA vs Inhalational anesthesia between the UK and the UAE.

Materials and Methods: It was a prospective audit. Data were collected by completing a questionnaire, which included questions on the mode of anesthesia preferred by the anesthetists, and their perspectives regarding the reasoning behind using a particular technique. As well as, uses of TIVA, frequency of monitoring during the

use of TIVA, and barriers to its use. A total of 23 responses were collected from Fairfield General Hospital (UK) with the same number of responses collected from Tawam Hospital (UAE). Data was transferred to an Excel sheet and converted into diagrams.

Results and Discussion: Using both techniques was more common in the UAE compared to UK (UK-78% vs UAE-82%). Better patient recovery from anesthesia and reduced post-operative nausea and vomiting were the main reasons for the use of TIVA at Tawam Hospital. Cost-effectiveness was the main reason for the use of TIVA in the UK followed by better recovery. Both centres agreed that the risk of awareness was less likely and hemodynamic stability was better with inhalational anesthesia.

Conclusion(s): The results show that although the practice of TIVA is less at Tawam Hospital, both centres agree on the potential benefits of TIVA. We noticed that the depth of anesthesia monitoring was the most common barrier to the use of TIVA at Tawam hospital. We plan to present these results and propose the availability of depth of anesthesia monitoring equipment, which may increase the use of TIVA at Tawam hospital.

In particular, we aim to increase awareness of the possible benefit of TIVA in cancer surgery and on the environment compared to inhalational technique.

01AP06-07
Prevalence of patient-reported perioperative anxiety and its relation to patient satisfaction

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Background and Goal of Study: Perioperative anxiety is a widespread complaint.(1) The mutual relation between anxiety and patient satisfaction with anaesthesia care is still under debate. We aimed to assess the prevalence and different types of perioperative anxiety and their association with patient satisfaction.

Materials and Methods: This retrospective observational study used clinical data from a previous study.(2) A psychometric developed questionnaire including 10 anxiety questions (one main and nine specific triggers of anxiety) and 29 quality items determining patient satisfaction(3) was sent one to two weeks after discharge and a reminder two weeks later. Originally, sample size was calculated to recruit a minimum of 300 participants with complete data. Statistical analysis included bivariate and multivariate analyses.

Results and Discussion: For analysis, 474 completed questionnaires were included (response rate 79%). 141 patients (30%) reported anxiety regarding anaesthesia before admission to hospital. Age, extent of surgery, sex and surgical specialty were significantly associated with the prevalence of anxiety. The fear of not waking-up from anaesthesia and of being at mercy are by far the most reported triggers of anxiety (Table 1). Finally, the presence of anxiety was associated with impaired overall patient satisfaction.

Conclusion: Perioperative anxiety is common. Anaesthesia providers must identify and approach specific triggers of fear. Further prospective studies should aim at developing strategies to mitigate anaesthesia-related anxiety and consequently explore its potential influence on outcome parameters such as patient satisfaction.

	Absolute Number	Relative Number (%)	Standard Deviation
Q1: Did you feel anxious regarding the upcoming anaesthesia before hospital admission?	141	29.75	45.763
Q2: What was the most important trigger of your anxiety? a) Fear of not waking up from anaesthesia	44	31.65	46.681
b) Fear of waking up during anaesthesia	18	12.95	33.696
c) Fear of being at mercy	23	16.55	37.295
d) Fear of postoperative nausea and vomiting	42	30.00	45.990
e) Fear of paralysis and damage of the spinal cord	20	14.39	35.224
f) Fear of problems with concentration, memory or forgetfulness	18	12.95	33.696
g) Fear of cardiovascular problems	14	10.07	30.205
h) Fear of pain	20	14.39	35.224
i) Other trigger	9	6.47	24.697

Table 1: Prevalence and specific triggers of perioperative anxiety

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01AP06-08
Perfusion index: which finger does tell the truth?

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Background and Goal of Study: Perfusion index is a relative evaluation of the pulse's infrared signal strength returning from the monitoring site.[1] In this respect, the aim of this study is to define which finger is the best choice for the perfusion index measurement.

Materials and Methods: Healthy subjects were placed in a room, and blood pressure, heart rate, respiratory rate and oxygen saturation were recorded. Perfusion index was simultaneously measured on all fingers of one hand (first the right, then the left) for at least five minutes.

Results and Discussion: The highest mean perfusion index value was 3.68∓2.84 in the right ring finger, while the lowest one was 2.34∓1.81 in the right thumb. The right ring finger has an intermediate effect size of 0.111 and observed power of 0.949 compared to mean perfusion index value of all fingers ($p < 0.01$). Right middle finger and left ring finger have factor loadings of 0.838 and 0.822, respectively (Table 1).

	Mean ±SD	Effect Size#	Observed Power	Factor loadings†	p
RF1	2.34±1.81	0.201	0.999	0.700	**<0.01***
RF2	2.89±2.16	0.011	0.193	0.754	0.275
RF3	2.90±1.97	0.018	0.280	0.838	0.168
RF4	3.68±2.84	0.111	0.949	0.776	**<0.01***
RF5	3.27±2.37	0.026	0.386	0.814	0.095
LF1	2.56±1.82	0.134	0.980	0.771	**<0.01***
LF2	3.32±2.38	0.036	0.504	0.795	**0.049***
LF3	3.30±2.47	0.027	0.401	0.787	0.087
LF4	3.16±2.4	0.007	0.135	0.822	0.396
LF5	3.03±2.37	0	0.051	0.750	0.934
RHPI	3.02±1.84	–	–	–	–
LHPI	3.07	–	–	–	–

*p<0.05
#The individual effect size (partial eta square-η^2)
†Principal components analysis
PI, perfusion index; RF1, right thumb; RF2, right index finger; RF3, right middle finger; RF4, right ring finger; RF5, right little finger; LF1, left thumb; LF2, left index finger; LF3, left middle finger; LF4, left ring finger; LF5, left little finger; RHPI, mean perfusion index value of right hand; LHPI, mean perfusion index value of left hand; SD, standard deviation

Table 1.

Conclusion(s): The present study demonstrated that perfusion index has the highest value on the right and left ring finger, those could be used to measure perfusion index on right hand dominance individuals.

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01AP06-09
Trends in anaesthestic techniques before and after the Covid pandemic in outpatient unilateral inguinal hernia repair

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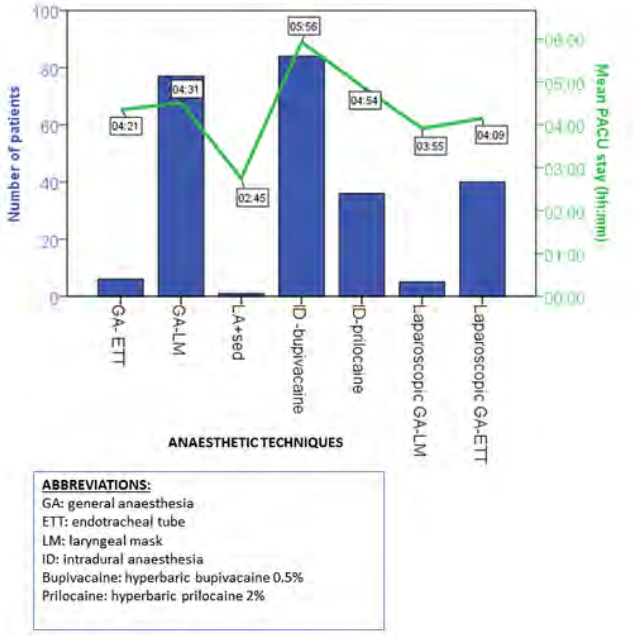
Background and Goal of Study: Outpatient unilateral inguinal hernia repair (IHR) is a very frequent surgical procedure and anaesthetic techniques are constantly adapted to optimize patient care reducing the length of postoperative stay. The Covid pandemic prompted changes in anaesthetic techniques according to the Ministerial recommendations. This study aimed to evaluate anaesthetic trends in outpatient surgery for unilateral IHR.

Materials and Methods: We conducted a retrospective analysis including all patients undergoing outpatient unilateral inguinal hernia repair from 1 October
2019 to 27 November 2020 in Hospital Universitario Santa Cristina, Madrid, Spain. Two study periods were defined: 1, before March 2020; 2, after March 2020 (Covid pandemic). Discharge from hospital required fulfilling the criteria of the modified Aldrete scale, including urination and oral feed tolerance. Prolonged Postoperative Recovery (PPR) was defined as over 6 hours of Post-Anesthesia Care Unit (PACU) stay.

Results and Discussion: A total of 249 patients were included, 125 and 124 in period 1 and 2, respectively. Overall, laparoscopic cases (18%) had shorter PACU stay compared to open surgery. Sedation with local anaesthesia (n=1) had the shortest PACU stay, followed by general anaesthesia (GA), intradural (ID) with 2% hyperbaric prilocaine, and ID with 0.5% hyperbaric bupivacaine. We found increased use of ID anaesthesia techniques after the declaration of pandemic (52% vs. 65% in period 2). The use of 2% hyperbaric prilocaine allowed faster discharge than 0.5% hyperbaric bupivacaine (mean difference of 60 minutes). PPR was observed in 30.5% of open repair cases (64.5% of them with the use of hyperbaric bupivacaine). The type of anaesthesia and PACU stay are shown in the figure.



Conclusions: Apart from sedation with local anaesthesia, general anaesthesia is associated with the shortest PACU stay in outpatient unilateral IHR, especially in laparoscopic surgery. However, during Covid pandemic a significant increase of intradural techniques over GA was observed. Among intradural medication, prilocaine allows for a faster discharge than bupivacaine.

01AP06-10
The effects of irrigation solution on body temperature in HoLEP surgery. A prospective observational study

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Background: Holmium laser enucleation of the prostate (HoLEP) is an endoscopic surgical procedure increasingly used to treat benign prostate hyperplasia. As clinical experience suggests, HoLEP requires longer operative time and intravesical irrigation fluid volumes.

The aim of this study is to evaluate if this is associated with greater hypothermia incidence and short-term postoperative complications.

Materials and Methods: In this unicentric prospective observational study (HCB/2022/1038), all HOLEPs under general anesthesia are recorded over a 6-month period. Medical history, perioperative characteristics (core temperature via esophageal thermometer, operative time, and irrigation fluid volume), and postoperative information (cutaneous temperature, shivering) are registered. Information on short-term postoperative complications is later obtained from medical records. Data is analyzed using SPSS 19.0.
Results and Discussion: Preliminary data from October 1st to November 30th, 2022, included 15 patients. Most patients were ASA 2 (60%) or 3 (33,3%). The mean age was 74,9± 6,7 years. 26,7% had an IMC ≥30 and 13,3% had a medical history of cardiovascular disease. The prostatic volume was 104,7±41,6 cc. Mean irrigation time and volume were respectively 97±41,7 min and 38.266,7±25.126mL. The temperature drop was 0,7±0,5ºC at the end of surgery. In almost all patients (93%), an air blanket and warm mattress for hypothermia prevention were used. A strong correlation was seen between the length of general anesthesia and irrigation time (r 0,98; p 0,000) and volume (r 0,865; p 0,000). A low-strength correlation was observed between temperature decrease and irrigation volume (r 0,209; p 0,472). Regarding postoperative data, the median length of stay was 3 days. One patient (7,14%) presented with a cardiovascular complication (transient ischemic stroke) and five (35,7%) had difficulty in hemostasia control. No correlation between temperature drop and postoperative complications was seen.
Conclusion(s): HoLEP seems to be indicated in patients with bigger prostates; which implies longer surgeries, higher intravesical infusion times and volumes. However, this doesn't seem to be associated with a significant drop in core temperature and postoperative complications, which may be due to the use of active preventative measures. These are preliminary results, and further data must be collected in order to determine if this directly relates to irrigation fluid volumes.

01AP06-11
5HT3 receptor antagonists (5HT3RA): Does one "size" fit all patients? A narrative literature review

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Background and Goal of Study: Genetic variants may affect drug efficacy on postoperative nausea and vomiting (PONV). The understanding of these mechanisms will help to identify the surgical patients who might benefit from specific antiemetic treatment.
Materials and Methods: We included 29 articles published from 2005 to 2022, utilizing the electronic databases PUBMED, EMBASE, COHRANE Library and ScienceDirect. The aim of the present review was to explore the relationship between genetic variations and 5HT3RA efficacy in PONV. A comparison was made with the relevant genetic variations and their impact on 5HT3RA efficacy in the context of chemotherapy induced nausea and vomiting (CINV).
Results and Discussion: We focused on three different gene polymorphisms: the cytochrome P450 mono-oxygenase system gene (CYP2D6), the adenosine triphosphate (ATP)-binding cassette subfamily B gene (ABCB1), and the 5HT3 receptor gene (5HT3R). According to literature, ultra-rapid metabolizers, linked to a genotype of more than three functioning alleles of the CYP2D6 gene, are associated with reduced activity of 5HT3RAs in PONV, with the exception of granisetron. Carriers of the 2677TT or 3435TT variations of the ABCB1 gene seem to have greater concentration of 5HT3RAs in the CNS and better drug response in PONV. The -100_-102AAG deletion variant of the 5-HT3BR gene might predict failure of ondansetron in PONV, as well as of tropisetron and ramosetron in CINV.
Conclusion(s): Personalized medicine will definitely be affected by pharmacogenetics and their determination of the medication type and dose that is most suitable for an individual's genotypic/phenotypic profile. Thus, possibly in the future, the genetic variations will also be considered when 5HT3RA are given as antiemetics, in the context of either PONV or CINV.
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López-Morales P, Flores-Funes D, Sánchez-Migallón EG, Lirón-Ruiz RJ, Aguayo-Albasini JL. Genetic Factors Associated with Postoperative Nausea and Vomiting: a Systematic Review. J Gastrointest Surg Off J Soc Surg Aliment Tract. 2018 Sep;22(9):1645–51.

01AP06-12
Waist to height ratio and ASA status. A valid marker of visceral obesity and of co-morbidities?

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Background and Goal of Study: Increased abdominal visceral adipose tissue (VAT) has been shown to be an independent risk factor for mortality in obese patients (1). There also appears to be a link between VAT and metabolic syndrome and cardiovascular disease (2). While visceral adiposity can be measured using imaging modalities such as DXA, this is an expensive, not widely available and time-consuming tool. Surrogate indicators of visceral adiposity are required as practical clinical tools.
Waist to Height Ratio (WHtR) has been suggested as a useful anthropometric variable when it comes to predicting VAT (3). It follows that there should be a correlation between WHtR and patient co-morbidities. This study tests that hypothesis by looking at the relationship between WHtR and the ASA status of a cohort of patients more than 1500 patients who underwent bariatric surgery.

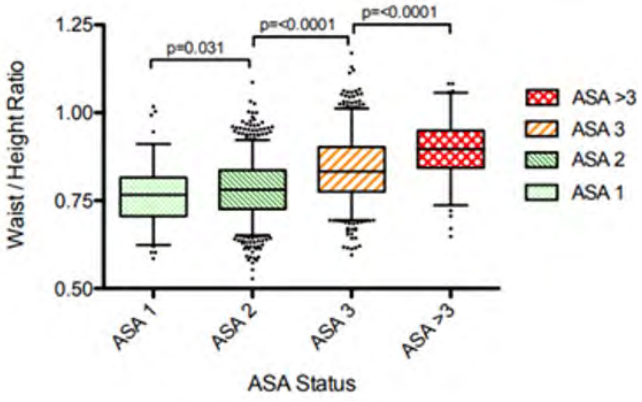

Figure. Waist to height ratio vs ASA status in Bariatric patients (n=1569)

Materials and Methods: An anaesthetic database of patients undergoing primary bariatric was analysed, and WHtRs were calculated. The patients were then grouped by ASA grade, and the WHtRs of adjacent groups compared. T-Tests determined whether the differences were statistically significant.
Results and Discussion: WHtRs were calculated for 1569 patients. The results are shown in the graph below. There is a clear and stepwise increase in the Waist to Height ratios between the ASA 2 and 3 groups ($p<0.0001$) and ASA 3 and >3 groups ($p<0.0001$).
Conclusion: There appears to be a stepwise and fairly strong correlation between patients' WHtR and their comorbid state, as measured by ASA status. This is consistent with other reports of WHtR as the best marker of comorbidities and mortality.
This surprisingly simple anthropometric marker may turn out to be a useful indicator of peri-operative risk, and certainly warrants further investigation.
Acknowledgements: No conflicts of interest to declare.
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01AP06-13
Outcomes and anaesthetic challenges of bariatric surgery in patients with a BMI of 70 or greater

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Background and Goal of Study: Patients with severe obesity present a number of anaesthetic challenges. Over the twenty years of our bariatric surgical service, we have anaesthetised a large number of patients with a high BMI, and maintained a detailed anaesthetic database throughout. We report here our experiences and some key aspects of airway and anaesthetic practice from those patients with a BMI >70kg/m2.
Materials and Methods: Our Bariatric anaesthetic database of >5000 surgical cases was interrogated to identify patients with a BMI of 70 or greater. We then compared selected parameters in this group against the BMI<70 cohort. Where differences occurred, Chi-square test was used to determine significance.
Results and Discussion: A total of 156 patients with a BMI of 70 or greater were identified. Of these patients: 142 underwent gastric bypass, 5 had endoscopic placement of gastric balloons, 5 underwent sleeve gastrectomies, 1 had a gastric band placed, and 3 were re-operations. The median age was 41 years (IQR 36-47). There were 65 male patients (42% of BMI >70 patients, vs 22% of the entire cohort).
Two patients were classed as ASA 1, 16 as ASA 2, 99 ASA 3 (this included 28 high-risk classed as ASA 3+) and 33 as ASA 4. There were six deaths within 30 days of surgery (3.8% vs 0.3% overall): five males, all identified as ASA 3+ or 4, and one female death on day 28 - from incidental COVID pneumonitis. One early death was surgical and one anaesthesia-related, with intra-operative acute cardiac decompensation and subsequent MOF.
There were no airway issues, with 92 grade 1 laryngoscopies, 37 grade 2 and only 3 were grade 4 (all in females).
Conclusion: The intra-operative anaesthetic management of patient with a BMI >70 was surprisingly straightforward, although surgical complications were more common. The 30-day mortality rate was significantly elevated, greater than 20 times that of the BMI<70 group.

01AP07-01
Widespread subcutaneous emphysema after ERCP - case report

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Background: Endoscopic retrograde cholangiopancreatography (ERCP) is a gold standard technique in the diagnosis and treatment of bilio-pancreatic diseases[1]. However the complication rate associated is high[2].
Case report: An 85-year-old woman with history of congestive heart failure, atrial fibrillation and parkinson's disease underwent endoscopic retrograde cholangiopancreatography (ERCP) to remove a biliary prosthesis placed 12 days before due to an acute cholangitis. The patient was sedated with boluses of propofol and alfentanil. During the procedure the patient developed acute respiratory failure that presented with an increase in respiratory rate along with hypoxemia. The procedure had to be terminated suddenly. The first clinical impression given the patient's age and comorbidities was that this was a case of drug induced respiratory depression but as we advanced in our physical examination we came across with widespread subcutaneous emphysema. The emphysema was observed on the right side of the thorax all the way to the right shoulder, right abdomen and right thigh. After 10 minutes of bag mask ventilation the patient didn't regain consciousness and the decision was to secure the airway with orotracheal intubation.
The patient was then taken to do a CT scan which revealed an extensive pneumoperitoneum, pneumomediastinum and a right pneumothorax as consequence of a duodenal arch perforation. The patient was then admitted to the intensive unit care (ICU) and urgently submitted to surgery.
Discussion: This case report aims to alert anesthesiologists towards the possibility of bowel perforation during an ERCP, which may be complicated by pneumomediastinum, pneumothorax or pneumoperitoneum. When a complication like this occurs, early recognition, airway management and hemodynamic stabilization are mandatory.
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Learning points: The awareness of the operator and of the anesthesiologist for the early recognition and prompt handling of such complications can influence patients outcomes.

01AP07-02
Post-operative visual loss (POVL) after head and neck (H&N) surgery

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Background: POVL in non-ocular surgery is a rare anaesthesia complication.This is a case of permanent POVL after a H&N surgery due to Central Retinal Artery Occlusion (CRAO).
Case report: Elderly male with oropharynx cancer (previous surgery, chemotherapy and radiation) presented for cervical lymph node excision. PMH: coronary artery disease (on statin, b-blocker, dual antiplatelet therapy). Figure 1 summarises the perioperative period.

Figure 1. Perioperative period

Emergency ophthalmic exam revealed hand movement recognition only. Table 2 details examination findings.

Fundoscopy	Cherry spot appearance of the macula (R) - CRAO	Microemboli in smaller arterial branches of the temporal retina (R)
Carotid US	Rt Internal Carotid 50-60% stenosed	Rt External Carotid 70-80% stenosed
CT (Figure 2)	Space- occupying mass in the right carotid space	Causes severe stenosis in R CCA

Table 2: Post-operative investigations of POVL

Management of the CRAO focused on improving retinal artery circulation: -eye massage (displaces emboli) -CO2 inhalation (induces vasodilation) -IV acetazolamide (decreases intraoccular pressure) -clopidogrel continuation
Next day visual acuity improved to counting fingers and patient gained awareness of temporal visual fields. Remained unchanged at follow up.

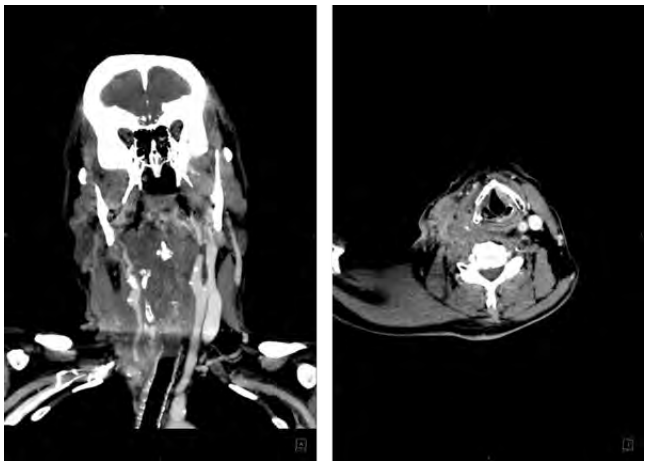

Figure 2: CT scan (coronal and axial) showing space-occupying mass in R carotid space (skull base to thoracic inlet)

Discussion: POVL is mainly due to Ischaemic Optic Neuropathy (ION) due to intraoperative anemia and hypotension at cardiac/spine cases. However this case is due to an emboli from the CCA causing CRAO. Radiation arteritis, side effect of neck irradiation, results in accelerated atherosclerosis and plaque formation. Imaging and fundoscopic findings suggest that neck manipulation caused plaque rupture and CRA embolisation.
Learning Points: Consider additional preoperative testing in patients with previous neck radiation (risk of Ca atherosclerosis) and take steps to prevent embolisation.
References:
1. Roth.Perioperative visual loss: what do we know, what can we do? Br J Anaesth2009;103:31-40

01AP07-03
When the airway is difficult… But so is the heart: managing Brugada syndrome

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Background: Brugada syndrome (BS) is an autossomal dominant genetic disorder characterized by abnormal findings on the electrocardiogram (ECG), an increased risk of ventricular tachyarrhythmias and sudden cardiac death. The prevalence in the population is 0,1 to 1% and it is 2 to 9 times more likely in men.(1)
Many drugs have been reported to induce arrhythmias in BS patients, and so should be avoided by the anaesthesiologist.(2)
But what if in addition to BS, which precludes the use of local anaesthetics, the patient also has a known difficult airway?
Case report: A 63-year-old-man, with dyslipidemia and an implantable cardioverter-defibrillator (ICD) placed for suspected BS, was proposed for bilateral ear canaloplasty. He also had a history of difficult orotracheal intubation in past surgery, but easy face mask ventilation.
As a strategy, we chose to perform a rapid sequence induction after preoxygenation, with fentanyl, etomidate and rocuronium, given the impossibility of approaching the airway with the patient awake. He was intubated with videolaryngoscope at first try. Anaesthesia was maintained with sevoflurane; a second peripheral access was placed, and the radial artery was catheterized.
During surgery, to maintain hemodynamic stability, atropine and isoprenaline boluses were administered, followed by isoprenaline infusion. The magneto was available in case of need. The surgery was uneventful, and the patient was successfully extubated.
Discussion: BS should be familiar to the anaesthesiologist in order to manage it correctly: a meticulous pre-anaesthetic evaluation, planning and perioperative management should be carried, with prompt diagnosis and treatment of arrhythmias. (3)
In this case, an additional challenge of the difficult airway existed, with the impossibility of performing local anaesthesia of the oropharynx. Decisions must be individualized, based on current guidelines, and the planning of the anaesthetic approach must encompass several hypotheses.
References:
1. Wylie,J., Brugada syndrome.UpToDate,2022
2. Postema. Heart Rhythm2009
3. Dash, S. Anaesthetic Management in Brugada Syndrome. JCDR2017
Learning Points: Regarding BS, decisions must be individualized, based on current guidelines, and the planning of the anesthetic approach must encompass several hypotheses, with prompt diagnosis and treatment of arrhythmias. When, in addition, a difficult airway presents, alternatives to using local anaesthetics must be encountered.

01AP07-04
Postponed extubation after EVAR in a patient with severe renal and hepatic disfunction: is delayed postoperative curarization a concern?

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Background: In patients with compromised kidney and liver function, there is a change in rocuronium pharmacokinetic profile with reduced clearance. We report the case of an extremely prolonged residual blockade in a patient with end-stage renal disease and liver cirrhosis.
Case report: A 74-year-old man underwent fenestrated endovascular repair of a juxtarenal aortic aneurysm. His medical history included chronic kidney disease, hypertension, chronic alcoholism and liver cirrhosis. He was 168 cm tall and weighed 80 kg.
Creatinine seric level was 4.41 mg/dL, with an estimated clearance of 12 mL/min. Liver function tests showed an isolated elevation of alkaline phosphatase.
He received 80 mg of rocuronium at induction. Surgery had a total duration of 7 hours. Repeated boluses of rocuronium were administered in a total of 160 mg (initial 80 mg for induction and 4 additional boluses of 20 mg each). The patient was transferred to the Post-Anesthesia Care Unit (PACU) intubated, with no reversal of the blockade.
Six hours after the end of surgery, PACU team prepared to awake and extubate him. After withdrawal of sedative drugs, the patient attempted to open his eyes but was unable to move his limbs. One of the hypothesis considered was spinal ischemia during the procedure.
At this time, neuromuscular block was assessed with train-of-four (TOF) stimulation. There was a TOF count of 2/4, suggesting a moderate neuromuscular block 6 hours after the last rocuronium bolus. After reversal with 400 mg of sugamadex, the patient showed no clinical signs of residual paralysis, was able to maintain spontaneous ventilation and was extubated without complications.
Discussion: Cases of residual curarization as prolonged as the one we present are rare. This severe prolonged effect of rocuronium was due to a combination of multiple conditions affecting its pharmacokynetics: renal injury, liver disease and advanced age, which result in reduced clearance and a change of distribution volumes1.
Reference:
1. Khuenl-Brady, K.S., Sparr, H. Clinical Pharmacokinetics of Rocuronium Bromide. Clin-Pharmacokinet 31, 174–183 (1996)
Learning points:
• Although no dosage adjustment is formally indicated in renal and hepatic impairment, physicians should be aware these are risk factors for residual blockade.
• Even in cases of postponed extubation, neuromuscular monitoring and pharmacological reversal should be ensured.

01AP07-05
Membranous tracheal rupture after endotracheal intubation in elective surgery

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Background: Postintubation tracheal laceration (PITL) is extremely rare; the incidence is only 1/20,000 intubations [1]. Despite the low incidence, it carries the risk of life-threatening complications. Depending on the size and location of the injury, it can present with a variety of symptoms.
Case report: We present a female patient with an elective surgical procedure of total hip replacement and tracheal laceration after endotracheal intubation (EI). EI was performed without difficulty in the first attempt, using the usual tube. We present to you a 77-year-old patient who underwent surgery for a femur fracture. The patient suffers from hypertension, atrial fibrillation and COPD. She uses Acenocoumarol (Sintrom®) as therapy, which was discontinued before the operation and LMWH was introduced.
The patient was operated on under general anesthesia, which passed without significant complications. After 12 hours, the patient developed subcutaneous emphysema of the neck and chest, and an X-ray of the chest and a CT scan of the chest were immediately performed.
After receiving the results, a bronchoscopy was performed, where a lesion of the membranous part of the trachea was confirmed, 35 mm long, 3 cm above the bifurcation of the trachea.
The patient underwent a surgical procedure with single sutures on the membranous wall and tracheal reconstruction with a flap of the fourth intercostal muscle over the reconstructed trachea.
Discussion: This case showed that even a small laceration of the trachea can create severe subcutaneous emphysema of the head, neck, and upper trunk, as well as pneumomediastinum. Treatment of PITL can be conservative, namely for lacerations below 3 cm, surgical or endoscopic, according to size and location of the laceration and ventilatory efficiency [2]. Our decision for surgical treatment was the presence of pneumomediastinum.
References:
1. Lung India. 2021;38(1):77-9.
2. Intensive Care Med. 2019;45(4):521-2.

01AP07-06
Non-invasive respiratory support with High Flow Nasal Cannula in endoscopic surgery in a patient with pneumonia legionella: a case report

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Background: Legionella pneumofila is one of the most important causes of respiratory disease in human. More than 30% of hospital-acquired pneumonia iscaused by *Legionella*. Ventilator-associated pneumonia (VAP) is an infection acquired in hospital wards, particularly in intensive care unit (ICU). This disease approximately affects 9% to 20% of intubated patients.
Mortality in these patients varies between 8% and 76%. Legionella is one of the important factors for infection in intubated patients. Post-operative anastomotic leak after esophageal resection represent a serious complication or disease with significant morbidity and mortality.
Prompt diagnosis and initiation of therapy are essential to improve outcome. It offers a minimally invasive therapeutic approach regarding sepsis control, which however is also associated with procedure-specific complications.
Case presentation: We describe the case of an anastomotic leak in a 77-year-old patient who had previously undergone gastrectomy. During his ICU stay, the patient was found to be suffering from legionella pneumonia. To avoid re-intubation during the procedure, we decided to treat his hypoxemic respiratory failure with HFNC. Throughout the operation the patient maintained spontaneous breathing, absence of significant desaturations and hemodynamic alterations.
Conclusions: Hfnc may represent a valid alternative to intubation and the placement of supraglottic devices in periprocedural sedation in frail patients with underlying hypoxemic pathology.
Learning Point: HFNC can be useful during the procedural sedation for endoscopic procedure.

01AP07-09
Cervical edema after internal jugular vein cannulation: when thyroid enters the equation

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Background: Acute neck swelling after internal jugular vein (IJV) cannulation requires prompt evaluation. IJV cannulation can easily damage large vessels and lead to airway compromise due to hematoma on prevertebral, mediastinal and retropharyngeal spaces.
Case report: A 52 year-old man with unknown relevant medical history was admitted to the operation room in decompensated hypovolemic shock due to a duodenal ulcer perforation. An emergent exploratory laparotomy was performed.
After balanced general anesthesia induction an IJV cannulation was established using landmarks. A large cervical edema was noticed after one hour. To rule out vascular complications, a cervical ultrasound was performed. It revealed no signs of vascular damage. A cervical CT scan was obtained after surgery, describing no ana-

tomical complications related to the cannulation, but it raised suspicion of thyroiditis (figure 1). There was no history of previous thyroid disease and the thyroid function was normal. A shock thyroid related to hypovolemia was proposed.

Discussion: Shock thyroid was first described in 2006 after accidental CT scan findings1. It is hypothesized that shock thyroid results from hypoperfusion of the thyroid gland causing intracellular and perithyroidal edema, with subsequent thyrotoxicosis without direct thyroid injury. Until now, the majority of the cases 2 reported were related to shock in trauma patients. It is thought to be part of a constellation of secondary CT findings termed hypovolemic shock complex.

In our case report, CT scan findings and the resolution of the cervical edema with the correction of hypovolemia support the diagnosis of thyroid shock. From our knowledge, this is the first report of shock thyroid in which a clinical sign (cervical edema) triggered further investigations.

References:

1. J Comput Assist Tomogr. 2006;30(2):310-2
2. Emerg Radiol. 2017;24(3):319-24.

Learning Points: Shock thyroid is recognized as a sign of the hypovolemic shock complex and can present with cervical edema. Clinical and prognostic consequences are unknown, but this finding could surrogate the magnitude of hypoperfusion. Additionally, it should be recognized to avoid misdiagnosis and inadequate management.

01AP07-10
Undiagnosed intra-operative pheochromocytoma: a case report

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Background: Undiagnosed pheochromocytoma patients have higher morbidity and mortality rate under anesthesia.[1] Here, we report a case of a patient undergoing elective surgery with an unrecognized pheochromocytoma.

Case report: 81-year-old women with arterial hypertension of difficult control and type 2 diabetes mellitus was hospitalized for pyelonephritis. During disease workup, a CT shows a large mass in the superior pole of left kidney. After antibiotic therapy, she's scheduled for left radical nephrectomy by laparotomy.

A combined anesthesia technique with epidural catheter placement and general anesthesia was conducted. After induction, the patient remained hypertensive and epidural boluses were administered. During kidney dissection, a laceration of the spleen occurred with estimated blood losses of 1 liter and the patient became hypotensive. Crystalloids fluids and a bolus of tranexamic acid were administered. Hypotension persisted, especially after tumor removal, hence, 2 units of red blood pack cells were transfused and a perfusion of noradrenaline started.

After surgery, the patient was transferred to the intensive care unit with noradrenaline perfusion until hemodynamic stability was restored.

The anatomic pathology report of the surgical sample revealed a pheochromocytoma.

Discussion: Pheochromocytoma is a rare neuroendocrine tumor and the classic triad of symptoms are headache, palpitations, and diaphoresis.[2] This patient had arterial hypertension of difficult control that could have raised suspicion for pheochromocytoma but no other known signs of the disease.

The preoperative titration of a blockers enables the control of arterial pressure and the expansion of intravascular volume.[3]

In this case, hypovolemia was pointed as the main cause of hypotension. Patients with unrecognized pheochromocytoma have higher risk of arrhythmia, severe hypertension or hypotension and cardiovascular collapse. Management of hypotension crisis includes fluid therapy and vasopressors, such as noradrenaline.[1]

References:

1. Connor D *et al*. British journal of Anesthesia Education. 2016: 16 (5): 153-158.
2. Godoroja-Diarto D *et al*. Acta Endocrinologica (Buc). 2021, 17 (4): 557-564.
3. Lenders J *et al*. The journal of clinical endocrinology and metabolism. 2014, 99 (6): 1915-1942

Learning points: Pheochromocytoma should be suspected in hemodynamic unstable patients under anesthesia in order to treat adequately and diminish morbidity.

01AP07-11
Unique case of bilateral pheochromocytoma in patient with Brugada syndrome

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Background: The incidence of Brugada syndrome and multiple endocrine neoplasia (MEN) syndrome is quite low, with no published case in which they concur in a patient who must be anesthetized. We present a case of bilateral pheochromocytoma in a patient with Brugada syndrome who did not allow the use of the usual medication.

Case report: A 44-year-old male with a history of Brugada syndrome with a recent diagnosis of MEN type 2A syndrome (bilateral norepinephrine-epinephrine secreting pheochromocytoma and medullary thyroid cancer). Before the intervention, conditioning treatment was started. Due to the presentation of Brugada syndrome, the use of traditional beta blockade was not recommended. Induction was started with 450 mcg fentanyl, sevoflurane and 70 mg rocuronium. Intubation was done with the use of a videolaryngoscope to avoid possible triggers and the adrenalectomy was performed by laparoscopy with low pneumoperitoneum. Low-dose esmolol perfusion was started from the beginning of the intervention. Anesthetic maintenance was accomplished with sevoflurane, remifentanil infusion, and rocuronium boluses. During the procedure, numerous hypertensive peaks occurred (250/115 mmHg) which required increasing the rate of esmolol infusion (150 mcg/kg/min) as well as clevidipine infusion (32ml/h), which successfully controlled the excessive catecholamines released. After clamping the main adrenal veins, hemodynamic stabilization improved rapidly, and withdrawal of both infusions was possible. He was extubated in the operating room and the evolution of the patient in the immediate postoperative period was uneventful.

Discussion: The intraoperative management of a pheocromocytoma without beta blockade requires the use of drugs with a very rapid onset of action and a short duration of effect to palliate the consequences of catecholamine discharge. Brugada syndrome limits the range of drugs available. In our case, esmolol and clevipine infusions proved to be effective and safe options.

Reference: Rodríguez González O, et al. Manejo hemodinámico intraoperatorio con esmolol durante la extirpación de un feocromocitoma bilateral en una paciente de 10 años. Rev Esp Anestesiol Reanim 2010: 57(7): 454-457.
Learning points: Esmolol and clevidipine infusions are a safe choice for hypertensive peaks and normotensive maintenance in bilateral adrenalectomy due to pheochromocytoma in patients with Brugada syndrome.

01AP07-12
Fiberoptic intubation to assess the conditions of extubation

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Background: Neck masses may distort the airway anatomy, making airway management difficult. The use of a flexible fiberoptic bronchoscopy (FOB) has been an effective and safe method for intubation as well as to assess local conditions for safe extubation (1). We describe a case where the use of fiberoptic endoscopy revealed essential for both.
Case report: A 65-year-old male, ASA-PS III, was brought to the emergency department with hoarseness, mild respiratory distress and dysphagia after a rapid growth of a known cervical mass. His past medical history was relevant for thyroid disease. CT scan of the neck revealed a soft tissue mass on the left side, compressing and deviating all adjacent structures contralaterally, and significant laryngeal stenosis and distortion. Placement of a percutaneous endoscopic gastrostomy (PEG) was sought to allow for nutritional support. ENT surgery declined to perform an elective tracheostomy as the patient wasn't in severe respiratory distress. Airway evaluation revealed a Mallampati IV and significant shift of the midline structures. After reviewing the case the airway management was plan A, FOB intubation; plan B, awake/emergency cricothyrotomy. With informed consent provided, the cricothyroid membrane (CTM) was preemptively identified and marked with ultrasound. The patient was then monitored, topical anesthesia applied, and sedation started for a RASS of -1. Nasotracheal intubation with a 6 ETT was achieved at first attempt. The PEG procedure was laborious but rather than uneventfully. The extubation strategy was to first assess peri-laryngeal conditions under FOB followed by placement of an exchange catheter through the ETT and only then removing the tube. Also, previous FONA marking was left in place. The FOB examination showed edematous structures and slight airway bleeding. The patient was admitted to the ICU for vigilance, and safely extubated the next day using the same strategy described above.
Discussion: This case highlights the value of FOB in a safe intubation and extubation strategy, and the importance of US CTM marking for a solid backup plan.
Reference:
1. Anesthesiology 1995; 82:785–786
Learning points: An airway evaluation before extubation is as important as before intubation in patients with anatomic alterations or laborious airway manipulation.
Fiberoptic visualization of an intubated patient's airway can help to assess the safety of extubation and to implement and adequate strategy.

01AP08-01
Perioperative management in a laparoscopic cholecystectomy case with multiple acyl-CoA dehydrogenase deficiency

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Background: Multiple acyl-CoA dehydrogenase deficiency, also known as Glutaric Acidemia type II(GAII) is a rare autosomal recessive metabolic myopathy with a defect at electron transfer in mitochondria. Low lipid diet and riboflavin treatment are recommended; prolonged starvation, dehydration, and metabolic stress can cause acute decompensation[1].
Case report: A 23-year-old patient with GAII, had acute cholecystitis and was scheduled for laparoscopic cholecystectomy. For preoperative management, we avoided metabolic decompensation by infusion of 10% dextrose and ICU admission was planned after surgery. The patient was monitored with pulse oximetry, ECG, invasive blood pressure, TOF, BIS, and temperature probe. Anaesthesia was induced via IV anaesthetics: 2 mg midazolam,150 mcg fentanyl, 5 mg/kg thiopental, and 0.6 mg/kg rocuronium.
After intubation, TIVA was administered with 3-5 mg/kg/h thiopental and 0.05-0.2 mcg/kg/min remifentanil infusion for maintenance, and BIS values were kept between 40-60. IV 10% dextrose infusion continued during the operation, and there was no hypoglycemia, elevated lactate, or metabolic acidosis. The duration of surgery was 103 minutes, the TOF ratio was >0.9 and the max BIS value was 76 at the end of the operation.
The patient with delayed emergence wasn't extubated and was admitted directly to the ICU. After 90 minutes, he was extubated without any problem and was discharged from the hospital on 3rd day without any complications.
Discussion: Perioperative regulations were sufficient and any severe complications weren't observed during our management. Our plan was GA rather than neuraxial due to the side effects of IV lipids essential in a possible LA intoxication.
Volatiles might have a hypersensitive effect on mitochondria in metabolic myopathies and might depress oxidative phosphorylation theoretically. Propofol infusion might cause PRIS even if small doses were used in those patients. There are reports volatiles and propofol were applied or avoided.[1,2]
We preferred to administer thiopental infusion which hasn't been regularly used for TIVA.
Besides metabolic regulations, thiopental infusion might be applied in these critical patients with precautions for prolonged emergence, when other agents have possible side effects.
Reference:
1. Anesth Analg 2017;25:822–36 2.Paediatr Anaesth 2013;23(9):785–793.
Learning Points: Patients with critical metabolic disorders may undergo surgery safely with perioperative anaesthetic and metabolic precautions.

01AP08-02
Myotonic dystrophy type 1 (Steinert's disease) – anaesthetic management of a rare disease

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Background: Myotonic dystrophy type 1 (MD1) is a rare systemic disease characterized by myotonia and muscle weakness. Other manifestations include cardiac conduction abnormalities, impaired lung function, aspiration risk and cognitive impairment.
Case report: 47-year-old woman with MD1 diagnosed 20 years ago, ASA III, proposed for vitrectomy due to epiretinal membrane with retinal detachment. Her comorbidities were chronic bifascicular block with a permanent pacemaker, central sleep apnoea under CPAP therapy, severe restrictive ventilatory disorder, cognitive impairment and hypoacusia. Physical examination revealed facial muscle weakness and high-arched palate. She had regular consultations with her cardiologist, neurologist and pulmonologist, and her comorbidities were optimized.
After discussion involving Anaesthesiology and Ophthalmology, it was decided to conduct general anaesthesia (GA). Aspiration prophylaxis was performed, following TIVA with propofol and remifentanil TCI, and rocuronium bolus. Airway was uneventfully managed with videolaryngoscope. ASA standards, neuromuscular block, anaesthesia depth and invasive blood pressure were monitored intraoperatively. Normothermia was maintained and possible myotonia-triggering drugs were avoided. No adverse events were reported. Postoperative period was planned in the ICU, where she recovered uneventfully.
Discussion: MD1 is a rare disease that can affect multiple organ systems, increasing perioperative complications risk, such as dysrhythmias, aspiration and impaired ventilatory function. Knowledge of these risks by Anaesthesiologists allows careful planning for elective procedures and effective management in emergent surgeries.
In this case, regarding patient's increased ventilatory impairment risk, it was crucial to ensure postoperative care in a level 2 or 3 unit. When possible, regional anaesthesia is advised in MD1. If GA is needed, it should be performed with short-acting drugs, and possible myotonia triggers (succinylcholine, neostigmine, volatile agents, hypothermia) should be avoided. Multidisciplinary discussion and planning is paramount in MD1 and should involve anaesthesiologists, surgeons, intensivists and other specialties managing the patient's comorbidities.
Reference: Case Rep Anesthesiol 2019;2019:4282305
Learning Points: This case highlights the relevance of recognizing MD1 anaesthetic risks, as well as a careful perioperative planning, which should include a multidisciplinary approach.

01AP08-03
A rare case of post polio syndrome: anaesthetic challenges

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Background: Postpolio Syndrome (PPS) is a disorder related to the recurrence of neuromuscular symptoms in survivors of paralytic poliomyelitis. This case report discusses the anaesthetic challenges and considerations during perioperative and postoperative period. Only a few cases of PPS have been reported.
Case report: A 60 year old lady with ASA 111 posted for laparoscopic surgery for carcinoma endometrium. She had poliomyelitis at 3 years of age following which she developed PPS. She is hypertensive, diabetic and has BMI of 34.9 kg/m2. She has bilateral lower limb muscle weakness of power 1/5.
Spine showed thoracic scoliosis with lumbar lordosis, with restrictive PFT. No DVT in bilateral lower limb doppler. Antiaspiration prophylaxis given. Forced air warmer and warm fluids used. Thoracic epidural secured in T10-T11 space in sitting position. Induction done with titrated dose of propofol 100mg, lignocaine 60mg and fentanyl 100mcg. Atracurium 20 mg was given and intubated with 7mm ID cuffed oral endotracheal tube under videolaryngoscope. All pressure points were padded. Ropivacaine 0.2% infusion was given epidurally. Reversal was administered when TOF ratio was >0.70 and extubated.
Discussion: The polio virus destructs anterior horn motor neurons resulting in limb paralysis.(1)
The main concerns are fatigue and muscle weakness as in PPS, axonal sprout degeneration occur leading to denervation and muscle weakness. Regional anaesthesia can be safely used. Limbs are adequately padded and positioned. To prevent cold intolerance warming devices are used. Titrated doses of drugs administered due to increased sensitivity of motor neurons(2).
Complete reversal of neuromuscular blockade ensured before emergence from anaesthesia. Prophylactic antiemetic administered to prevent aspiration risk.(3) There is postoperative risk of respiratory failure due to weakness or oversedation.
References:
1. Lambert DA, Giannouli E, Schmidt BJ, Warltier DC. Postpolio Syndrome and Anesthesia. Anesthesiology. 2005 Sep 1;103(3):638–44.
2. Wheeler D. Anesthetic considerations for patients with postpolio syndrome: a case report. AANA J. 2011 Oct;79(5):408–10.
3. Hiremath VR. Anaesthetic Management of Patient with Post Polio Syndrome with Head Injury. 2014;4:3
Learning points: Anaesthetic management includes altered sensitivity to general and regional anaesthetics, with considerations for compromised respiratory function, aspiration risk, cold intolerance and chronic pain syndrome.

01AP08-04
A patient with relapsing multiple sclerosis: is general anaesthesia safe? – A case report

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Background: Multiple Sclerosis (MS) is an autoimmune disease characterized by antibody-mediated demyelination in the central nervous system leading to axonal damage. This condition has many triggers for exacerbation in which perioperative stress and anesthesia are examples.[1]
If an exacerbation event occurs, elective surgery can be postponed until the remission of the symptoms.[2]
However, in urgent conditions this is not possible and surgery must be done with significant anesthetic implications.
Case report: We describe the successful use of general anesthesia in a 60 y/o female patient, diagnosed with MS since 2004, untreated by option, in a relapse. She experienced an urgent eye condition (retinal detachment) requiring immediate surgical approach with no chance to postpone.
After multidisciplinary team discussion, a preoperative evaluation and neurologic examination were done with decreased sensitivity in right tight and decreased strength at left eyelid. Intraoperative neuromuscular monitoring-guided titration of rocuronium was made with ASA standard, with lowest necessary dose. In order to minimize risk factors of exacerbation, special attention to temperature and any other stressors were taken. The patient's ventilation was closely monitored with no residual muscle relaxant postoperatively. Neurologic examination after surgery and day after was similar to the initial assessment.
Discussion: General anaesthesia was successfully achieved. The procedure was uneventful with effective ventilation during the anaesthetic emergency and the postoperative recovery without any registries worthy of note, with the patient being discharged the day after the procedure.
References:
1. Acar A *et* al. Anesthetic Technique in a Patient With Multiple Sclerosis Scheduled for Laparoscopic Nephrectomy for a Renal Tumor: A Case Report. *Anesthesiology and Pain Medicine.* Jan, 2013.
2. Merli G *et* al. Perioperative care of the surgical patient with neurological disease. *UpToDate.* April, 2022.
Learning Points: General anesthesia may be a safe approach for urgent surgical conditions that can't be postponed in patients suffering from relapsing MS. The neurological assessment has a crucial role and the reduction of stressors can minimize the impairment.

01AP08-05
Anaesthetic considerations for chronic traumatic diaphragmatic hernias surgery: a case report

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Background: Traumatic diaphragmatic hernias (TDH) are caused by the migration of abdominal viscera into the thoracic cavity through a solution of diaphragmatic continuity after a traumatic event. TDH are divided into acute or chronic. Chronic can be latent (asymptomatic or with non-specific mild symptoms) or obstructive (incarcerated). Up to 30% of the TDH are diagnosed in the chronic phase. Surgery should be scheduled as soon as possible, in order to avoid incarceration which has a high mortality rate.
Case report: 68-year-old male with chronic left sided TDH after blunt trauma, needing urgent laparoscopic surgery due to incarceration of the gastric body. Prior to induction a nasogastric tube (NGT) was placed. Uneventful rapid sequence induction (RSI) intubation, with a single-lumen endotracheal tube, was performed.
After pneumoperitoneum and reduction of the hernial content, a sudden drop of SpO2 from 98% to 91% was observed. Auscultation stated hipofonesis of the left hemithorax. Oxygenation improved after deflating the pneumoperitoneum and alveolar recruitment maneuvers (ARM).
Two hours after admission to the surgical recovery area, the patient presented again dyspnoea, and a SpO2 92%. A chest X-ray showed pneumothorax. A pleural drainage tube was placed with clinical improvement.
Discussion: Evidence exists in favour of laparoscopic surgery for TDH, despite the higher risk of pneumothorax due to the passage of CO2 into the thoracic space through the hernial whole (1).
Some anaesthetic considerations should be taken into account. The presence of intrathoracic abdominal contents increases the risk of bronchoaspiration during induction, therefore the placement of a NGT prior to RSI is recommended. Cricoid compression or even awake intubation may be useful.
The use of intraoperative PEEP and ARM may help to expand the atelectatic areas and increase the functional residual capacity. Intraoperative pneumothorax is almost a constant; use of low intraabdominal pressure, early detection and immediate placement of a pleural drainage tube may be needed. It may be necessary to interrupt surgery and deflate the pneumoperitoneum.
Reference:
1. Liu Q, Luan L, Zhang G, Li B. Treatment of Chronic Traumatic Diaphragmatic Hernia Based on Laparoscopic Repair: Experiences From 23 Cases. Front Surg. 2021;8:706824.
Learning points: TDH is uncommon and an anaesthetic challenge due to the risk of complications, such as aspiration, pneumothorax or lesion of abdominal viscera.

01AP08-06
The anesthetic challenges of bilateral adrenalectomy in a patient with Cushing's syndrome: a successful case

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Background: Cushing's syndrome is caused by an excessive glucocorticoid level, resulting in several features such as central obesity, supraclavicular fat, hyperglycemia, hypokalemia, hypertension and proximal muscle weakness. Treatment consists in normalizing cortisol levels and its systemic effects. When medical treatment fails, surgical treatment is an option. The anesthesiologist plays a vital role in perioperative management.[1]

Case report: A 48-year-old male with a personal history of adrenocorticotropic hormone-dependent Cushing's syndrome, massive pulmonary embolism with cardiac arrest, antiphospholipid syndrome, asthma and obstructive sleep apnea, was proposed for laparoscopic bilateral adrenalectomy.

Preoperative evaluation revealed central obesity, moon face, extreme fatigability and weakness. Serum electrolytes, blood pressure and glycemic control were all optimized. Intravenous hydrocortisone 100mg was given prior to induction and the surgery was performed under balanced general anesthesia.

Due to a predictable difficult airway, he was intubated using a videolaryngoscope. Intraoperatively, insulin infusion was required, as well as hypokalemia correction. Another dose of hydrocortisone 100mg was administered after 4 hours of surgery. He remained hemodynamically stable. The patient was extubated and admitted to an intermediate care unit. In the first 24 hours, intravenous hydrocortisone 50mg was administered every 6 hours with posterior adjustments by the endocrinologist. He was discharged with endocrinology monitoring.

Discussion: As this patient was not controlled with medical therapy and ectopic causes were excluded, bilateral adrenalectomy was the treatment of choice. In the perioperative period, the anesthesiologist must deal with difficult airway management, hemodynamic disturbances, volume overload, hypokalemia, hyperglycemia, maintaining the blood cortisol level and preventing glucocorticoid deficiency. The features of these patients make them more likely to develop respiratory complications.

Reference:

1. Domi R. Cushing's surgery: Role of the anesthesiologist. Indian J Endocr Metab 2011; 15:322-8.

Learning points: The anesthesiologist should be aware of Cushing's syndrome's high perioperative morbidity and mortality. Perioperative management is a challenge due to clinical features. Although bilateral adrenalectomy is considered a high-risk procedure, it can be performed safely with close multidisciplinary perioperative support.

01AP08-07
Anaesthesia managment of a young woman with tuberous sclerosis for urgent nephrectomy: a case report

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Background: Tuberous sclerosis(TS) is a rare autosomal neurocutaneous disorder, with an incidence of 1:6000 new births(1).

Typical clinical features are mental retardation, epilepsy and adenoma sebaceum, but it can also affect many organs, most commonly the brain, skin, heart, kidneys, and lungs, leading these patients often to the operating room(2).

In this case report we present the anaesthetic management of a young woman with TS and renal angiomyolipomas(AMLs) who was scheduled for urgent nephrectomy.

Case report: A 24-year-old woman(BW 60Kg) with a history of congenital TS, epilepsy, left renal AMLs and anaemia presented in the emergency department with intense abdominal pain and a loss of consciousness episode.

CT scan confirmed the presence of multiple ruptured AMLs of left kidney and retroperitoneal haematoma, leading to the need for urgent left nephrectomy. Preoperative hemodynamic parameters showed a developping shock. Anaesthesia induction achieved with fentanyl, propofol and rocuronium while maintainance included sevoflurane and remifentanil infusion.

For postoperative analgesia morphine (0.1mg/kg) and paracetamol 1g were administered. Due to intraoperative hemodynamic instability, noradrenaline infusion was added. Blood transfusion was guided by ABG samples and ROTEM testing, while cerebral activity was monitored using cerebral oximetry and depth of anaesthesia index. Postoperatively the patient remained hemodynamically stable without additional transfusion needs, neither epileptic episodes.

Discussion: Lack of anaesthetic experience and multi-organ involvement in TS make this case an anaesthesia challenge, necessitating high perioperative awareness. In such cases, meticulous hemodynamic, coagulation and cerebral oxygenation monitoring is of significant value with a view to minimizing perioperative complications.

References:

1. Genetics of Tuberous Sclerosis Updated: Sep 02, 2021 Author: Robert A Schwartz, MD, MPH; Chief Editor: Luis O Rohena, MD, PhD, FAAP, FACMG more.

2. Tuberous Sclerosis Complex: A ReviewStephanie Carapetian Randle PMID: 28414398DOI: 10.3928/19382359-20170320-01

Learning points: Specific/intensive perioperative monitoring under general anaesthesia is the cornerstone for optimizing patients with TS for nephrectomy.

01AP08-09
Anesthetic management for a patient with Eisenmenger syndrome undergoing inguinal Lichtenstein hernioplasty: a case report

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Background: Eisenmenger syndrome (ES) is a rare condition. It is defined as pulmonary hypertension, usually irreversible, with an intracardiac or aortopulmonary communication resulting in a bidirectional or reversed shunt. Patients with ES must have a close monitoring during non-cardiac surgery because of a high vulnerability to hemodynamic instability induced by anesthetics or surgery. The perioperative mortality is high, may reach up to 30%.
Case report: We report the successful management of a 49 year-old male patient with ES with an aortopulmonary communication, NYHA class III, on anti-failure and antiarrhythmic medications, erythrocytosis with an hemoglobin of 20,5 g/dL and an hematocrit of 61,4%, a baseline oxygen saturation of 89%, undergoing an inguinal Lichtenstein hernioplasty under subarachnoid block (bupivacaine 10 mg and sufentanil 2.5 mcg). Blood loss was minimal.
Fluid shifts were not expected, which led only to the usage of non-invasive monitoring and the ASA standard. The patient stayed in the hospital for 48h after the surgery, and was discharged without complications.
Discussion: The prevalence of ES varies from 1-9/1000.000. Patients with ES are clinically cyanotic, frequently with dyspnea on exertion, decreased exercise tolerance, signs and symptoms of congestive heart failure, such as signs of right ventricular overload and failure, peripheral edema, syncope, and eventually alterations in end-organ function.
Different anesthetic techniques including general and regional are employed, being the choice of the best technique controversial. The main anesthetic goal is the avoidance of hypotension by maintaining both the cardiac output and systemic vascular resistance.
Prevention of hypoxia, hypercarbia, acidosis and hypothermia are also crucial. Patients with ES can be challenging to manage by anaesthesiologists, due to inability to adapt to sudden changes in hemodynamics, since their pulmonary vascular bed and cardiac output are fixed.
Learning points: It remains crucial to practice a safe operative and perioperative care of patients, by understanding the pathophysiological changes which occur in the ES. We highlight the use of subarachnoid block as a safe and effective technique in selected surgeries in patients with ES, avoiding general anesthesia.

01AP08-10
Volatile anesthetics and myopathy: friend or foe? A report of two distinct cases

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Background: Patients with myopathies represent anesthetic challenges. In addition to potential multisystemic involvement, susceptibility to malignant hyperthermia (MH) is usually a major concern. Due to the existent heterogeneity, anesthesiologists are often unfamiliar with anesthetic implications (1), generally excluding volatile agents from the anesthetic plan. We present the cases of 2 patients with distinct myopathies, Duchenne Muscular Dystrophy (DMD) and mitochondrial disease, undergoing surgery under different anesthetic techniques.
Case report:
Case 1: A 14 year old male with a history of DMD presented for equinovarus foot correction. He had tetraparesis and mild hypoventilation. Intravenous anesthesia with target-controlled propofol infusion was combined with ultrasound guided popliteal sciatic nerve block.
Case 2: A 20 year old female with a history of mitochondrial myopathy presented for equinovarus foot correction. General anesthesia with sevoflurane was combined with an epidural block.
Discussion: Due to the vast origin of myopathies, there is unfamiliarity with individual anesthetic implications. Firstly, there is a misconception that all myopathic patients are at risk for MH (1).
For this reason, volatile agents are frequently discarded. Secondly, one must differentiate MH from anesthesia induced rhabdomyolysis (AIR), as presentation is similar but management differs (2).
Although there are no reported cases of MH linked to both presented diseases, DMD is at high risk for AIR, whereas mitochondrial myopathies are at risk of negative effects with propofol exposure (1,3). Therefore, although both diseases share myopathy, both warrant different management.
References:
1. European Journal of Anaesthesiology.2017.34(10):641-649
2. Pediatric Anesthesia.2017.27(5):490-493
3. Anesthesia & Analgesia.2016.122(2):579-580
Learning points: In regards to myopathies, an anesthetic “one fits all approach” is not recommended. Certain myopathies are at major risk of rhabdomyolysis, warranting a volatile-free approach, whereas propofol based techniques are not recommended in other myopathies, calling for volatile-based anesthesia.

01AP08-11
Carcinoid tumor, a challenging anaesthetic management

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Background: Carcinoid tumors (CT) are uncommon, slow-growing tumors, capable of secreting numerous bioactive substances. Surgical excision of CT could lead to unpredictable and hazardous physiological changes due to the release of these substances during the procedure. These case report describes a successful perioperative and multidisciplinary management of a patient with a CT.
Case report: Female, 59 years old, ASA III, presented for an elective laparoscopic CT excision, at the terminal ilium, right ovarium and multiple lymph nodes. She presented at the emergency department with manifestations of carcinoid syndrome (CS). All needed exams were done to meet the diagnosis: neuroendocrine tumor positive for Chromogranin A (Crg-A) and synaptophysin. Elevated urinary 5-HIAA and serum Crg-A were present.
Multidisciplinary evaluation (including by an endocrinology expert) were made to plan and prepare the patient to surgery. Cardiac work-up with NT-proBNP measurements and echocardiography excluded carcinoid heart disease. Treatment with long-acting somatostatin analogues was initiated 2 months before surgery. 12h before surgery

an octreotide perfusion was initiated at 100ug/h and maintained during the procedure. A combined general and epidural anaesthesia were performed under invasive blood pressure monitoring. Central venous line was placed. 50ug bolus of octreotide was needed prior to induction due to hypertension and the perfusion changed to 200ug/h. Temperature was monitored and actively controlled.

Hypertension was the main symptom of CS during the procedure and hemodynamic stability was maintained by adjusting octreotide perfusion (to a maximum of 400ug/h) and optimizing epidural analgesia. No other events were registered. The octreotide perfusion were maintained at 100 ug/h during 24h. Post op were at the intensive care unit for 48h and went uneventfully.

Discussion and Learning points: These case shows us what is mandatory for a successful anaesthetic management of patients with CS: good communication between surgeons, anaesthesiologist and endocrinologist; multidisciplinary plan; pre-op optimization of the patient. Although octreotide plays a major role on symptomatic control and acute treatment of CS, the ideal dose is unclear. Further studies into the anaesthetic management of this CS should be encouraged.

References:

1. Continuing Education in Anaesthesia, Critical Care and Pain. 2011 Feb;11(1):9-13.

2. Neuroendoc. 2017 Mar;105(3):245-254.

01AP09-01
Can we improve the performance of the ariscat score which is used to predict postoperative pulmonary complications? A prospective observational study

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Background: Post-operative pulmonary complications (PPC) are common after gastrointestinal surgeries. ARISCAT score is built for predicting PPC risk before surgeries. The aim of our study is to predict PPC's by adding the preoperative serum albumin value and surgery type (laparotomy or laparoscopy) to ARISCAT. With this modified score, we investigated if these can improve the scoring performance.

Materials and methods: In this prospective observational study we included patients whom stayed after gastrointestinal surgery at Istanbul University Cerrahpaşa General Surgery inpatient services, Sadi Sun Intensive Care Unit and Emergency Intensive Care Unit; between 04.2020-04.2021.

Patients under the age of 18, obstetric surgeries and pregnant women, patients underwent transplantation surgery, patients that underwent surgeries performed with local or peripheral nerve anesthesia, procedures performed outside the operating room, secondary surgeries related to the previous surgery, patients reoperated within 90 days of a follow-up and preoperative intubated patients were excluded from the study.

Results and discussion: 283 patients were found eligible for the study. Eight of these patients were excluded from the study because they were reoperated. PPC was detected in 33.8% of 275 who underwent gastrointestinal surgery. A significant and positive correlation was found between the ARISCAT score and PPC before. It has been shown that laparatomy instead of laparoscopy has a relationship with the occurrence of PPC ($p<0.001$).

During the study period, 2 patients died total and they both died after laparatomy. According to our results, relationship between pre-operative low serum albumin values and PPC is statistically significant($p<0.001$).

Conclusion(s): ARISCAT risk scoring system is effective to predict development of PPC in patients who underwent gastrointestinal surgery. There's a strong relationship between PPC and high-risk scored patients.

Our study showed that when we added the pre-operative serum albumin value and the laparoscopic surgery to the ARISCAT, it did not increase the predictivity of the scoring system. However, when examined one by one, they were shown to be effective factors in predicting PPC. By identifying the risk factors that can be corrected, shortening the hospitalization period and reduction of mortality and morbidity can be possible.

Reference:

Canet, Jaume et al. *The Journal of the American Society of Anesthesiologists* 2010;113(6):1338–50.

01AP09-02
Is atelectasis the risk factor of pneumonia?; retrospective analysis of the correlation with postoperative atelectasis and pneumonia

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Background and Goal of Study: Atelectasis may be related to the development of pneumonia; however, the pneumonia has never been evaluated as a primary outcome of atelectasis. We aimed to determine whether atelectasis is associated with an increased risk of postoperative pneumonia, ICU admission and length of hospital stay (LOS).

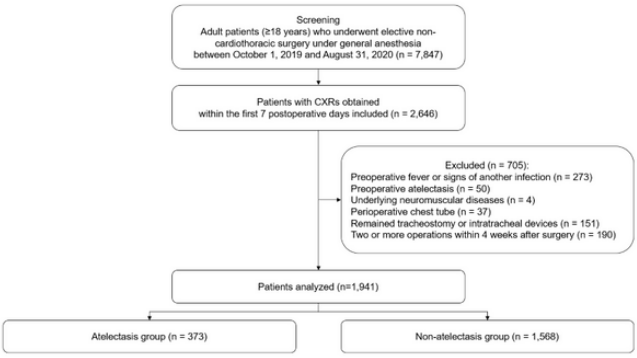
Materials and Methods: The electronic medical records of adult patients who underwent elective non-cardiothoracic surgery under general anesthesia between October 2019 and August 2020 were reviewed. Demographic and clinical variables (age, sex, body mass index, asthma, COPD, hypertension, heart failure, diabetes mellitus, anemia, smoking, serum albumin, ASA-PS class, pre- and postoperative CXRs, type of surgery, duration of anesthesia and type of reversal agents for neuromuscular blockade) were obtained.

Patients were divided into two groups: one with atelectasis within postoperative day 7 (atelectasis group) and the other without (non-atelectasis group).

The primary outcome was pneumonia occurred within the 30 days after the surgery. The secondary outcomes were ICU admission rate and postoperative LOS.

Results and Discussion: Of 1,941 patients, 61 (3.1%) developed postoperative pneumonia, which was significantly higher in the atelectasis group (4.6%) than in the non-atelectasis group (2.8%) (binary logistic regression analysis; OR 1.92 [95% CI, 1.01 – 3.65]; $P = 0.047$). The duration of postoperative LOS was significantly longer in the former group (median 7 [IQR, 5-10] days) than in the latter group (6 [3-8] days) (Unstandardized regression coefficient 1.83

[95% CI, 0.821 – 2.834]; $P = 0.000$). ICU admission rate did not differ between two groups ($P = 0.134$). The patients with postoperative atelectasis had 1.92 times higher risk of developing pneumonia and needed longer hospital stay, compared with those without.



Conclusion(s): To the best of our knowledge, this is the first report to suggest postoperative atelectasis as a risk factor for pneumonia in surgical patients. This finding may alert the need for postoperative management of atelectasis to reduce the adverse events including pneumonia and the burden of hospitalizations.

01AP09-03
Enhanced recovery after surgery (ERAS) program shorten hospital stay and improve survival rate in minimal invasive esophagectomy patients: a retrospective case control 3-year survival analysis

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Background: Enhanced recovery after surgery (ERAS) program is focusing on multi-disciplinary collaboration and has been suggested correlated with reduced complications, shorten hospital stay and better prognosis in colorectal surgeries. However, there were limited evidences regarding benefits of ERAS on esophageal cancer patients.

The aim of this study is to evaluate clinical efficacy and survival analysis of ERAS protocol in esophagectomy patients.

Materials and Methods: We included patients receiving esophagectomy from 2017 to 2022. Patients' characteristics, intraoperative variables and postoperative variables were collected by electronic medical records. Primary outcome were length of stay (LOS) after operation and in ICU. Secondary outcome was 3-year survival.

Results: 132 patients enrolled in the study, 66 in ERAS group and 66 in historical cohort. Demographic data including age, gender, cancer stages, neoadjuvant chemoradiation therapy, comorbidity and surgical approach were comparable between two groups, while control group had lower BMI (p= 0.037) and lower preoperative albumin (p= 0.007).

Intraoperative data including anesthesia duration and vasopressor dosage were similar between groups while ERAS group had milder blood loss and receive lower crystalloid and colloid volume.

Postoperative composite complications and severity were not significant different between groups (ERAS vs. control 33(50%) vs. 35(53%), Clavien-Dindo Grade I/II/IIIa/IIIb/IV 54.6%/42.4%/0%/3%/0% vs. 25.7%/57.1%/2.9%/11.4%/2.9%). ERAS group had significant reduction in mean postoperative LOS by 8.42 days and in mean ICU stay by 2.59 days compared with the control group ($p < 0.001$). In 3-year survival analysis, ERAS group had significant higher survival rate than historical control group (ERAS group: 70.16%; control group: 45.29%, p=0.028).

Fig. 1 revealed that among patients with albumin ≤4, cancer stage I&II, and age <65yrs, the ERAS group had significant higher survival.

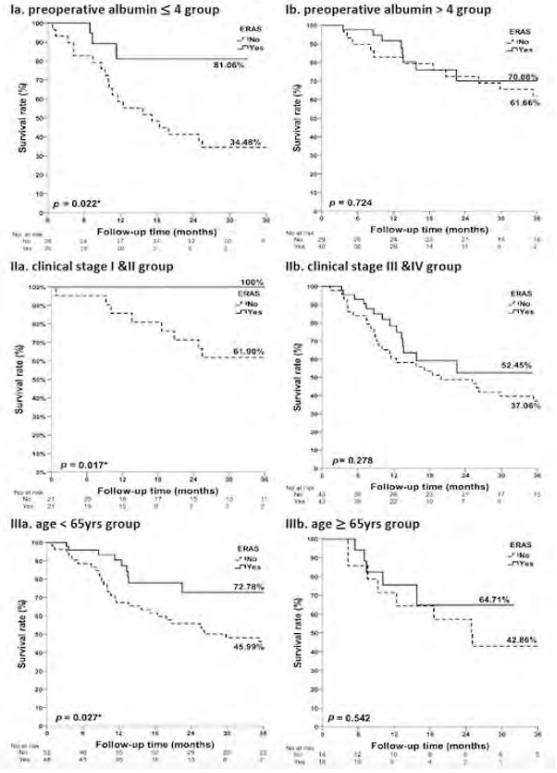

Figure 1. Kaplan-Meier method of survival in the ERAS and no ERAS groups for up to 3 years after receiving esophagectomy. (Ia: preoperative albumin ≤ 4 group, Ib: preoperative albumin > 4 group; IIa: clinical stage I & II group, IIb: clinical stage III & IV group; IIIa: age <65 yrs group, IIIb: age ≥65 yrs group.)

Conclusion: Application of ERAS program in esophageal cancer surgery shorten LOS and improve survival. The beneficial effects remain significant in patients with lower albumin, younger age and early tumor stage.

01AP09-04
Anaesthesia and aphasia in the post anaesthesia care unit

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Background and Goal of Study: In the PACU an uncommunicative patient, is commonly attributed to sedation and rarely considered to be a consequence of specific perturbations in the speech language networks of the brain. A pragmatic assessment was formulated to test PACU patients, the aim being to be able to classify post operative language problems into a particular type of aphasia and thereby determine the neuroanatomic basis for PACU aphasia and its possible relation to return of cognitive functions following anaesthesia.

Materials and Methods: This was a post-hoc secondary analysis of data collected during the alpha max study which included 200 adults aged over 60 years old and scheduled for elective surgery under general anaesthesia expected to last at least 2 hours. These patients were administered the speech language assessment at 30 minutes following arrival in the PACU. Four areas tested by the assessment were Verbal Fluency, Repetition, Naming and Discourse. A subgroup (Validation Group) of 30 participants were followed up after one year to establish a baseline comparator. A within subject comparison was conducted on the Validation Group, compared with the remaining 170 patients. Statistical analyses included t-test (unpaired) for normally distributed continuous data, chi square or Fisher's exact test for categorical data and Wilcoxon Signed Rank Test for non-parametric data.

Results and Discussion: Compared to their one-year follow-up, participants had a significantly lower word output in the PACU, an unimpaired level of comprehension and ability to repeat correctly. Patients could comprehend spoken language but were unable to engage in longer conversations. This pattern is commonly caused by lesions of the pre-frontal region and delayed return of cognitive functions performed by these regions may be responsible.

	Validation Group 1 year Follow up Median, (IQR)	Validation Group PACU Median, (IQR)	Difference (Follow Up− PACU) Median (IQR)	P value Wilcoxon Signed Rank Test
Verbal Fluency (Overall words per minute)	18 (8)	13.5 (8)	6 (7)	**p<0.001**
Naming (number of correct responses out of 4)	4 (0)	4 (0)	0 (0)	p = 0.250
Repetition (number of correct repetitions out of 4)	4 (1)	3.5 (2)	0 (1)	p = 0.011
Discourse Content and Fluency (0-3)	3 (0)	2 (1)		**p<0.001**

Conclusion: This analysis of speech and language following anaesthesia is unique. Individuals appear to present with a form of transcortical motor aphasia following anaesthesia, possibly due to the differential recovery of pathways connected to the pre-frontal cortex. Future work could help localize the pathways and networks involved and confirm the role of sub-cortical structures.

01AP09-05
Association between preoperative functional capacity and postoperative complications in patients undergoing non-cardiac surgery

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Background and Goal of Study: In Europe, 37-40 million operations are conducted annually. About 5% of these patients suffer from major postoperative complications within 30 days. Preoperative risk assessment is crucial to guide perioperative management. In addition, intensive care unit (ICU) capacities to monitor patients with increased risk are limited. Self-reported functional capacity is regularly used to estimate perioperative risk. However, data quantifying the association with postoperative complications are limited.

We hypothesized that reduced preoperative functional capacity is associated with:

1. Postoperative complications, and;
2. Unplanned ICU admissions.

Materials and Methods: This is a secondary analysis of the Clinical Trial Network multicenter cohort study MET-REPAIR (NCT NCT03016936) that enrolled patients with increased cardiovascular risk undergoing non-cardiac surgery between 2017 and 2019 in 150 centers in 26 countries. Main exposure was self-reported preoperative functional capacity defined as a) metabolic equivalents (METS, Cutoff <4) and b) reduced physical activity (= inactivity or less than 20 minutes activities like brisk walking or jogging per week).

The primary endpoints were postoperative complications defined by Clavien-Dindo-classification ≥1 and unplanned ICU admission, respectively. For statistical analysis, multivariate logistic regression models including 12 predefined covariables were performed.

Results and Discussion: Out of 15984 prospectively included patients, 15617 could be included into final analysis (39.5% female, mean age 72±8 years). 2472 (15.5%) patients had preoperative METS<4 and 10601 (66.3%) reported limited regular physical activity.

A postoperative complication occured in 4532 (29%) patients and 492 (3.2%) had an unplanned ICU admission. METS<4 were not associated with postoperative complications or unplanned ICU admission (complications: Odds Ratio (OR): 1.06 [95% Confidence-Interval (KI) 0.96-1.18]; unplanned ICU: OR: 1.12 [95%KI 0.87-1.43]).

There was an independent association between limited physical activity and complications (OR=1.12 [95% CI 1.02-1.20]), but not with unplanned ICU (OR=1.08 [95% CI 0.88-1.32]).

Conclusion(s): Self-reported daily acitivity is independently associated with postoperative complications, but not with unplanned ICU admission after non-cardiac surgery. METS seem not to be suitable for preoperative risk stratification in this context.

01AP09-06
Post-operative pain, recovery, and discharge after robot-assisted radical prostatectomy – a multi-centre, single blinded, randomized controlled trial

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Background and Goal of Study: General anaesthesia (GA) is the standard of care for patients undergoing robot-assisted laparoscopic prostatectomy (RALP). In this study, we sought to determine if GA combined with spinal anaesthesia reduces postoperative pain and side effects following RALP, allowing earlier home readiness compared to GA alone.
Materials and Methods: We randomised 211 patients to general anaesthesia with multimodal analgesia (Group GA) or spinal anaesthesia combined with GA (Group SG). Multimodal analgesia included parecoxib and morphine intraoperatively. Local anaesthesia and paracetamol were given to all patients, and postoperative pain was treated using opiates as needed.
We registered pain intensity, urge to pass urine, dissatisfaction, and complications. Home readiness was registered using standardized international criteria.
Data was analysed using statistical models for continuous and dichotomized data as well as normally and not normally distributed data, as appropriate.
Results and Discussion: 202 patients were analysed. Almost one third of patients (27%) reached home readiness criteria on the day of surgery, without differences between the groups. Pain intensity, postoperative nausea and vomiting and time to home readiness and home discharge were similar between the groups.
The urge to pass urine was greater in GA than in SG ($p < 0.001$) and lasted for a median of 2h. More patients were satisfied with early postoperative care in group SG ($p < 0.001$). Two patients (1%) were re-operated due to postoperative bleeding, no other major adverse events were recorded.
Conclusion(s): Spinal anaesthesia in addition to general anaesthesia did not lead to earlier home readiness, but it did decrease discomfort and bladder spasm in the early post-operative period, in comparison to multimodal pain management.
Therefore, spinal anaesthesia may be a suitable alternative to multimodal pain management in patients undergoing RALP. Although major complications were rare, fewer than one-third of patients were ready for home discharge the same evening, suggesting that RALP may only be appropriate as a day surgical procedure in a selected group of patients.
Further studies are needed to better identify which patients may not be suitable for same day discharge.

01AP09-07
Making handover safer by making it C.O.L.D.

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Background & Goal of Study: Handover involves the transfer of professional responsibility & accountability for care. It occurs frequently between Anaesthetist & nurse in postoperative recovery units when patients are clinically at high risk. Miscommunication is one of the leading causes for adverse events resulting in serious adverse events.[1] Given the importance of recovery handovers it was decided to examine & improve current practice at University Hospital Crosshouse (UHC).
Materials & Methods: Our methods were two-fold. A questionnaire was distributed amongst the anaesthetic & nursing teams exploring multidisciplinary views on handover performance with identification of key priorities.
Additionally, observational data was collected during prospective scrutiny of real world recovery handovers in our unit.
Results & Discussion: There were 41 questionnaire respondents & 11 real handovers observed. Large variation in handover practice was identified highlighting a lack of structure (54%) & deficiencies in establishing monitoring prior to information transfer (50%). There was clear consensus on the information which should be communicated. During handover observation none of the handovers had an obvious structure & 3 took place prior to the transfer of monitoring being completed.
Conclusion(s): Our results show the need for implementing a structured approach to recovery handover. We frequently observed handover occurring when receiving staff were not ready or task focused in establishing patient monitoring & unable to devote full attention to information transfer. Previous work by Redley et al created COLD: Connect, Observe, Listen, Delegate.[2]
This was adapted to UHC changing to Connect, Observe, Listen, Discuss & has now been introduced. COLD empowers a structured approach & includes the introduction of a clear “Pause” for safety. Now staff routinely complete tasks and only then pause for handover of information allowing for full concentration. On reassessment ongoing compliance was proven to be high illustrating a sustained improvement in communication & safety.
References:
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01AP09-08
Limited effect of Sugammadex on postoperative respiratory complications after spine surgery in the prone position; preliminary retrospective data analysis

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Background and Goal of Study: Postoperative pulmonary complications (PPCs) increase postoperative mortality, hospital stays, and healthcare costs. Recent studies have emerged that the use of sugammadex for complete reversal of neuromuscular blockade can reduce PPCs, but these are still controversial. Spine surgeries often take long and are often performed in elderly patients, thus increasing the risk of PPCs.

We aimed to find out if the use of sugammadex could more effectively reduce PPCs than pyridostigmine (AChEi) in patients who had undergone spine surgery, especially in prone position intraoperatively.

Materials and Methods: From March 2019 to February 2021, adult patients who underwent elective spine surgery at the Department of Neurosurgery, Korea University Anam Hospital were eligible. PPCs, especially pneumonia and respiratory failure (RF) that occurred within 28 days after surgery were the primary outcomes. As this is a preliminary study, secondary outcomes have not yet been analyzed.

The patients were divided into two groups (Sugammadex group and AChEi group), and the incidence of PPCs was compared. A separate multivariable logistic regression model was used to exclude the effects of other covariates and confirm the effect of the type of reversal agent on the outcome.

Results and Discussion: Among 447 cases, 112 patients are Sugammadex group and 335 patients are AChEi group.

When analyzed by chi-squared test, the use of sugammadex did not reduce PPCs, pneumonia, or RF in patients who underwent spine surgery (P = 0.656, 0.344, and 0.461, respectively). Even in the results of regression analysis, the use of sugammadex did not reduce PPCs (P = 0.504). Regression analysis was performed for 402 patients in the prone position, but the use of sugammadex did not reduce PPCs, pneumonia, or RF (P = 0.804, 0.995, and 0.326, respectively).

Only prone position, total spine surgery	PPCs/No PPCs	Pneumonia/No Pneumonia	RF/No RF
Sugammadex group (106, 112)	15/91, 16/96	0/106, 0/112	1/105, 1/111
AChEi group (296, 335)	50/246, 55/280	6/290, 6/329	7/289, 8/327

Conclusion(s): Although there are evidences that the use of sugammadex can attenuate the development of PPCs, this study did not show positive effects of sugammadex on patients with spine surgery. In particular, even when only patients in prone position were targeted, incidence of PPCs did not differ between two groups. Since there are deficiencies in this preliminary results, secondary outcomes will be added in the future.

01AP09-10
Impact of confinement of COVID-19 pandemic on survival in patients with intra- abdominal infections

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Background and Goal of Study: The first case of SARS-CoV-2, the coronavirus which causes coronavirus disease better known as (COVID-19), was detected in Spain on January 31st 2020. A state of confinement was declared in Spain starting on March14th and finishing June 21st 2020 in a bid to control the spread of the COVID-19 pandemic in the country.

The aim of our study is to analyze the impact of this confinement on intra-abdominal infections (IAI) mortality rates after the national lockdown

Materials and Methods: Two retrospective observational cohorts of the patients with IAI were conducted in 2019 (the pre-COVID-19, n = 150) and in 2020 (during the COVID-19, n = 88) included all abdominal emergency surgeries (defined as those not planned within the previous 24h) at the Hospital del Mar Barcelona, Spain. The demographic and clinical variables of the patients were collected and analyzed. The patients were followed-up, until the hospital discharge or death.

The chi-squared test were used for the qualitative variables and the quantitative variables were analyzed by using the Student's t-test, a P value less than 0.05 was considered statistically significant.

Results and Discussion: A total of 88 patients required surgical intervention during the confinement period, 41.3% less than during the same period in 2019.

Both the cohorts were homogeneous according to age, sex, ASA, and emergency surgery cause. The patients attended during the COVID-19 had significantly higher Mannheim score (16, 78% vs 12, 71%) respectively ($p < 0.001$).

The death rates during the COVID-19 and the pre-COVID-19 were higher 5.7% and 0.7%, respectively ($p < 0.017$).

Conclusion(s): This study showed the impact of the COVID-19 pandemic on the clinical outcome and death due to IAI associated with a higher Mannheim score, probably they were diagnosed later; the time intervals between the symptoms onset to the surgical intervention were significantly higher.

The reduced incidence of emergency surgical interventions could be explained by the social context that surrounded that time period.

Reference:

1. Perea del Pozo E, Aparicio-Sánchez D, Hinojosa Ramírez F, Pareja Ciuró F, Durán Muñoz-Cruzado V, Sánchez Arteaga A, et al. A prospective cohort study of the impact of covid19 world pandemic on the management of emergency surgical pathology. Br J Surg. 2020; 107(11):e463-4.

01AP09-11
Design and implementation of an enhanced recovery after surgery protocol in scoliosis patients undergoing corrective surgery: a retrospective, comparative study

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Background and Goal of Study: Enhanced recovery after surgery (ERAS) is now getting popularized in many surgical subspecialties. Corrective surgeries for scoliosis are complex and are challenging for the anesthesiologist and the orthopedic surgeon. We hypothesized that these patients would benefit immensely from ERAS that aims at minimizing the surgical stress response.

We devised a protocol and studied the changes in outcome after its implementation in a tertiary care center situated in a developing country.

Materials and Methods: This was a retrospective analysis of prospectively collected data from a single institutional database. After attaining approval from the institute's ethics committee, we recruited 150 patients who underwent corrective surgeries for scoliosis. ERAS protocol was formulated and implemented in scoliosis surgeries in our hospital from 2019. This divided our patient group into a 'pre-ERAS' category between July 2016 to December 2018 and a 'post-ERAS' category between January 2019 to March 2022.

The outcome measures for comparison were length of hospital stay (LOS), postoperative complications, Intensive Care Unit (ICU) stay, post operative mechanical ventilation and patient-reported outcome measures (visual analogue scale [VAS] and Oswestry Disability Index [ODI] score) at stipulated time intervals.

Statistical analysis was done using SPSS software, categorical variables were compared using Pearson's chi square test and continuous variables were compared using two sample t tests.

Results and Discussion: A total of 150 patients were included—with 71 patients in the pre-ERAS group and 79 patients in the post-ERAS group. There was no significant difference with respect to age, sex distribution, body mass index, comorbidities, distribution of diagnosis, type of surgical approach, average number of levels fused, or estimated blood loss. 45% of patients in pre-ERAS group suffered from perioperative complications while only 31% in the post ERAS group had any.

Days to ambulation and the ODI scores measured 1 month after the surgery were also significantly lower in the post-ERAS group. ICU admission, post operative mechanical ventilation, and readmission rate were lower in the post ERAS group, but not significantly. The LOS was comparable between the two groups.

Conclusion(s): ERAS protocol implementation is feasible in scoliosis surgeries and results in reduction in complication rates and better recovery.

01AP10-01
The effects of remimazolam versus dexmedetomidine on recovery after transcatheter aortic valve replacement under monitored anesthesia care: a propensity score-matched analysis

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Background and Goal of Study: A recent trend of minimalist transcatheter aortic valve replacement (TAVR) under monitored anesthesia care (MAC) emphasizes early recovery and faster discharge from the hospital. Remimazolam besylate is a newer benzodiazepine with a shorter recovery time, thus the authors hypothesized that remimazolam is non-inferior to dexmedetomidine in terms of recovery after TAVR.

Materials and Methods: In this retrospective observational study, remimazolam versus dexmedetomidine was compared in patients who underwent TAVR under MAC at a tertiary academic hospital between July 2020 and July 2022.

The primary outcome was timely recovery after TAVR, defined as discharge from the intensive care unit within the first day following the procedure.

Results and Discussion: The study included 464 patients, of whom 218 received remimazolam and 246 received dexmedetomidine. After propensity matching, 164 patients were included in each group. In terms of timely recovery after TAVR, remimazolam was non-inferior to the dexmedetomidine (152 of 164 [92.7%] in the remimazolam group versus 153 of 164 [93.3%] in the dexmedetomidine group, risk difference [95% confidence interval]; -0.6% [-6.7% to 5.5%]).

The use of remimazolam was associated with fewer postoperative vasopressors/inotropes (21 of 164 [12.8%] vs. 39 of 164 [23.8%], p=0.01) and temporary pacemakers (76 of 164 [46.3%] vs. 108 of 164 [65.9%], p<0.001) than dexmedetomidine.

	Before matching		After matching			
	Remimazolam (n=218)	Dexmedetomidine (n=246)	Remimazolam (n=164)	Dexmedetomidine (n=164)	**Risk difference** [95% CI]	**P-value**
Primary outcome						
Timely recovery	200 (91.7)	225 (91.5)	152 (92.7)	153 (93.3)	-0.6 [-6.7 to 5.5]	**1.00**
Secondary outcomes						
Length of ICU stay (hr)	25.5 [23 to 27]	26 [24 to 28]	25.5 [23 to 27]	26 [25 to 28]		0.02
Time to be fully awake (hr)	2 [0 to 4]	3 [2 to 6]	2 [0 to 4]	3 [2 to 5]		0.01
Oxygen supplement time (hr)	5 [4 to 6]	5 [4 to 6]	5 [4 to 6]	6 [5 to 6]		0.52
Intubation	1 (0.5)	2 (0.8)	1 (0.6)	2 (1.2)	-0.6 [-3.3 to 2.1]	1.00
Vasopressor/ inotropes	27 (12.4)	64 (26.0)	21 (12.8)	39 (23.8)	-11.0 [-19.9 to -2.1]	**0.02**
Delirium	38 (17.4)	43 (17.6)	30 (18.3)	31 (18.9)	-0.6 [-9.6 to 8.4]	1.00
Temporary pacemaker insertion	100 (45.9)	155 (63.0)	76 (46.3)	108 (65.9)	-19.5 [-30.1 to -8.9]	**<0.001**

Table. Primary and secondary outcomes

Conclusion(s): In patients undergoing TAVR under MAC, remimazolam was non-inferior to dexmedetomidine in terms of timely recovery. Additionally, remimazolam may be associated with a better recovery profile in some aspects, such as the postoperative requirement for vasopressors/inotropes and the use of temporary pacemakers.

01AP10-02
Impact of drug nebulisation inside the abdomen on peritoneal CO2 absorption during laparoscopy. A randomised controlled trial in pigs

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Background and Goal of Study: CO_2 absorption during pneumoperitoneum (PP) starts within 30 minutes when intra-abdominal pressure (IAP) is more than 8 mmHg (1) and peritoneal inflammation is insufficiently blocked. Lidocaine (L) and Dexmedetomidine (D) are effective in reducing CO_2 absorption (2) when given intravenously, but is a dose given by nebulisation at the start of PP more protective?
Materials and Methods: L 6 mg/kg, D 3 mcg/kg or SoluMedrol (S) 2 mg/kg were at random nebulised in each time 4 pigs and compared with 4 pigs that got saline nebulisation and 4 pigs that got intravenous L (Liv) in the same dose. The Aerogen nebulisation device was adapted for intra-abdominal use. An electrostatic precipitator (Ultravision from Alesi Surgical) charges the water droplets to give a better spreading and penetration via electrostatic attraction to the peritoneum. (3) A metabolic computer (GE Healthcare) measures the amount of exhaled CO_2 and consumed O_2 to calculate the Respiratory Quotient (RQ). This allows to calculate the amount of CO_2 absorption assuming no change in RQ since the start of PP.
Results and Discussion: 20 pigs after ethical committee approval were investigated under general anesthesia with small minute volume ventilation adaptations at minimum 10 minutes before taking a RQ measurement to keep end tidal CO2 around 40. A constant neuromuscular block and a PP of 15 mmHg during 120 minutes was given.
CO_2 absorption in ml/min after 120 min PP: Control group 98 +/- 46; S 83 +/- 35; Liv 57 +/-65; L 35 +/-52 and D 33 +/- 67. Kruskal-Wallis p=0,083. When combining the nebulised drugs D and L and comparing it to Liv and the control or S, a significant difference was found in favor of nebulisation with the Kruskal-Wallis test p=0,022.
S being a much larger molecule had no effect when nebulised. The high dose of D and L was equally effective and L was more effective when nebulized. It remains to be investigated if the side effects will be less compared to iv applications and thus a larger patient population is now needed to verify the effects.
Conclusion: Nebulisation of L or D is effective in protecting the peritoneum against CO_2 absorption during PP of 2 hours.
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Acknowledgements: Thanks to Patrick Martens and to Eva Vanderstraeten, Kevin Bauwens from ORSI in assisting the experiments.

01AP10-03
Does intravenous injection of ramosetron affect the hemodynamic changes during anesthesia induction by total intravenous anesthesia with propofol and remifentanil? - A randomized controlled trial

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Background and Goal of Study: Serotonin (5-hydroxytryptamine; 5-HT) induces the triphasic blood pressure response consisting of early short-term hypotension due to bradycardia, a middle pressor phase, and longer-lasting hypotension. Considering the triphasic effect on blood pressure of 5-HT, the 5-HT3 antagonist, ramosetron, may skip the phase of early short-term hypotension, enhance a middle pressor phase, and result in the prevention of significant hypotension.
We investigated whether ramosetron could affect the hemodynamic changes during anesthesia induction (AI) under total intravenous anesthesia with propofol and remifentanil.
Materials and Methods: After obtaining IRB approval and the patient's informed consent, 67 patients aged 20 to 70 years with an ASA PS of I-III were randomly assigned to three groups receiving normal saline (groupC, n=21), ramosetron 0.3 mg (group R3, n=23) or ramosetron 0.6 mg (group R6, n=23) once 5 minutes before the start of AI. AI was initiated with a bolus dose of propofol 1 mg/kg followed by 6 mg/kg/h and Remifentanil 60 μg/kg/h, which were infused until endotracheal intubation (EI).
The primary outcome was the changes in hemodynamic values between baseline and before EI. We recorded hemodynamics [systolic arterial pressure (SAP), diastolic arterial pressure (DAP), mean arterial pressure (MAP), and heart rate), and calculated their changes between baseline and each time point.
We analyzed data using the one-way analysis of variance (ANOVA) and repeated measures ANOVA, appropriately. p values < 0.05 were considered statistically significant.
Results and Discussion: No significant differences in SAP (p=0.080), DAP (p=0.335), MAP (p=0.160), and heart rate (p=0.530) were observed among the groups. The differences in hemodynamics value from baseline were lesser in group R6 than in groups C and R3 during AI, and they showed more positive changes in group R6 than in groups C and R3 after EI (without significant differences).
In subgroup analysis, the antihypertensive drug being taken has been shown to offset the effect of ramosetron 6 mg (group R6) on hemodynamic changes occurring during AI and after EI.
Conclusion(s): Ramosetron in the clinical dose range has no significant effect on hemodynamic changes after AI and EI. A high dose of ramosetron can be expected to reduce the degree of blood pressure drop that occurs during AI, but this effect can be offset in patients taking antihypertensive drugs.

01AP10-04
Pharmacodynamic relationship of dobutamine and dynamic hemodynamic variables during pancreaticoduodenectomy: preliminary results

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Background and Goal of Study: The inodilator dobutamine (DOBU) is used to improve cardiac function. Augmentation of cardiac index (CI) is provided by enhanced left ventricular contractility however in some patients, the dominant mechanism to increase CI, is an increased heart rate (HR)[1].
The aim of the study was to evaluate the effect of DOBU on dynamic haemodynamic variables at two different dosages.
Materials and Methods: After written informed consent, patients scheduled for pancreaticoduodenectomy were included. All patients received standardized anaesthesia case, using target-controlled anaesthesia with propofol (Schnider) and remifentanil (Minto). PulsioflexTM was used to measure and guide haemodynamic data. After baseline measurements (T1), DOBU was started at 2 mcg.kg^{-1}.min^{-1} (T2) and increased to 5 mcg.kg^{-1}.min^{-1} (T3). A minimum of 10 minutes stabilization period was before each measurement. At these designated time-points, haemodynamic variables such as mean arterial blood pressure (MAP), CI, HR, dP/dtmax, central venous pressure and systemic vascular resistance (SVRI) were measured. Stroke volume indexed (SVI) was calculated post-hoc. These variables were related to different dosages of DOBU, and linear mixed modelling was used for statistical analysis.
Results and Discussion: A total of 16 patients were included. DOBU dose-dependently significantly increased CI, dP/dtmax and HR ($p < 0.05$). The net effect on CI was minimal between T2 and T3 but SVRI and SVI decreased at higher dosage of DOBU ($p < 0.05$).

	T1	T2	T3
MAP (mmHg)	73 (11)	78 (10)	73 (9)
CI (L.min^{-1}m^{-2})	3.0 (0.5)	3.4 (0.5)#	3.5 (0.6)#
HR (bpm)	79 (8)	95 (12) #	117 (16) # *
dP/dtmax (mmHg.sec)	1178 (191)	1609 (281) #	1969 (328) # *
CVP (mmHg)	8 (3)	8 (2)	8 (2)
SVRI (dyn.sec.cm^{-5}.m^{-2})	1754 (382)	1671 (312) #	1527 (272) # *
SVI (ml.m^{-2})	38 (5)	36 (6)	31 (7) # *

statistical difference versus T1 ($p < 0.05$)
* statistical difference versus T2 ($p < 0.05$)

Table 1: data are mean (SD)

Conclusion(s): DOBU increased both contractility and heart rate. At higher dose however, the effects on MAP and CI seemed counterbalanced by the decrease in SVRI.
Reference:
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01AP10-05
Electromyographic signals of Bispectral Index™ (BIS™) Monitoring System predicts Train of Four in neuromuscular monitoring well during emergence of general anesthesia

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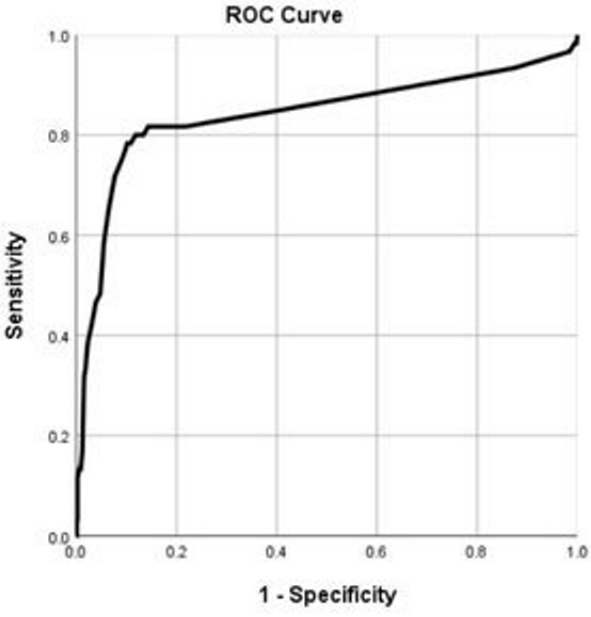
Background and Goal of Study: Bispectral Index (BIS) has gained popularity in anesthetic practice for monitoring consciousness, yet electromyography activity recorded in BIS monitoring (BIS-EMG) was rarely studied for clinical implication. The aim of this prospective and observational study was to explore the connection between BIS-EMG and routine neuromuscular monitoring in patients under general anesthesia.
Materials and Methods: Patients scheduled for video-assisted thoracoscopic surgeries were recruited. 1 mg/kg of rocuronium was administrated during induction of anesthesia and maintained based on neuromuscular monitoring parameters. 2 mg/kg of sugammadex was given to reverse neuromuscular blockade at the end of the surgery. BIS, BIS-EMG values and neuromuscular monitoring parameters including train-of-four (TOF) ratio, TOF count and post-tetanic count (PTC) were collected from the induction of anesthesia to extubation of endotracheal tube. Patient characteristics were also recorded and analyzed. Multivariate logistic regression analysis was conducted to examine to the relation between patient characteristics, BIS-EMG and neuromuscular parameters. To prevent overfitting, 75 percent of dataset was assigned as the training set and the remaining 25% was used as the test set. Area under ROC curve was measured to evaluate the performance of the model.
Results and Discussion: A total of 36 patients were enrolled and 4840 set of data were recorded. BIS-EMG was significant elevated when TOF ratio was above 0.9. (odds ratio=1.137, p=0.000) Area under ROC curve was 0.801. Neuromuscular monitoring parameters were independent of patients' gender, age, weight and total rocuronium dose.



Conclusion(s): BIS-EMG may assist in evaluating the timing of extubation and excluding clinically significant residual neuromuscular blockade.

01AP10-06
Haemodynamic stability of remimazolam versus propofol in anaesthetic management of unruptured-aneurysm coil embolization using LMA

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Background and Goal of Study: Anaesthesiologists are responsible for maintaining a tight haemodynamic stability during induction and endovascular treatment of intracranial unruptured-aneurysm patients. Previous studies reported that remimazolam exhibited fewer hypotensive events than propofol. The aim of the present study was comparing the safety profile of remimazolam to propofol using LMA for the unruptured intracranial aneurysm patients, based on an analysis of haemodynamic stability.
Materials and Methods: The study protocol was approved by the Institutional Review Board and a written informed consent were obtained to all patients. Using computer-generated random numbers, total of 22 patients were randomly allocated to remimazolam group (n = 11) or propofol group (n = 11). Both groups were co-administered with remifentanil target-controlled infusion at effect site concentration of 2.5 ng/ml. The bolus induction dose of remimazolam and propofol was 0.25 mg/kg and 2 mg/kg, respectively. Remimazolam was maintained by 1-2 mg/kg/h and propofol was maintained by 5-10 mg/kg/h in each group.
The blood pressure, heart rate, peripheral oxygen saturation (SpO_2) and anaesthetic depth monitor for sedation index (ADMS) data were collected at ten measurement points: before anaesthesia induction (T_0), after loss of consciousness (T_1), immediately after LMA insertion (T_2), 5 min after LMA insertion (T_3), 10 min after LMA insertion (T_4), skin puncture time (T_5), during arteriography (T_6), during intravascular coil insertion (T_7), at the completion of remimazolam or propofol infusion (T_8) and after LMA removal (T_9).
The primary outcome was the difference between maximum systolic arterial blood pressure and minimum systolic arterial blood pressure (=SBP) during anaesthetic induction and LMA insertion time. Hypotension (mean arterial pressure < 65 mmHg) incidence throughout the study period were also assessed.
Results and Discussion: ΔSBP was significantly lower in the remimazolam group than in the propofol group, 27.9 ± 17.1 mmHg and 43.7 ± 12.7 mmHg, respectively (p=0.035). Hypotension incidence in the remimazolam group was 5 (45%), and in the propofol group was 8 (73%). Heartrate, SpO_2 and ADMS value throughout the study period did not shown significant difference between the two groups.
Conclusion(s): General anaesthesia with remimazolam using LMA ensured more haemodynamic stability than propofol for coil embolization of intracranial unruptured-aneurysm patients.

01AP10-07
What could be the ideal anesthetic in mechanical circulatory support patient for non-cardiac surgery?

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Background and Goal of Study: Treatment of cardiac failure with Mechanical Circulatory Assist Devices (MCAD) has increased in the last years, and therefore it is becoming more common to find a patient with a MCAD in elective non-cardiac surgery. There are no reports in literature that mention which anesthetic drug would be the most appropriate for maintenance in these patients.
The objective of our research was to compare two anesthetics, propofol and desflurane, through the study of organ blood flow in a porcine model of MCAD in total assistance (providing 100% of the specimen's cardiac output).
Materials and Methods: Once the study was approved by the Ethic Committee on Animal Investigation (CEEA), a total of 16 *minipigs* were spread in two groups, 8 animals each, according to the anesthetic applied (desflurane vs. propofol) during the general anesthesia maintenance. A continuous flow pump was placed to assist the left ventricle in total assistance.
Afterwards, the *colored microspheres method* was implemented to measure blood flow in different tissues at two moments of the study: before assistance start and 30 minutes after total assistance. At the end of the experiment the animal was sacrificed, and the organs were biopsied. Statistical analysis was performed using the independent samples t-test. Statistical significance: $p<0.05$.
Results and Discussion: A statistically significant increase in cerebral, cardiac, hepatic, renal, pulmonary and intestinal blood flow was found after 30 minutes of total assistance in the desflurane group compared to the propofol group.
Conclusion(s): Desflurane could be the most appropriate option to apply on anesthetic procedures for patients with a mechanical circulatory assist device that provides total assistance to the left ventricle.
Acknowledgements: This study was financed by a grant from FIS 17/01319 and FEDER Funding.

01AP10-08
Differences between visually inspected and processed burst suppression detection in the SEDLine monitor

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Background and Goal of Study: Burst suppression (BS) has been implicated as a risk factor for perioperative neurocognitive disorders in older adults; thus, correctly identifying these episodes may influence the decisions about the intraoperative anesthetics that the patient receives. Anesthesiologists using commercially available monitors rely on processed burst suppression algorithms to make intraoperative decisions regarding anesthesia.
In this study, we seek to understand if there are differences between visually inspected and processed burst suppression identification and duration.
Materials and Methods: We evaluated the processed and raw EEG Sedline data from a cohort of 233 patients that underwent spine surgery at the University of California San Francisco (UCSF IRB 18-26716). In 134 patients BS could be visually identified. Those with BS underwent additional analysis by visual inspection of the raw data by two independent researchers. For analysis of the processed BS, we defined different BSR thresholds.
Results and Discussion: The median duration of visually identified BS was 16min [7 to 28] minutes (25th and 75th percentile). Up to a BSR=10, the processed BS duration was significantly longer than for the visually inspected. Figure 1A presents the durations for the different thresholds and the visual approach. Figure 1B highlights the agreements/discrepancies between visual and processed BS detection. The discrepancies of longer BS episodes in the processed detection for low threshold may be found in the long analytical windows used for BS detection that will lead to positive BSR even after BS goes away.
Conclusion(s): At lower BSR values, there is an overestimation of burst suppression duration, and at higher BSR values, there is an underestimation of BS duration. BSR can provide information about possible BS, but the overestimation and underestimation point to the importance of incorporating visual analysis of the EEG for the interpretation of BS.

01AP10-09
Association of alpha frequency of the frontal intraoperative EEG and postoperative delirium: a retrospective propensity-matched analysis

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Background and Goal of Study: Postoperative delirium (POD) is a serious complication often resulting in negative postoperative outcomes. It has been proposed that decreasing the amount of anaesthetics intraoperatively by titrating to an EEG index will lower delirium incidence, but clear evidence is missing. Strong anti-correlation has been reported between alpha frequency and end-tidal anaesthetic concentration[1], but it is unknown if slower alpha oscillations are associated with subsequent POD.
As RCTs on POD using spectral EEG are lacking, we planned to investigate the association of frontal alpha frequency and POD in this retrospective analysis.
Materials and Methods: Ethical approval was granted by the Bernese Ethics committee. Frontal EEG was recorded using a Narcotrend monitor. Peak alpha frequency was measured at highest power between 7 to 17 Hz. Delirium was assessed by chart review. Demographic and clinical characteristics were compared between POD and non-POD groups using Pearson chi-square test for categorical variables. Selection bias was addressed using a 5:1 nearest neighbour propensity score matching (PSM) for best balance.
The PS for each individual was defined as the probability of suffering from POD given the patient's baseline characteristics and comorbidities. This incorporated 18 variables (Figure 1). Patients with missing variable information or without an alpha oscillation were excluded.

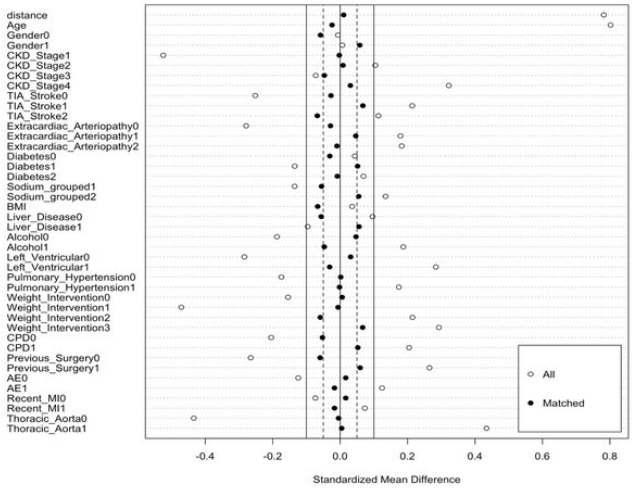

Figure 1.

Results and Discussion: Of the 1072 patients in the original study, 828 were included - 73 with POD, 755 without. PSM allowed 328 patients into the final analysis, 67 with, 261 without POD. Before PSM, 8 variables were significantly different between POD and non-POD groups, none thereafter (Figure 1).

Mean alpha frequency was significantly lower in the POD in contrast to non-POD group before and after matching (7.9 vs 8.9 Hz, 7.9 vs 8.8 Hz respectively, SD 1.3 respectively, $p < 0.001$).

Conclusion(s): A slower frontal alpha frequency is independently associated with POD and may be a simple intraoperative pathophysiological marker of a vulnerable brain with decreased cognitive capacity.

Reference:

1. Hight et al. (2017), Frontiers in Systems Neuroscience

01AP10-10
Nitrous oxide use in GGC: a snapshot audit and survey of opinions

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Background and Goal of Study: The environmental impact of nitrous oxide (N_2O) has been highlighted in an attempt to decelerate global warming. Anaesthetic gases account for 2% of NHS emissions with a calculated reduction of one third of emissions by eliminating N_2O.[1] There was an estimated 5.7 million litres of N_2O delivered to the Greater Glasgow and Clyde trust (GGC) trust over 3 years. In a bid to reduce wastage of N_2O, we conducted an audit to determine N_2O use in the general theatre suite.

Materials and Methods: Anaesthetists working in GGC were surveyed on their use of N_2O in daily practice. Anaesthetic machines within GGC trust were interrogated to determine N_2O used in litres.

Results and Discussion: 49 respondents to the survey. N2O was used for the following: 23/49 inhalation induction, 16/49 additional analgesia and 11/49 to reduce required concentration of volatiles. 48/49 were aware of environmental impacts of N_2O. 34/49 anaesthetic practices would not be affected by removal. 20/49 favoured having cylinders on request to decrease wastage.

Extrapolated data for N_2O use during 477 cases on anaesthetic machines reviewed in anaesthetic rooms and theatres. 454/477 consumed 0 Litres (L) of N_2O. 15/477 consumed 0.01-1L of N_2O. 1/477 consumed 1.1-10L of N2O. 6/477 consumed 11-100L of N_2O. 1/477 consumed over 100L of N_2O.

Conclusion(s): Chakera et al estimate that most of the N_2O emissions across NHS Scotland health boards is due to system loss.[2] The majority of anaesthetists surveyed don't use N_2O in their daily practice and a significant proportion favoured having cylinders on request to reduced wastage. Audit of N_2O use supports this sentiment, with the majority of cases using no N_2O. 3% of cases had less than 1L use which may be attributed to system loss, supports the argument for making N_2O available on demand in certain clinical areas.

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2. Chakera A, Storrar I, Roberts S. 2022. Anaesthetic nitrous oxide system loss mitigation and management Technical update (v1.0). NHS Scotland Assure. https://www.sehd.scot.nhs.uk/publications/anaesthetic-nitrous-oxide-system-loss.pdf

01AP10-11
Real life analysis of intraoperative ventilation with regard to dynamic parameters of fluid responsiveness

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Background and Goal of Study: Pulse pressure variation (PPV) is commonly used to predict fluid responsiveness. Reliably assessing fluid responsiveness with PPV with accepted cut off values deserves the presence of sinus rhythm (SR) while being mechanically ventilated with a tidal volume (VT) > 8 ml/kg ideal bodyweight as essential requirements. In contrast, standard lung-protective ventilation strategies favor VTs of 6-8 ml/kg.

This study aimed to evaluate how often ventilation criteria for PPV are met for patients undergoing non-cardiac surgery with a particular focus on abdominal surgery, where assessment of volume responsiveness is most likely needed.

Materials and Methods: Retrospective Data of 10,845 patients were collected pseudonymously from three large tertiary care centers in Germany and Switzerland between January and December 2018 using electronical patient records.

Exclusion criteria were cardiac surgery, a duration < 120 minutes and an endtidal CO_2 < 3.44 kPa. Along with ventilation data, demographic, medical and surgical data were analyzed. Statistical analysis was performed using IBM SPSS.

Results and Discussion: Of 3,398 included patients, 46.4% were classified as female and 53.6% as male. Mean age was 59.8 years. Most patients were of normal weight or preadipose (34.1% and 33.3% respectively). The majority was categorized as ASA status II and III (44.0% and 42.1% respectively). 88% of patients were ventilated based on a PEEP of 5-10 mbar.

Overall, 6.3% of patients qualified for PPV as they were ventilated with a VT > 8 ml/kg. In 75% lower VTs of 6-8 ml/kg and in 18.6% VTs < 6 ml/kg were used. Considering patients undergoing abdominal surgery (75.5% of analyzed cases), in 5.5% a VT > 8 ml/kg was used, which was not different between laparoscopic (45.9%) and open (55.1%) approach.

Reasons for using lower tidal volumes – e.g. a lung-protective ventilation strategy – remain unclear. Cardiac rhythm was documented in 25% of cases, 93.1% of those were SR.

Conclusion(s): Data suggest that only few patients meet the currently requested VT for assessment of fluid responsiveness during surgery. Either punctual adjustments of ventilator settings or further development of PPV under lower tidal volumes to reliably guide fluid therapy during surgery is needed.

01AP10-12
Time-course analyses of mechanical power variations during robotic-assisted laparoscopic prostatectomy

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Background and Goal of Study: Our primary target was to evaluate the effects of Trendelenburg position and pneumoperitoneum during Robotic-Assisted Laparoscopic Prostatectomy (RALP) on Mechanical Power and its determinants during the different surgical phases.
Materials and Methods: This is a prospective observational study performed on 58 anesthetized and paralyzed patients during RALP; patients were ventilated in volume-controlled mode with a tidal volume of 6-8 ml/kg of IBW and a respiratory rate set to obtain an end-tidal CO_2 between 35-45 mmHg. PEEP and FiO_2 were adjusted to ensure a peripheral saturation greater than 92%. Anesthesia, hemodynamic and respiratory intraoperative management were decided by the attending physician.
We computed MP [1] 10 minutes after induction (A), during pneumoperitoneum (B) and at the end of the surgery (C). Differences within timepoints were assessed by one-way repeated measures ANOVA or Friedman test.
Results and Discussion: MP increased from timepoint A to B and a decreased thereafter at timepoint C (9.9 ± 3.0 *vs* 14.5 ± 3.7 *vs* 11.0 ± 3.2 J/min, $p < 0.001$), because of variations in driving pressure (8.5 ± 3.0 *vs* 16.6 ± 4.1 *vs* 9.1 ± 2.6, $p < 0.001$) and respiratory rate (12 ± 1 *vs* 13 ± 1 *vs* 13 ± 1, $p < 0.001$). Elastic (2.9 ± 1.3 *vs* 6.1 ± 1.9 *vs* 3.4 ± 1.2, $p < 0.001$) and resistive (3.3 ± 1.7 *vs* 4.4 ± 2.5 *vs* 3.5 ± 2.1, $p < 0.001$) MP components behaved accordingly.

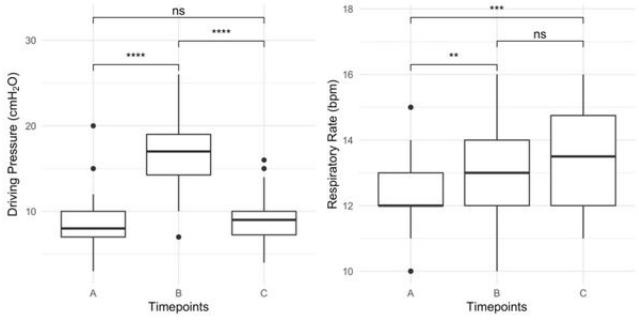

Figure 1: Time-course of driving pressure (A) and respiratory rate (B) during surgery time.

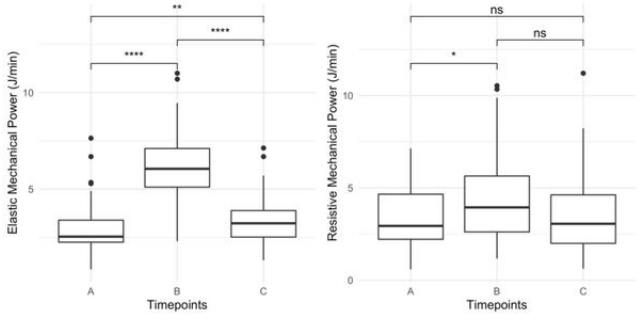

Figure 2: Time-course of mechanical power components (elastic, A and resistive, B) during surgery time.

Conclusion(s): Driving pressure and respiratory rate were the main ventilatory factors causing increase in elastic and resistive MP during RALP.

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01AP10-13
Realtime model to estimate the slow-wave activity in general anaesthesia

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Background and Goal of Study: Several EEG-based depth of anaesthesia monitors are commercially available, including GE-Entropy. However, most current monitors are calibrated using population data [1]. Slow-wave activity saturation (SWAS) is a potential individualised EEG marker of perception loss [2].
Post-hoc sigmoid fitting of the slow wave power-hypnotic dose response is the gold-standard to identify SWAS [3]. Here, we demonstrate dynamic real-time titration of surgical anaesthesia to SWAS. Furthermore, we compared GE-Entropy values at SWAS and loss of responsiveness (LOR) based on the isolated forearm test.
Materials and Methods: EEG data was collected in N=20 patients (age 53±18, weight 94±29kg) undergoing surgery at Waikato Hospital, NZ with a GE-Entropy module (GE Healthcare, Medical Diagnostics, UK). Raw EEG was streamed to the real-time SWAS model program in Matlab, which computed the SWAS level based on the anaesthetic drug inputs.
The real-time SWAS model was validated by comparison with post-hoc fitting using linear regression and Bland-Altman plots. Mean entropy values at LOR and SWAS were calculated, and entropy variability at SWAS was explored for each patient.
Results and Discussion: Several patients required real-time SWAS dosing that was surprisingly high or low (Figure 1A); as loosely validated by eye-opening at high or low anaesthesia concentrations after surgery.
Strong agreement was observed between the power and concentration at SWAS for real-time and post-hoc fitting models (Figure 1A&B). The bias between the models was negligible (P_{SWAS}: 0.43dB, C_{SWAS}: -0.09MAC).
Entropy values changed significantly between LOR and SWAS (77±14 vs 52±16, p<0.0001; Figure 1C). At SWAS, within-patient entropy values widely fluctuated due to noise and high-frequency influences (Figure 1D).
Conclusion(s): Individualised titration to SWAS was achieved in real-time during surgical anaesthesia. In contrast to entropy, SWAS was found to be more stable and linked to the drug response.

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2. Mhuircheartaigh RN, et al. Sci Transl Med (2013) 5:1–9.
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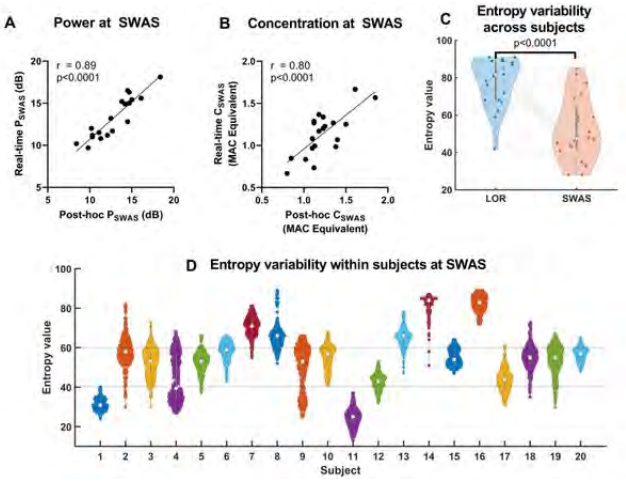

01AP11-01
The effects of intra-operative acupuncture of PC6 on postoperative nausea and vomit after laparoscopic cholecystectomy: a double-blind randomized control trial

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Background and Goal of Study: Postoperative nausea and vomiting (PONV), represents a common condition after surgery and anesthesia. Acupuncture has been used for centuries for analgesia and quality of life improvement including nausea and vomiting.
This study is a double blind randomized control trial examining the antiemetic efficacy of acupuncture delivered intra-operatively as an additive effect when used in combination with intravenous antiemetics in laparoscopic cholecystectomy, in comparison to patients under only antiemetic intravenous administration.
Materials and Methods: One hundred patients were enrolled and randomly allocated in one of the two groups. No significant changes were observed for their sex, age, and comorbidity. Both anesthesia and antiemetic medication were personalized according to each patient's medical history.
Both groups followed identical anesthesia procedures. In the experimental/study group, after anesthesia induction and before pneumoperitoneum application, a sterile 0.25x25, stainless steel acupuncture needle was inserted bilaterally at the Pericardium 6 acupuncture point (PC6) for 20 minutes, rotated manually clockwise and then anticlockwise every 5 minutes and then removed.
The primary study outcome measure was considered as the number of PONV incidence for the two groups. The secondary outcome measure of this study was the number of participants who manifested PONV and were in need of antiemetic medication of any kind in both groups.
A comparison of PONV cases between the groups would highlight the additive effect of acupuncture on antiemesis. The Fisher's exact test was chosen for the statistic evaluation of both outcomes.
Results and Discussion: There were 8 PONV cases in the experimental group against 18 cases in the control group. Fisher's exact test highlighted a significant difference between the groups (p-value=0.03). Two of the PONV cases in the study group required an antiemetic after the episode in contrast to 13 PONV cases of the control group (p-value=0.03). Apart from the antiemetic and analgesic effects of acupuncture, the safety that it offers as well as the financial benefits in comparison to medication costs have to be noted.
Conclusion(s): Intra-operative PC6 needling presents a statistically significant additive effect of antiemesis compared to standard anesthesia procedure in patients undergoing laparoscopic cholecystectomy.

01AP11-02
Target-controlled infusion of remifentanil has no advantage in postoperative nausea and vomiting prevention

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Background and Goal of Study: The incidence of postoperative nausea and vomiting (PONV) has been reported from 30% to 80% in patients with many risk factors. Risk factors for PONV include women, non-smokers, a history of PONV, and postoperative use of opioid. Remifentanil is mainly used for continuous intravenous infusion during surgery because it has a short context-sensitive half-time and a relatively quick recovery time compared to other opioids.
On the other hand, manual infusion can be used by the physician intuitively. Both methods are commonly used in clinical practice.
Materials and Methods: 90 patients who were scheduled for elective gynecological pelviscopic surgery were divided into 2 groups. 0.2mg of glycopyrrolate and 5mg of dexamethasone was injected as premedication in both groups. 2mg/kg of propofol and 6-8mg/kg of rocuronium was administered for general anesthesia. In the manual infusion group, 0.5μg/kg of remifentanil was administered before intubation using an infusion pump and the remifentanil infusion rate was managed by an experienced anesthesiologist.
In the target-controlled infusion (TCI) group, Ce of remifentanil was initiated at 2.0ng/ml, and manipulated to 4.0-5.0ng/ml before intubation. Right after intubation, remifentanil was reduced to 1.5 ng/ml and managed as needed.
Results and Discussion: Within POD2, the incidence of PONV was 27 (61.4%) in TCI group and 27 (60.0%) in manual group, there was no statistically difference between the two groups ($P = 0.895$). Total dose of remifentanil was significantly higher in the TCI group (0.093 (0.078-0.112) μg/kg/min in TCI group vs. 0.062 (0.052-0.076) μg/kg/min in manual group, $P < 0.001$).
The HR (82 ± 11.5 /min in TCI group vs. 87 ± 11.1 /min in manual group, $P = 0.046$) and MBP (83 ± 17.2 mmHg in TCI group vs. 90 ± 16.7 mmHg in manual group, $P = 0.035$) were significantly low in the TCI group after tracheal intubation. Other postoperative outcomes were comparable between the two groups.
Conclusion(s): Both intraoperative TCI and the manual infusion method of remifentanil showed comparable postoperative outcomes. Even the total amount of remifentanil was higher in the TCI group, the incidence of PONV until POD2, perioperative BP, HR, emergence time, PACU opioid requirement, PACU LOS, NRS pain scores up to POD2, and postoperative hospital LOS were similar in both groups.

01AP11-04
Effect of dobutamine and noradrenaline on hepatic blood flow: preliminary results

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Background: Dobutamine (DOBU) and noradrenaline (NOR) regulate systemic and regional blood flow. Both affect hepatic blood flow (HBF) by stimulation of adrenergic receptors[1]. The aim of the study is to compare the effect of NOR and DOBU on HBF.

Methods: Data from 2 trials were used to compare the effect of DOBU and NOR on HBF. Both trials used similar methodology. Pulsioflex™ was used to measure and guide haemodynamic data. HBF was measured using ultrasound transit time (Medi-Stim AS). In both studies baseline measurements (T1) were taken before the start of the study medication. In the NOR study, NOR was titrated to increase mean arterial pressure (MAP) to plus 10% (T2) and plus 20% (T3) of baseline. In the DOBU study, patients received incremental dosages of 2 $mcg.kg^{-1}.min^{-1}$ (T2) and 5 $mcg.kg^{-1}.min^{-1}$ (T3). Haemodynamic variables were related to indexed hepatic arterial flow (HAF_i) and indexed portal vein flow (PVF_i). Linear mixed modelling was used for statistical analysis.

Results: A total of 44 patients were included. In the DOBU study (n = 16) both CI and HR increased ($p < 0.05$). Total HBF_i increased at T3 which was primarily related to an increased PVF_i ($p < 0.05$). In the NOR study (n = 28) MAP increased ($p < 0.05$) but CI and HR remained similar. Total HBF_i decreased primarily due to a reduction of HAF_i (see table 1).

	Time point	DOBU study (n = 16)	NOR study (n = 28)
Total $HBF_{indexed}$ ($ml.min^{-1}.m^{-2}$)	T1	499 (139)	548 (182)
	T2	539 (137)	465 (149)#
	T3	570 (129)#	458 (144)#
$HAF_{indexed}$ ($ml.min^{-1}.m^{-2}$)	T1	148 (98)	215 (118)
	T2	140 (94)	163 (83)#
	T3	115 (83)	142 (70)#
$PVF_{indexed}$ ($ml.min^{-1}.m^{-2}$)	T1	351 (94)	333 (137)
	T2	399 (125)#	302 (117)
	T3	455 (127)#*	315 (120)
CI ($L.min^{-1}.m^{-2}$)	T1	3.0 (0.5)	3.1 (0.5)
	T2	3.4 (0.5)#	3.1 (0.5)
	T3	3.5 (0.6)#	3.2 (0.5)
MAP (mmHg)	T1	73 (11)	73 (10)
	T2	78 (10)#	84 (10)#
	T3	72 (9)*	93 (12)#*
HR	T1	79 (8)	78 (11)
	T2	95 (11)#	75 (11)
	T3	117 (12)#*	75 (12)

*#statistically significant compared with T1 ($p < 0.05$), *statistically significant compared with T2 ($p < 0.05$)*
Data are shown as mean (SD).

Table 1: haemodynamic variables at different time points in the DOBU and the NOR study.

Conclusion: DOBU increased CI with only minimal effect on MAP while NOR resulted in increased MAP with only minimal effect on CI. DOBU increased total HBF_i due to an increased PVF_i while NOR decreased total HBF_i due to a decreased HAF_i.

References:

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01AP11-05
Detecting intraoperative troponin elevation improves the accuracy of the best predictive score for posttransplant mortality after liver transplantation

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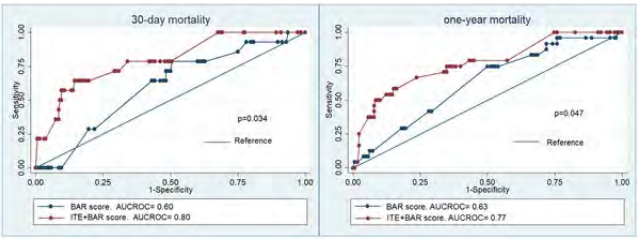
Background and Goal of Study: Patients undergoing liver transplantation (LT) are at very high risk of perioperative complications. The BAR-score is the most accurate predictive tool for post-LT mortality. Recently, we demonstrated that Intraoperative Troponin Elevation (ITE) during LT is independently associated with all-cause 30-day and one-year mortality.

This study aims to investigate whether the predictive ability of BAR-score may be improved by adding the variable "Intraoperative Troponin Elevation" to the score.

Materials and Methods: We conducted a retrospective analysis of all patients undergoing primary LT who had an intraoperative determination of troponin (high sensitivity troponin T, -HsTnT- Roche Elecsys) between 2011 and 2017 in Hospital General Universitario Gregorio Marañon, Madrid, Spain. Intraoperative Troponin Elevation was identified, as previously defined, as hsTnT≥ 61ng/L at the closure of the abdominal wall.

We calculated and compared the C-statistics of the BAR-score (alone) and the combination of ITE and BAR-score (combined ITE+BAR) in our dataset referred to 30-day and one-year posttransplant mortality. Statistical study was performed with SPSS and STATA.

Results and Discussion: A total of 203 patients were included. As shown in figure 1, combined ITE+BAR-score shows significantly better predictive capacity compared to BAR-score alone for both, 30-day mortality (AUCROC 0.80 vs. 0.60, p=0.034) and one-year mortality (AUCROC 0.77 vs. 0.63, p=0.047).



Conclusion(s): Our results suggest that adding the variable "Intraoperative Troponin Elevation" to the BAR-score enables more accurate identification of transplant recipients at significantly higher risk of all-cause posttransplant mortality. We suggest Intraoperative Troponin Elevation should be monitored and included in the BAR-score to improve its predictive capacity.

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01AP11-06
Accuracy of non-invasive spectrophotometric measurements of haemoglobin during live donor liver resection for living related liver transplantation. A diagnostic test accuracy

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[1]Menoufia University / National Liver Institute, Anesthesia, Shebeen El Kom, Egypt, [2]Menoufia University / Faculty of Medicine, Anesthesia, Shebeen El Kom, Egypt, [3]King Faisal University / College of Medicine, Anesthesia Unit, Surgery, Hofuf, Saudi Arabia

Background and Goal of Study: Non-invasive monitoring reduce risks and improve live liver donors safety. Aim is monitor continuous noninvasive spectrophotometric measured haemoglobin (SpHb, g/dl) during major hepatic resection compared to laboratory haemoglobin (Hb, g/dl).
Materials and Methods: PACTR201902855547795. Living related donors undergoing right hepatotomy for living related donor liver transplantation were included. SpHb and Pleth variability Index (PVI, %) were calculated via finger probe sensors (Masimo Radical 7, Irvine, CA, USA). Laboratory Hb were measured by Sysmex XE-2100 (Sysmex, Kobe, Japan) analyzer utilizing. T0 = ten minutes after induction, T1-T3= 1, 2 and 3 h after opening fascia, T4= post-hepatic resection T5= end of surgery. p<0.05 indicates statistical significance.
Results: 34 donors (18-45, ASA I) were enrolled (2018-2021). Attached figures will demonstrate: A simple scatter plot with regression (best-fit) line showed a positive correlation between Hb (g/dl) and SpHb (g/dl) at the different times. A good degree of reliability were observed between Hb (g/dl) and SpHb (g/dl) (n=204 readings) with a narrow range of bias (-1.9424 to 2.7248). Intra Class Correlation (ICC) was 0.665 with a 95% CI from 0.556 to 0.747 (F=5.375.776, p<.001).
However laboratory Hb were consistently higher than SpHb. No significant correlation existed between PVI (%) and SpHb (g/dl), τ = 0.066, p=0.189 (>0.05 NS). Significant changes with time were observed with PVI and laboratory Hb, but non with SpHb. Volumes of blood loss was 400 mL (400-500), infused Ringer lactate, 4000 mL (3500-4500) and albumin 5% was 250m L (0-500.0).

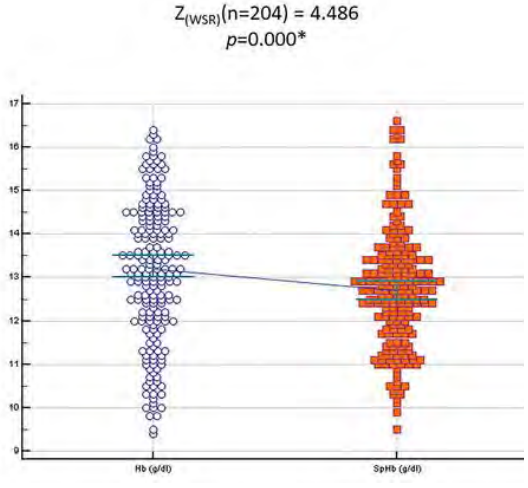

Figure. Dots plot with connecting lines for median and 95% CI for median.
WSR: Wilcoxon signed ranks test

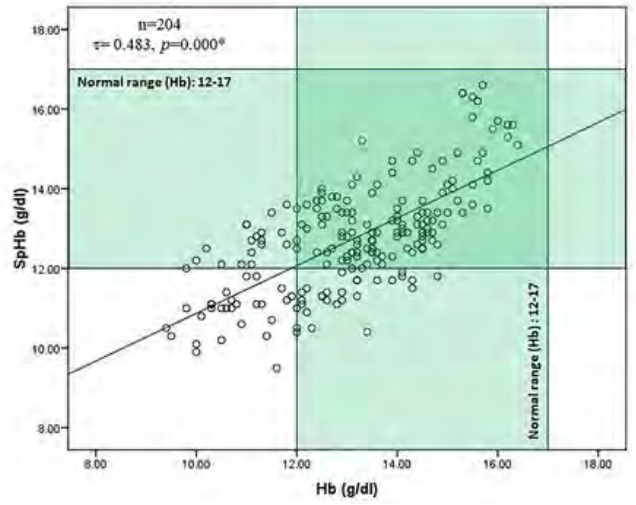

Figure. Simple scatter plot with regression (best-fit) line showing low positive correlation Hb (g/dl) and SpHb (g/dl).

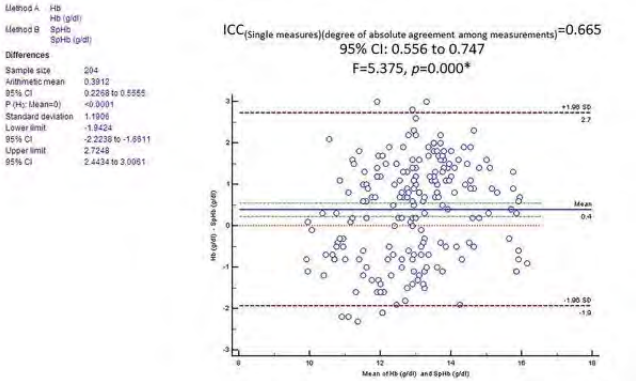

Figure. Bland and Altman graph of hemoglobin intraoperative and hemoglobin SpHb.

Conclusion(s): SpHb demonstrated a positive correlation with laboratory Hb with a good degree of reliability and a narrow range of bias. SpHb as a continuous trend monitor during liver resection among live liver donors can replace laboratory Hb putting in consideration that laboratory Hb is consistently higher than SpHb. SpHb was not affected by fluid restriction during dissection phase or by fluid administered post resection, this could be due to the low blood loss that associated the dissection of healthy liver of this study group of liver donors.

Acknowledgements: El Sayed Amr Basma for statistics.

01AP11-08
Effectiveness of intraoperative and early postoperative hyperoxia in the prevention of postoperative nausea and vomiting after breast cancer surgery. A randomised controlled trial

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is one of the most common causes of patient dissatisfaction in the postoperative period after general anaesthesia. Hyperoxia may prevent PONV after abdominal surgery, but the effectiveness of intraoperative and early postoperative hyperoxia in preventing PONV after breast cancer surgery has not been adequately studied so far.

Materials and Methods: Forty female patients with breast cancer were recruited, all of whom underwent surgical treatment of breast cancer with axillary sentinel node extirpation or axillary lymph node dissection. Balanced general anaesthesia with propofol induction and sevoflurane maintenance was administered.

Twenty patients received a volatile mixture with inspiratory fraction of inspired oxygen (FiO_2) of 0.8 intraoperatively and 3l/min oxygen via face mask for two hours after surgery. The other 20 patients received a FiO_2 of 0.4 during the intervention, without further administration of oxygen in the early postoperative period.

Analgesia was provided intraoperatively with boluses of fentanyl (50 - 100 mcg), and all patients received metamizole 2.5g iv and ondasetron 4mg iv at the end of the procedure. The presence and severity of PONV was assessed at 30 minutes, 4/24/32/48/56 hours after surgery (0 – no nausea or vomiting; 1 – mild nausea; 2 – severe nausea; 3 – nausea and vomiting; 4 – severe vomiting). Data were collected in Excel spreadsheet and analysed using the independent Student's t-test.

Results and Discussion: The overall incidence of PONV 30 minutes after the intervention was 15% in the group of patients receiving FiO_2 of 0.8 intraoperatively and 20% in the group of patients receiving volatile mixture with FiO_2 of 0.4. Mild nausea was observed in 5% of the patients undergoing surgical treatment under hyperoxic conditions and in 10% in the control group.

Severe nausea occurred in 10% of cases in both groups. Four hours after surgery, the overall incidence of PONV was 10% in the hyperoxia group and 15% in the control group. There was no statistically significant difference ($p \geq 0.05$) between the two groups in the frequency and severity of PONV.

Conclusion(s): We found no benefit of intra- and postoperative hyperoxia in reducing the incidence of PONV. The data do not support routine administration of hyperoxia in addition to antiemetics in patients undergoing breast cancer surgery for the prevention of PONV.

01AP11-09
Biomarkers for the preoperative prediction of flap loss in microvascular flap surgery: a single-center prospective analysis

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Background and Goal of Study: Free flap surgery has become a generally acknowledged procedure for significant defect reconstruction. Complex microvascular techniques and in-depth knowledge of blood rheology and microanastomoses is required for this kind of surgery. Although substantial progress has been achieved in preventing complications through anaesthesia and surgical considerations, the rate of flap loss is still significant.

Multiple patient related risk factors have been identified yet there is limited data on laboratory biomarkers for preoperative prediction of flap loss [1].

We aim to investigate the link between flap complications and a set of immunological and rheological biomarkers.

Materials and Methods: This prospective cohort study includes 52 adult patients undergoing elective microvascular flap surgery. The study was conducted with the approval of the Ethics Committee of Riga Stradins University. Preoperative blood draws for analysis of full blood count and plasma fibrinogen concentrations were collected preoperatively on the day of surgery before initiation of crystalloid infusion. Postoperative data on flap complications and duration of hospitalization was obtained.

Results and Discussion: Malignancy was the primary indication for surgery in 59.6%, trauma in 13.5% and preceding defects in 26.9% of all cases. Flap loss with subsequent anastomosis revision occurred in 7.7% and other less severe flap complications occurred in 9.6% of all cases. Patients with flap complications were not different in gender or age distribution, proportion of malignancy, choice of anaesthesia or ASA score from patients with no complications.

Patients with flap complications had higher preoperative hematocrit (40.6 ± 3.1 vs 36.4 ± 6.1; $p=0.046$) higher plasma fibrinogen (4.01 ± 0.47 vs 3.25 ± 1.03; $p=0.041$) lower lymphocyte count (1.06 ± 0.41 vs 1.61 ± 0.86; $p=0.045$) and lower monocyte count (0.35 ± 0.18 vs 0.58 ± 0.29; $p=0.031$). Duration of hospitalization after surgery was positively correlated with plasma fibrinogen ($r=0.33$; $p=0.026$) although this association is unlikely to be linear.

Conclusions: Our findings indicate that plasma lymphocyte count, monocyte count, hematocrit and fibrinogen could be implied as predictive biomarkers for flap complications. Larger studies are needed to further elucidate the concept of predictive biomarkers in microvascular flap surgery.

Reference:

1. Lese I et al. J Plast Reconstr Aesthet Surg. 2021;74(3): 512-522.

01AP11-12
The transplanted kidneys' first breath - an inside look at reperfusion

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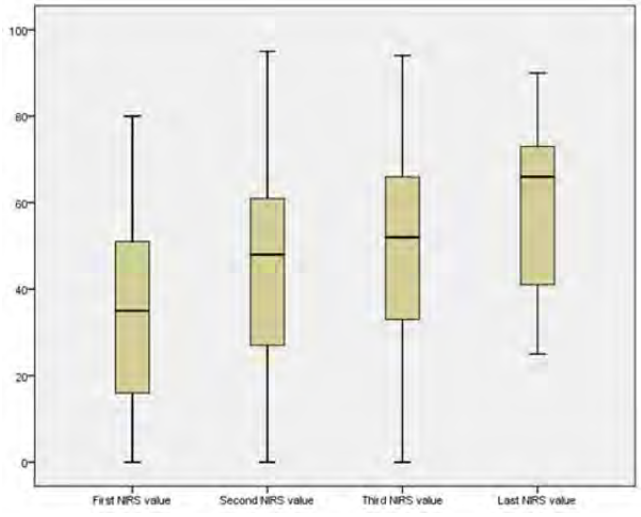
Background and Goal of Study: Studies found a link between renal graft blood flow and oxygenation to function.
Our goal was to measure renal graft saturation with NIRS expecting to measure different saturations at pre-set time intervals.
Materials and Methods: This study included patients receiving live organ donations at the Tel Aviv medical center between February 2021 and January 2022. Demographic and clinical data were collected from electronic medical records.
NIRS electrode directly placed on the cortex at 5 and 10 minutes post-reperfusion, and before and after fascia closer. Brain NIRS and the fraction of inspired oxygen were documented for control.
Continuous variables described using means (± SD) or medians (IQR). We compared the means of different variables using Spearman correlation and of related variables with Firedmans' Chi-Square.
Results and Discussion: The recipients: 80% males, mean age 54.7 years (±11.4), 36% with diabetic renal failure and 33% glomerulonephritis.

	1st measurement	2nd measurement	3rd measurement	4th measurement	p Value
NIRS%±SD	38.6 ±23.2	48.0 ±25.8	50.4 ±24.3	59.8 ±19.1	0.06
NIRS% Δ from 1st measurement ±SD		8.7 (±26.7)	12.9 (±30.0)	20.5 (±29.5)	
Fraction of inspired oxygen ±SD	41.3 ±6.9	41.1 ±7.1	41.0 ±7.2	43.0 ±10.1	

	pValue
Change in 1s and 2nd	0.99
Change in 2nd and 3rd	0.63
Change in 3rd and 4th	0.72



A gradual increase in measured saturation was observed. No correlation between changes in brain and renal graft indices.
The observed gradual increase in saturation may reflect increase in blood flow over time. Low saturation and a reduction over time reflect long-term vasoconstriction, while higher indices may reflect cell dysfunction. No significant similarity was found with to brain measurements concluding that measurements were local.
Conclusion(s): NIRS evaluation of renal grafts can be reproduced and aid to identify rectifiable complications. Further research is needed to determine whether the absolute indices or change in saturation over time has clinical significance and can predict DGF.

01AP12-01
Effects of norepinephrine and general anaesthesia on the mean systemic filling pressure

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Background and Goal of Study: Effects of norepinephrine (NE) administration are mainly appraised on the arterial side of the circulation. It however influences the venous side of the circulation as well, of which its vascular tone and intravascular volume may be reflected by the mean systemic filling pressure (Pmsf). Pmsf can be estimated using the arm-stop-flow method (Parm).
We evaluated the net effect of NE administration on Pmsf, estimated by Parm, in healthy volunteers while awake, and subsequently while under general anaesthesia (GA).
Materials and Methods: This secondary analysis included 36 healthy volunteers (18-70 years), who received a NE step-up dosing scheme from 0 to 0.20 mcg kg^{-1} min^{-1}, while being awake and under GA, sequentially. Predefined safety limits were installed. Pmsf and haemodynamic variables were measured at before the start of NE administration (T1) and at the highest NE dosage step (T2). This was repeated under GA (T3 and T4, respectively) and timepoints were compared using a paired t-test or Wilcoxon signed rank test.
Results and Discussion: Pmsf was 16 (5) mmHg at the start of the awake phase (no NE administration) and 19 (5) mmHg at the peak NE administration (p=0.007). Pmsf was 15 (4) mmHg at the start of GA (if necessary, NE administration was started and titrated to the minimal required NE dose to maintain MAP >50 mmHg) and increased to 17 (4) mmHg (p<0.001) for peak NE administration. Baseline Pmsf under GA was comparable to the awake baseline (p=0.400). Mean arterial pressure (MAP), heart rate, and cardiac index are reported in table 1.

	T1	T2	p-value T1 vs. T2	T3	T4	p-value T3 vs. T4	p-value T1 vs. T3
Mean Arterial Pressure (mmHg)	87 [80-92]	101 [96-111]	<0.0001	59 [57-62]	98 [89-102]	<0.0001	<0.0001
Heart Rate (bpm)	66 [55-73]	59 [52-66]	0.005	53 [50-58]	49 [45-53]	0.002	<0.0001
Cardiac Index (L min^{-1} m^{-2})	3.4 [2.8-4.1]	3.7 [3.3-4.5]	0.015	2.0 [1.5-2.5]	3.3 [2.7-5.7]	<0.0001	<0.0001
Mean systemic filling pressure (mmHg)	16 (5)	19 (5)	0.007	15 (4)	17 (4)	<0.001	0.400

Data are presented as mean (SD) or median [IQR]. A p-value of 0.017 was considered statistically significant (Bonferroni adjusted).

Table 1. Haemodynamic variables at four timepoints

Conclusion(s): NE administration increased Pmsf in awake and anaesthetised healthy volunteers. Baseline Pmsf awake and under GA were comparable, provided that a minimal MAP of 50 mmHg was maintained. These results suggest that irrespective of the hypnotic state, NE increases (venous) vascular tone and thus cardiac preload.

01AP12-03
Intraoperative hypotension: incidence, determinants and associated morbidity and mortality

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Background and Goal of Study: Intraoperative hypotension (IOH) is reportedly common and associated to myocardial and kidney injury and mortality. Reducing IOH can improve patient outcomes. In this study we aimed to determine IOH incidence, its determinants, and its relation to postoperative outcomes.
Materials and Methods: We performed a single center retrospective cohort including adult inpatients submitted to elective non-cardiac surgery in October and November 2020. Data collected from medical record included: age, gender, American Society of Anesthesiologists Physical Status (ASA), anesthetic technique, use of vasopressors, surgical specialty, surgical risk, procedure time, postoperative mortality (30 days), and complications according to *Clavien-Dindo* classification.
IOH was defined as 15-minute consecutive period of mean arterial pressure ≤ 65mmHg. Mann-whitney u test, pearson chi-square or fisher's exact test and logistic regression were used for statistical analysis
Results and Discussion: Our study included 1642 patients, 32.6% with IOH. IOH was more frequent in females (35.2 vs 29.8%, p=0.021). Higher ASA and higher surgical risk were associated with IOH (p=0.006 and p<0.001, respectively). Anesthetic technique was found to be a determinant of IOH (p<0.001), as was procedure time (median 151 vs 92 minutes, p<0.001).
In a multivariate analysis, locoregional anesthesia (OR 0.4, IC95 0.3-0.7) and sedation (OR 0.2, IC 0.1-0.7) were found to be protective vs general anesthesia. Intermediate and high surgical risk remained associated to IOH (vs low risk), respectively OR 1.4, IC95 1.1-1.8 and OR 3.9, IC95 2.1-7.4. Procedure time >120 minute was independently related to IOH (OR 2.8, IC95 2.2-3.7). Only 44.4% of IOH patients were administered a vasopressor. 13 patients died. Mortality was higher in patients with IOH (1.7 vs 0.4%, p=0.013).
Major and overall complications were higher in IOH patients, respectively 8.8 vs 3.0%, p<0.001 and 36.6 vs 18.2%, p<0.001. In a multivariate analysis of mortality including related factors (ASA, age, gender, surgical risk, procedure time and surgical specialty), IOH was not found to be an independent mortality risk factor (OR 2.4, IC95 0.5-11.3).
Conclusion(s): IOH is common and its approach can be optimized. Locoregional and sedation techniques are protective from IOH, compared to general anesthesia. Surgical risk and procedure time are associated with IOH. IOH was associated with postoperative complications.We found no independent association between IOH and mortality.

01AP12-04
The influence of pressure support ventilation during laparoscopic and robotic abdominal surgery on norepinephrine requirement

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Background and Goal of Study: Norepinephrine is a first line choice medicine to control arterial pressure during different type of operations [1,2].
It is widely known that pneumoperitoneum have a strongest influence on hemodynamic during laparoscopic and robotic abdominal surgery [3].
We hypothesized that moderate neuromuscular block (NMB) with pressure support ventilation (PSV) during laparoscopic and robotic abdominal surgery may decreases norepinephrine consumption. The aim of our study was to assess of the impact of moderate NMB with PSV during prolonged laparoscopic and robotic abdominal surgery on norepinephrine consumption.
Materials and Methods: 70 patients undergoing elective long (2 and more hours) laparoscopic (n=60) or robotic (n=10) abdominal surgery under general anaesthesia were included. All patients were randomly assigned in two groups.
Group 1 – moderate NMB and PSV;
Group 2 – deep NMB and mandatory ventilation. In both groups we use norepinephrine to avoid an intraoperative mean arterial pressure decreases of >20% from baseline values or < 60-70 mmHg.
HR, mean BP, intraabdominal pressure and BIS values were assessed every 15 min.
Norepinephrine consumption was assessed during surgery.
Results and Discussion: HR, MBP and BIS values were comparable between groups in all points (all p > 0,05, Mann-Whitney U–test). The median of intraabdominal pressure was 11 [10; 12] mmHg in the group 1 and 12 [11; 14] mmHg in the group 2 (p<0,00001, Mann-Whitney U–test). We have needed to use norepinephrine in 12 patients in the group 1 and 23 in the group 2 (p=0,009, Pearson's $\chi 2$).
Conclusion(s): Moderate NMB with PSV significantly decrease norepinephrine requirement during laparoscopic or robotic abdominal surgery. This may be related to low abdominal pressure in PSV group.
References:
1. French WB, Rothstein WB, Scott MJ. Time to Use Peripheral Norepinephrine in the Operating Room [published correction appears in Anesth Analg. 2021 Nov 1;133(5):e62]. *Anesth Analg*. 2021;133(1):284-288. doi:10.1213/ANE.0000000000005558
2. Futier E, Lefrant JY, Guinot PG, et al. Effect of Individualized vs Standard Blood Pressure Management Strategies on Postoperative Organ Dysfunction Among High-Risk Patients Undergoing Major Surgery: A Randomized Clinical Trial. *JAMA*. 2017;318(14):1346-1357. doi:10.1001/jama.2017.14172
3. Atkinson TM, Giraud GD, Togioka BM, Jones DB, Cigarroa JE. Cardiovascular and Ventilatory Consequences of Laparoscopic Surgery. *Circulation*. 2017;135(7):700-710. doi:10.1161/CIRCULATIONAHA.116.023262

01AP12-05
Controlling arterial blood pressure during pheochromocytoma resection - "old problem, new approach"

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Background: Intraoperative hemodynamic fluctuations are the most dreaded phenomenon associated with the treatment of pheochromocytoma. Preoperative alpha-adrenergic blockade protocols aimed at abating these fluctuations have achieved controversial results. Deliberate compensated vasoplegia (DCV) is a novel pharmacological regimen developed at our institution intended to decrease severe hypertensive events.
This regimen conjoins pharmacologically induced non-adrenergic vasodilation with concurrent alpha-agonist administration so as to control both arms of vascular tone.
In this retrospective study, we compared outcomes of pheochromocytoma resection with and without use of the DCV protocol.
Methods: A retrospective analysis of all pheochromocytoma resections performed between 2012-2020. These comprised of 41 laparoscopic resections, 20 performed under DCV protocol. The primary outcome measured was the incidence of severe hypertension during surgery. Secondary outcomes included other abnormal blood pressure, perioperative data and complications.
Results: No significant difference in preoperative parameters including patient characteristics, tumor size, or alpha-blockade protocol. The use of the DCV protocol resulted in a significant decrease in the incidence of severe hypertensive and was not associated with any adverse events.

Pharmacological Agent	HR	SVR	CO	Cardiac Contractility	Coronary blood flow
Isoflurane	↑	↓↓	↔	↓	↑↑
Isosorbide dinitrate (Isoket®)	↑	↓	↑	↑	↑↑
Nicardipine	↑	↓↓	↔↑	↔↑	↑↑
Noradrenaline	↔↑	↑↑↑	↔↑	↔↑	Direct effect ↓ Indirect effect ↑
Propofol	↓	↓	↔↓	↔	↔

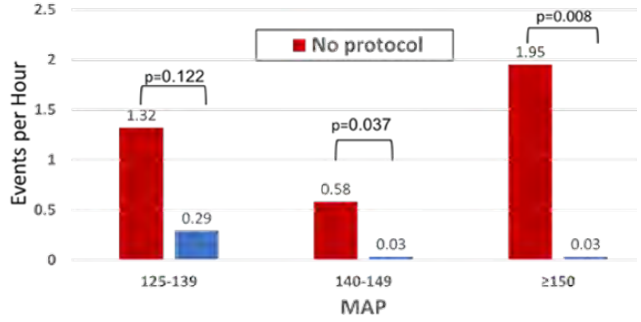
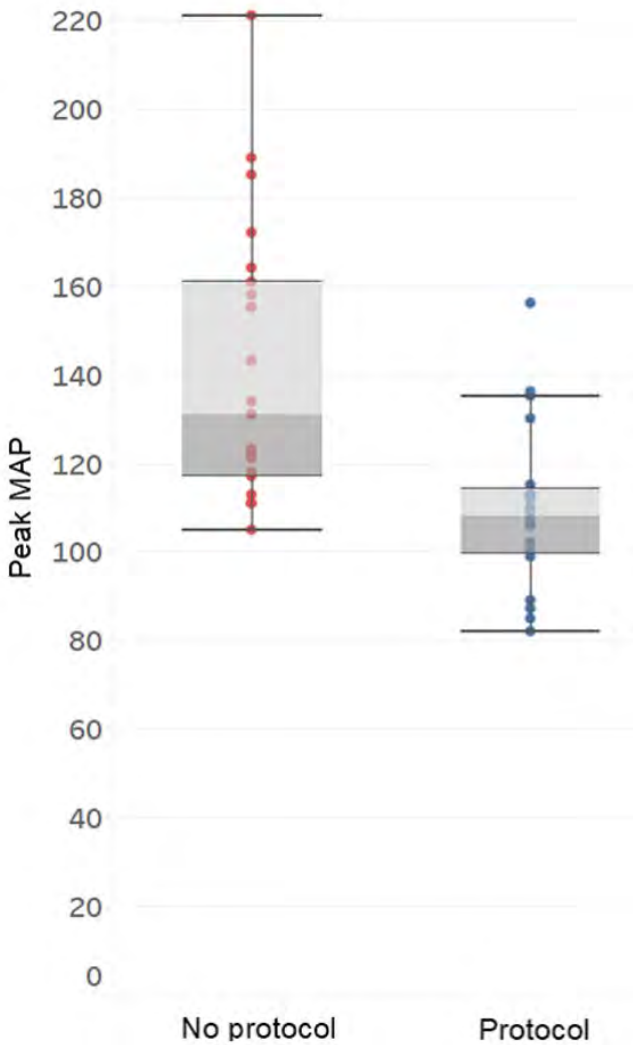


Figure. Hypertensive events during surgery.

Conclusion: DCV anesthesia protocol can decrease the incidence of severe hypertensive episodes during pheochromocytoma resection. We describe a highly effective protocol for controlling intraoperative hypertension in pheochromocytoma patients.



01AP12-06
Antalgic spinal effect on haemodynamic stability, assessed by Hypotension Prediction Index (HPI) monitoring in patients undergoing robotic prostatectomy surgery: preliminary data

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Background and Goal of Study: Intraoperative arterial hypotension, defined as a mean arterial pressure (MAP) ≤ 65 mmHg, is a severe and common complication during robotic prostatectomy surgery. Hypotension Prediction Index (HPI) is a new machine-learning algorithm, obtained through measurement of arterial pressure values based on waveform analyses.
The aim of the study is to evaluate the effectiveness of antalgic spinal, in the context of blended anaesthesia and in preserving good haemodynamic stability, assessed by HPI monitoring, in patients undergoing robotic prostatectomy surgery.
Materials and Methods: Patients scheduled for elective robotic prostatectomy were enrolled. In all patients, analgesia was maintained by a single-shot spinal technique with levobupivacaine 0.5

% (15mg), 0.1 mg/kg ketamine, 0.1 mg morphine. Intraoperative invasive arterial monitoring through the use of Acumen sensor connected with Hemosphere software (Edwards Lifesciences®) was performed. Two groups were defined: "HPI" received a HPI monitoring, while "NON HPI" received the standard invasive hemodynamic monitoring.

Results and Discussion: Fifty-two patients underwent to elective robotic prostatectomy, were recruited. The mean age was 65,3 ± 5,75. Data are presented as median, IQR, number, percentage. P-value <0,05 is considered significant. Results are shown in the table:

	HPI n 26	NON HPI n 26	*P value*
TIME WEIGHTED AVERAGE (TWA) = [depth of hypotension (mmHg) below a MAP of 65 mmHg × time (minutes) spent below a MAP of 65 mmHg] ÷ total duration of surgery (min) (mmHg)	0,19 [0-0,37]	0,24 [0-0,44]	0,3
NUMBER OF HYPOTENSIVE EVENTS PER PATIENT	1 [0-2,25]	2 [0-2]	0,4
TIME IN HYPOTENSION PER PATIENT (min)	2,67 [I0-6,66]	3,67 [0-10,74]	0,7
TIME UNDER HYPOTENSION THRESHOLD PER PATIENT (%)	1,095 [0-2,8]	1,635 [0-5,67]	0,2
NUMBER OF PATIENTS WITH IPOTENSION	17 of 26 (65,4%)	18 of 26 (69,23%)	0,7

Conclusion(s): The antalgic spinal would appear to be effective in the anaesthetic management of patients undergoing robotic prostatectomy surgery, because it seems to maintain haemodynamic stability by reducing the number and duration of hypotensive event compared to what has been reported in the literature.

01AP12-07
Quantifying myocardial oxygenation during the induction of general anaesthesia with perioperative cardiovascular magnetic resonance imaging

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Background and Goal of Study: General anaesthesia (GA) bears many potential triggers for perioperative myocardial ischaemia. Yet, if and when this occurs during induction remains a black-box. Novel cardiovascular magnetic resonance (CMR) techniques can now image perturbations in myocardial oxygenation. We optimized a free-breathing CMR sequence that measures left ventricular tissue oxygenation every heart beat and applied it to investigate the dynamics of myocardial oxygenation changes in patients undergoing GA induction.

Materials and Methods: To validate the imaging technique, 12 healthy spontaneously breathing controls performed pre-induction-like breathing maneuvers: 2.5min with a respiration rate of 14, followed by 5 deep breaths, then apnea up to one min. Two heart-healthy patients scheduled for orthopedic surgery underwent GA induction inside the MRI. Myocardial oxygenation CMR imaging was applied continuously for the entire breathing procedure in awake controls and in patients from the awake stage through GA induction, intubation, and for 10 minutes of the maintenance phase.

Results and Discussion: In the awake controls, deep-rapid breathing (coronary vasoconstriction) significantly reduced myocardial oxygenation (-5.4±7.0 %, $p<0.01$), while apnea had an opposite effect (15.7±10.0%, $p<0.01$). In both GA patients, the preoxygenation phase with deep breathing also reduced myocardial oxygenation. However, in the first patient undergoing GA, myocardial oxygenation did not return to baseline until well into the maintenance phase (Figure).

In the second patient myocardial oxygenation after deep breathing, myocardial oxygenation returned to baseline by intubation with the reduced breathing rate and apnea.

Conclusion: Interim results show in the first study to ever use CMR to monitor the heart during GA induction, that the impact of GA on myocardial oxygenation can be assessed. In heart-healthy patients, GA induction has a dynamic effect on myocardial oxygenation, which resulted in periods of reduced myocardial oxygenation prior to normalizing during maintenance. This will be further investigated in more healthy and cardiovascular patients undergoing GA.

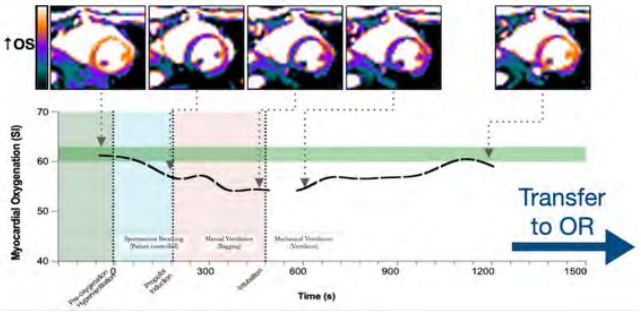

Figure. Change in myocardial oxygenation-sensitive (OS) signal intensity (SI) measured by cardiovascular magnetic resonance in a heart-healthy patient undergoing induction of general anaesthesiology.

01AP12-08
Diagnostic accuracy of subclavian vein collapsibility index v/s inferior vena cava collapsibility index for predicting postinduction hypotension: an observational study

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Background: Ultrasound (US) guided measurement of inferior vena cava (IVC) diameter and its respiratory variability i.e. collapsibility index (CI) has been shown to predict the postinduction hypotension after general anaesthesia (GA). Recently, the subclavian vein (SCV) CI during deep breathing was shown to predict postinduction hypotension after GA.

The present study was carried out to compare the diagnostic accuracy of IVC and SCV parameters for the prediction of postinduction hypotension after GA.

Materials and Methods: A total of 132 patients of either sex, aged above 18 years, scheduled for elective surgery under GA were enrolled. On the day of surgery, US-guided measurement of IVC and

SCV parameters was done in the preoperative holding area, with patients lying supine and spontaneously breathing. Maximum (dmax) and minimum (dmin) diameters over a single respiratory cycle were measured and the CI was calculated. After the examination of veins, patients were shifted to the operating room and standard monitoring was attached. Induction was performed using the standard technique in all the patients.

Episodes of hypotension [MAP less than 60 mmHg and/or >30% fall in MAP] in the 20 minutes period after induction of anaesthesia were recorded. The primary outcome of the study was the comparison of diagnostic accuracies of SCV-CI and IVC-CI for the prediction of postinduction hypotension during quiet breathing.

Secondary outcomes were the incidence of hypotension after induction and a comparison of the diagnostic accuracies of SCV-CI and IVC-CI for the prediction of postinduction hypotension during deep breathing.

Results: Out of the 132 patients enrolled, 57 (43.2%) developed hypotension following induction of anaesthesia. Demographic profile, fasting status, drugs used, and baseline vitals were comparable between yes hypotension and no hypotension groups. The IVC-CI and SCV-CI during both quiet and deep breathing were significantly higher in the yes hypotension group compared to the no hypotension group.

Vein	AUC	95% CI	Cut off	Sensitivity	Specificity	p-value
IVC quiet breathing	0.672	0.58 to 0.76	34%	70%	59%	0.001
IVC deep breathing	0.679	0.59 to 0.77	50%	70%	56%	<0. 001
SCV quiet breathing	0.659	0.56 to 0.75	10%	68%	56%	0.002
SCV deep breathing	0.662	0.57 to 0.76	27%	71%	51%	0.002

Conclusion(s): For predicting this hypotension, the IVC-CI and SCV-CI have comparable and moderately good diagnostic accuracy both during quiet as well as deep breathing.

01AP12-09
Pressure vs. volume-controlled ventilation and their impact on dynamic parameters of fluid responsiveness

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Background and Goal of Study: Pulse pressure variation (PPV), which is based on the pressure force caused by controlled mechanical ventilation, is commonly used to predict fluid responsiveness. When PPV was introduced into clinical practice, volume-controlled ventilation (VCV) with tidal volumes (VT) ≥ 10 ml/kg was most commonly practiced. Nowadays, lower VT and the use of pressure-controlled ventilation (PCV) has widely become the preferred ventilation mode.

Due to their specific flow characteristics VCV and PCV result in different airway pressures at comparable tidal volumes. We hypothesized that higher inspiratory pressures would result in higher PPVs and aimed to determine the impact of VCV and PCV on PPV.

Materials and Methods: 16 anesthetized, paralyzed, and mechanically ventilated (goal: VT 8 ml/kg) pigs were instrumented with catheters for continuous arterial blood pressure measurement and transpulmonary thermodilution. At four different intravascular fluid states (IVFS; baseline [BL], hypovolemia [Hypo], resuscitation [Res] I and II), ventilatory and hemodynamic data including PPV were assessed during VCV and PCV. Statistical analysis was performed using U-test and RM ANOVA on ranks.

Results and Discussion: Complete data sets of eight pigs were available. VT (7.7 ml/kg for VCV vs 7.8 ml/kg for PCV; $p = .69$) and respiratory rates (25.5/min for VCV and PCV; $p = .978$) were similar in both modes. Heart rate, central venous, systolic, diastolic, and mean arterial pressures were not different between VCV and PCV at any IVFS.

Figure 1 shows airway and transpulmonary pressures and the corresponding PPVs (median, IQR and range; * $p < 0.05$). Peak inspiratory pressure was significantly higher in VCV, while plateau and driving pressures were significantly higher in PCV. However, these higher pressures did not result in different PPVs at any IVFS.

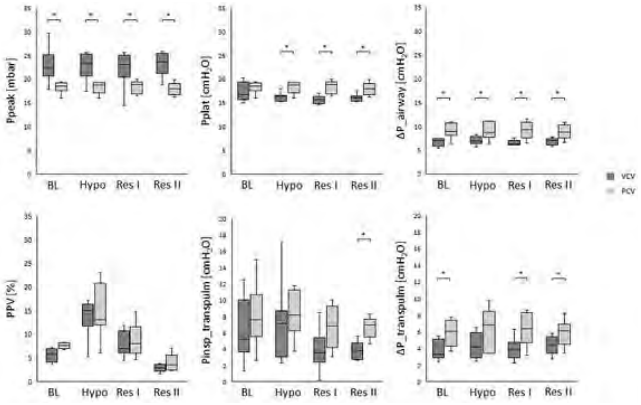

Figure 1: Airway and transpulmonary pressures and corresponding PPVs

Conclusion(s): VCV and PCV at similar tidal volumes and respiratory rates produced similar PPVs. Thus, both ventilation modes can be used in hemodynamic management while meeting the needs of modern ventilation therapy.

01AP12-10
Assessment of intra-abdominal pressure with a novel continuous bladder pressure monitor – a clinical validation study

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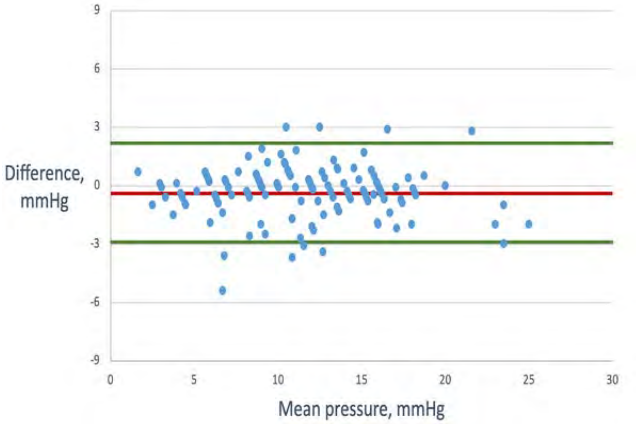
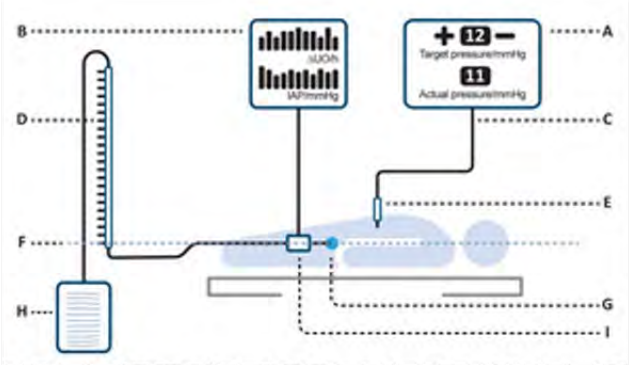
Background and Goal of Study: Intra-abdominal hypertension and the resulting abdominal compartment syndrome are serious complications of severely ill patients. Diagnosis requires intra-abdominal pressure (IAP) measurement, which is currently cumbersome and underused. We aimed to test the accuracy of a novel continuous IAP monitor.

Materials and Methods: Adults having laparoscopic surgery and requiring urinary catheter intra-operatively were recruited to this single arm validation study. IAP measurements by the novel monitor and a gold-standard foley manometer were compared. After anesthesia induction, pneumoperitoneum was created through a laparoscopic insufflator, and 5 randomly pre-defined pressures (between

5 and 25 mmHg) were achieved and simultaneously measured by both methods in each participant. Measurements were compared using Bland-Altman analysis.

Results and Discussion: In total, 29 participants completed the study and provided 144 distinct pairs of pressure measurements that were analyzed. A positive correlation between the two methods was found (R = 0.962). There was good agreement between the methods, with a mean (95% CI) bias of -0.4 (-0.6, -0.1) mmHg, that was statistically significant but of no clinical importance. The limits of agreement (where 95% of the differences are expected to fall) were -2.9 and 2.2 mmHg, both within the pre-defined allowed delta of 3 mmHg. The proportional error was statistically insignificant (P=0.85), suggesting a constant agreement between the methods across the range of values tested.





Study system design (not to scale). A – Insufflator. B – Study device control unit. C – Tube from CO2 insufflator to the surgical port. D – Classic Fluid column manometer measures intra-vesical pressure via Foley catheter. E - Surgical port into the peritoneal cavity. F – Mid-axillary line (reference level). G – Urinary Bladder. H - Urine collection bag. I – Study device disposable measurement unit, transmitting pressures to the controller.

Figure.

Conclusion(s): Continuous IAP measurement by the novel monitor performed well in the clinical setup of controlled intra-abdominal hypertension across the evaluated range of pressures. Further studies should expand the range to more pathological values.

01AP12-11
Continuous non-invasive blood pressure monitoring in renal transplantation: a safe alternative?

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Background and Goal of Study: Strict intraoperative hemodynamic monitoring and fluid-replacement strategies are of utmost importance for adequate graft function in kidney transplantation [1]; thus, invasive blood pressure (IBP) is common practice.

However, renal patients often have limited vascular accesses; hence, current guidelines advocate to minimize vascular punctures. Clearsight System™ is a novel system for continuous non-invasive blood pressure (cNIBP) monitoring based on photo-pletysmography, validated in procedures where strict control of BP is required [2].

The aim of this study is to investigate the safety and effectiveness of cNIBP monitoring for hemodynamic management during kidney transplantation in the recipient.

Materials and Methods: In this observational study, we included data from patients who received a kidney transplant from a deceased donor in our centre. Hemodinamic monitor consisted of either IBP (n=5) with ProAQT or cNIBP (n=10) with Clearsight System™. To evaluate safety of cNIBP, we recorded intraoperative adverse events, such as cardiac arrest or new-onset arrhythmias.

To evaluate graft function, we collected creatinine, urea, urine output before surgery and at hospital discharge. We recorded the use of postoperative hemodialysis and hospital readmission in the next 30 days.

Results and Discussion: Patients were evenly distributed by age and sex in both groups. Both groups had a significant decrease in creatinine ($p<0.01$) and an increase in urine output ($p<0.05$) after transplant, with no significant differences between them ($p=0.4$ and $p=0.03$, respectively). Urea values did not significantly decrease in either group. No patients required postoperative hemodyalisis or were readmitted due to kidney failure.

To our knowledge, this is the first study to compare safety and graft function between invasive and non-invasive blood pressure monitoring in renal transplantation.

Conclusion(s): This case series suggests that cNIBP devices could be a safe and effective alternative to IBP monitoring in hemodynamically stable patients who receive kidney transplantation under general anesthesia, with the benefits of reducing bleeding and risk of infection at postoperative care units.

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01AP13-01
Opioid-free anesthesia in bariatric surgery - a prospective case series

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Background and Goal of Study: According to ERAS guidelines[1] for perioperative care in bariatric surgery (BS) opioid-sparing anesthesia with multimodal approach should be used to improve postoperative recovery. Recently published article[2] showed that opioid-free anesthesia (OFA) improved pain outcomes after BS.
The goal of the study was the efficacy of OFA for laparoscopic sleeve gastrectomy.
Materials and Methods: 22 patients (ASA III, 77% female) who met the inclusion criteria underwent OFA protocol.[3] After premedication with pregabalin, infusion of dexmedetomidine, lidocaine and ketamine in 1 syringe was initiated 10min before induction (propofol, rocuronium). For anesthesia maintenance the mixture was titrated to hemodynamics and sevoflurane according to BIS. Dexamethasone, thiethylperazine, ketoprofen and acetaminophen were added postinduction.
Patients were assessed during 24h postoperatively every 4h for VAS (10 points analgesia score) and PONV. Simple analgesics were given as needed, pethidine was used as rescue analgesia in case of VAS≥4. Patient satisfaction was assessed 24h after surgery.
Results and Discussion: Patients median(IQR) age was 41(29–51), BMI 45,6(40,3–53,3), 77% had comorbidities (2 with OSA). Length of surgery ranged from 50-115min and anesthesia from 75-150min. Time to extubation was 5(3-8)min. VAS values were significantly lower 12h postoperatively compared to the values in the first 8h.
Additionally, 24h postoperative VAS values were significantly lower compared to all other measurements (Friedman test, $P<0.001$). 8(36%) patients received rescue opioid analgesia with median (IQR) time 1,3(0,5-7,2)h postoperatively. PONV occurred in 12(55%) patients (2 with vomiting, 10 with nausea).
Postoperative hypoxemia was detected in 3 patients. 18 patients reported maximal satisfaction score. Median postoperative hospital LOS was 2,5d. Although this population is prone to respiratory complications, no major was encountered. Even less PONV and need for rescue analgesia may be achieved by preventive use of more potent antiemetics and regular administration of non-opioid analgesics, respectively.
Conclusion(s): There is room for modifications of the OFA protocol to achieve more effective analgesia (particularly in the first 8h after surgery) and PONV control, although overall patient satisfaction was excellent with fast hospital discharge.
References:
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3. Rev Esp Anestesiol Reanim. 2017 Oct

01AP13-03
The impact of the head position on the laryngeal mask airway leak in paediatric patients: prospective randomized control trial

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Background and Goal of Study: Horizontal alignment of the tragus and jugulum (*sniffing position*) is the recommended head position for the laryngeal mask airway (LMA) insertion and direct laryngoscopy for every patient. Recent studies show, that *beyond sniffing position* (25% increase in the head elevation) can lead to better larynx visualisation and easier airway management. Nevertheless, data from paediatric patients are lacking.
The aim of this trial was to compare the incidence of first try LMA insertion failure and the LMA leak between neutral, sniffing and beyond sniffing head position in paediatric patients.
Materials and Methods: Eligible for inlusion were patients from 2 to 19 years of age undergoing an elective surgery with controlled ventilation during general anaesthesia and without predicted difficult airway management with LMA. The head position for the LMA insertion was randomized (sealed envelopes).
After the LMA insertion, the LMA leak volume was measured in all three head positions consequently. The LMA leak volume was defined as a mean difference of three consequent meseuresemnt between the inspiration and the expiration tidal volume.
Results and Discussion: Unitil 12/2022, 32 patients were enrolled in this study with the age median od 14 years. Fisher's exact test did not demonstrate any difference in the first try LMA insertion failure incidence (1/11; 0/12; 1/9 for neutral, sniffing and beyond sniffing position, respectively). Wilcoxon's test did not demonstrate any significant difference in the LMA leak volume for the different head positions either. The LMA leak volume median was 0.48; 0.42 and 0,46 ml/kg body weight for the neutral, sniffing and beyond sniffing head position, respectively.
Conclusion: In the current study population, there is no significant difference in the first try LMA insertion failure and LMA leak volume for the different head positions.
Acknowledgements: Supported by RVO (FNBr, 65269705) and MŠMT (MUNI/A/1109/2022, MUNI/A/1105/2022).

01AP13-04
Mechanistic and applicative modulation of wound-healing processes by morphine and fentanyl

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Background & Goals: Physiological wound healing requires the timely transition of 4 phases: hemostasis, inflammation, proliferation, and remodeling. Failure to initiate or transit may promote slow-healing wounds, associated with complications such as infections, dehiscence, and seromas. These complications greatly impact patients and families, as well as burden health systems and economies. Opioids are widely used in modern anesthesia, and while largely regarded as immunosuppressors, literature regarding their wound-healing effects is surprisingly scarce and of contradicting nature.
Furthemore, the mainsty of scientific literature revolves around morphine and largely neglects other opioids such as fentanyl. In this study we compared wound healing effects of fentanyl and morphine in vitro.
Materials & Methods: A549 cells were grown to confluence and scratched with a pipette tip. Media was replaced to media with or without fentanyl or morphine in clinical concentrations, scratch healing rate was monitored by serial photography and image analysis.
Results & Discussion: Fentanyl exposure resulted in a dose-dependent faster would-healing rate whereas exposure to morphine resulted in dose-dependent scratch expansion.

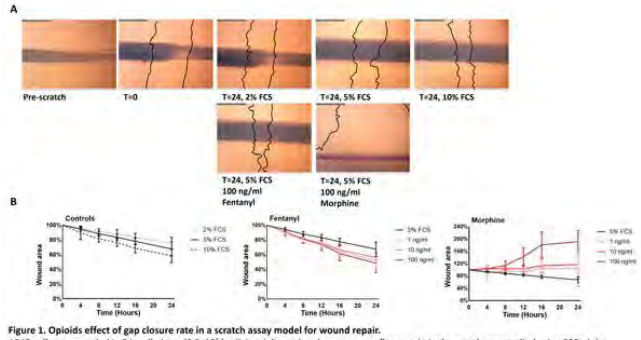

Figure 1. Opioids effect of gap closure rate in a scratch assay model for wound repair.
A549 cells were seeded in 24 well plates ($0.2x10^5$/well, in triplicates) and grown to confluence. A single scratch was applied using 200ml tip. Media was replaced with DMEM 5% FCS (unless states otherwise) with or without varying concentrations of morphine or fentanyl. Scratch site was photographed at indicated times and images analyzed by Digimizer software. **(A)** representative images from cell cultures at pre-scratch time, right after scratch (T=0) and at 24 hours after scratch (T=24). *Black* indicates scratch border. **(B)** Graphic representation of gap closure rate as % of wound area at T=0. Mean±SEM.

While morphine exposure effects well coincide with its described immunosuppressive effect, fentanyl exposure results are surprising considering that both drugs are suggested to elicit effects via the same receptor. Taken together, these results suggest the existence of other opioid-related pathways yet to be revealed.
While anesthetists and ICU doctors give great consideration to a multitude of physiological aspects when choosing opioids for analgesic purposes, little consideration is given to effects on wound healing and the wound environment. These results suggest that these effects may vary dramatically with possible profound implications for clinical practice, especially in surgical anesthesia and ICU recovery context.
Conclusion(s): Great discrepancies exist in the wound-healing effects of morphine and fentanyl, suggesting the existence of more elaborate and complicated pathways with possible implications for surgical anesthesia and ICU care.

01AP13-07
Relationship between intraoperative nociception and occurrence of postoperative pain

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Background and Goal of Study: Intraoperative assessment of nociception to optimize anaesthesia management is not widely established in daily clinical practice [1]. The effect of intraoperative pain perception on acute postoperative pain experience has already been investigated in some studies, but the effect on chronic postoperative pain has not been sufficiently illuminated [2].
Therefore, the aim of this study was to examine the influence of intraoperative nociception on immediate postoperative, but also on chronic pain perception.
Materials and Methods: A total of 40 patients could be included in this prospective, monocentric observational study. Intraoperative nociception (PMD-200™, Medasense, blinded) was measured during head and neck tumor surgery using defined painful index events (intubation, skin incision, tracheostomy).
On postoperative day 1 and 4, pain scores were recorded in all patients using a questionnaire (SF-MPQ). A telephone survey on chronic postoperative pain was conducted 6 months postoperatively. Statistical analysis was performed with SPSS® using the Spearman test.
Results and Discussion: On day 1 following surgery, the intraoperative NOL (Nociception Level Index) values were correlated with the quality of pain as well as with general pain intensity (correlation coefficient >0.3).
On day 4, this association was no longer detectable and patients reported only mild pain on average (Numeric Rating Scale (NRS) 2-3). 6 months after surgery, there was no correlation between intraoperative NOL values and the incidence of chronic postoperative pain.
Conclusion(s): Intraoperatively assessed higher NOL values may have an impact on acute postoperative pain perception. In contrast, pain levels on postoperative day 4 and chronic postoperative pain in our study cohort experience do not seem to be associated with the intraoperative nociception level.
References:
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01AP13-10
Dexmedetomidine effect on postoperative stress and pain response to patients undergoing pelvis osteosynthesis surgery under general anaesthesia

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Background and Goal of Study: Dexmedetomidine (Dex) sedative and analgetic effects might be desirable for hemodynamically stable adult polytrauma patients undergoing surgery since those often present significant stress response with anxiety, tachycardia, opioid hyperalgesia and emotional distress.
The goal was to evaluate the effect of Dexmedetomidine on postoperative stress and pain response in patients under general anaesthesia after pelvis osteosynthesis.
Materials and Methods: In prospective trial stable patients undergoing pelvis osteosynthesis with general anaesthesia were included. Patients in a single-blinded way were randomly assigned to general anaesthesia (GA) with Phentanyl (Ph-GA) or Phentanyl with Dexmedetomidine (Ph-DEX-GA) groups. Ph-DEX-GA group received Dex 1 mcg/kg over 10 min after intubation, followed by a continuous infusion 0.4 mcg/kg/h until the end of surgery. Ph-GA group received standard approach without Dex. Additional Phentanyl was adjusted based on BIS monitoring, keeping Sevoflurane level MAC 0.8-1.
Cortisol, Il-6 and CRP plasma levels after intubation and 24 h postoperatively were detected to analyse postoperative stress response. Pain intensity with NRS was analysed 24 hours postoperatively.
Primary outcome was to analyse postoperative stress response.
Secondary - total Phentanyl dose during surgery and pain intensity was evaluated 24h after surgery. $P < 0.05$.
Results and Discussion: Preliminary results of 18 patients: Ph-GA (n=9), Ph-DEX-GA (n=9) with mean age 51.5 ± 9.9 years were collected in Riga East University Hospital, Latvia. Mean duration of surgery (244 ± 91 min) and mean duration of anaesthesia (314 ± 99 min) in both groups were similar.
We observed that cortisol plasma level increased in Ph-GA group by +16% (MD 2.08) and decreased in Ph-DEX-GA by 4% (MD 0.6). Il-6 and CRO increased in both Ph-GA and Ph-Dex-GA groups similarly with MD 81.4 and 91.9 for Il-6, and with MD 36.4, and 27.4 for CRO.
Pain intensity at rest was similar during all analysed time points Ph-GA vs. Ph-Dex-GA: T0 2.4 vs. 2.6, T6 2.9 vs. 3.4, T12 2.8 vs. 3.2, T24 2.6 vs. 2.9, despite the fact that total phentanyl dose during surgery was lower in Ph-DEX-GA group 0.28±0.1 mg vs. 0.7±0.2 ml; p=0.3.
Conclusion(s): Dex for general anaesthesia may have an impact to reduce postoperative stress response and it provides good analgesic effect, reducing phentanyl consumption during general anaesthesia for pelvis osteosynthesis surgery patients.

01AP14-01
Anaesthetic management of a patient with glucose-6-phosphate dehydrogenase deficiency undergoing cochlear implant surgery - a case report

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Background: Glucose-6-phosphate dehydrogenase deficiency (G6PD) is a recessive hereditary disease linked to the X chromosome. It can lead to acute hemolysis episodes from exposure to oxidative drugs[1].
Even though it is the most common enzymatic deficiency, not much information is available in the literature regarding the anaesthesia approach to patients with this disease[2,3].
Given that drugs with hemolytic potential such as certain antibiotics, non-steroidal anti-inflammatory drugs, local anaesthetics and analgesics such as paracetamol are regularly used in surgical-anaesthetic procedures, it is essential that they be avoided in any anaesthetic approach to patients such as this.
Case report: Male, age 24, 53kg, with a history of G6PD deficiency and secondary cerebral palsy and hiperbilirrubinemic encephalopathy. No record of previous anesthetic procedures. To undergo cochlear implant surgery. The surgical procedure occurred under general intravenous anesthesia using a Target Controlled Infusion (TCI) of remifentanil and propofol. Morphine was administered for analgesic purposes.
Neuromuscular block maintained with rocuronium and reverted at the end of the procedure through administration of sugamadex. ASA standard monitorization. Successful pain relief and no postoperative nausea. Patient was discharged without occurrences.
Discussion: The anaesthesia approach to G6PD deficient patients must avoid oxidative stress generating drugs and reduce the effects of surgical stimulation with use of appropriate analgesic methods and optimal ventilation, so as to reduce acidosis and hemolytic effects triggered by hypercapnia.
Additional monitorization of the latter may be an option, namely by use of an arterial catheter. Furthermore, perioperative monitoring for erythrocyte lysis is essential. Total intravenous anaesthesia with propofol and remifentanil has proven effective and safe for G6PD deficient patients. We are unaware of any mention in the literature of a similar approach to this procedure.
References:
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2. Indian J Anaesth. 2011 Jan;55(1):68-70.
3. J Med Cases. 2019 Oct;10(10):293-295.
Learning Points: The anaesthesia approach to G6PD deficient patients must avoid oxidative stress generating drugs and reduce the effects of surgical stimulation. Perioperative monitoring for erythrocyte lysis is essential. Total intravenous anesthesia with propofol and remifentanil has proven effective and safe for G6PD deficient patients.

01AP14-02
Inverted TakoTsubo cardiomyopathy following a laparoscopic surgery

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Background: Takotsubo cardiomyopathy (TKM) is an acute heart failure (AHF) characterized by transient alterations in the contractility of the left ventricular (LV) wall secondary to sympathetic overstimulation 1). The prevalence is around 1%.
Case report: A 40-year-old female obese patient underwent a scheduled laparoscopic cholecystectomy in which the manipulation of meso led to bradicardia. The need of atropine produced tachycardia up to 140 beats per minute and a hypertensive crisis correctly controlled. Prior to extubation reddish frothy secretions were observed through the orotracheal tube with bilateral moist crackles.
Suspecting acute pulmonary edema (APE), furosemide was administered and she was transferred to the Anesthesia Intensive Care Unit (ICU-A), presenting dyspnoea as only symptom. The chest X-ray revealed APE and the transthoracic echocardiogram (TTE) showed midbasal hypokinesia of the LV wall with apical hyperkinesia compatible with reversed TKM. During the first 24 hours of continuous monitoring diuretics were prescribed. In the control ECG decreased T waves and prolonged QT interval were observed. The patient was discharged from ICU-A 48h after admission to a telemetry ward, where the ECG changes normalized.
Discussion: We find several triggers of TKM as preoperative anxiety or the surgical act itself (pneumoperitoneum, meso manipulation or intraoperative drugs). On the basis of an increased susceptibility to catecholaminergic toxicity in midventricular regions, our patient suffered a cardiac stunning ending in AHF and causing APE. This heart condition was diagnosed by bedside TTE, compatible with reverse TKM, which is the less frequent variant of the syndrome.
Since the patient did not have typical central thoracic pain, no alterations in the ST segment and the InterTAK score was >70 points, a high probability of TKM could be assumed and no coronary angiography was needed.
References:
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Learning points: TKM is a rare syndrome but it has to be taken into account as a differential diagnosis of acute LV failure in patients subjected to surgical stress and administration of sympathomimetic drugs. As noveltys, we consider this case an example of the importance to perform point of care ultrasound, which offers dynamic images in real time, help to make a quicker diagnosis of a rare variant of the TKM and the possibility of avoiding coronary angiography.

01AP14-03
Beating the odds: successful total hysterectomy in a patient with low Ejection Fraction using epidural anesthesia

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Background: Anesthetic management of patients with dilated cardiomyopathy (DCM) is a challenge due to poor left systolic function, risk of malignant arrhythmias and sudden cardiac death. Anesthesia goals include maintaining forward flow by preserving normovolemia, decreasing afterload, and avoiding myocardial depressant drugs.[1]
Case report: A 41-year-old woman with a personal history of DCM was admitted to the hospital with shortness of breath and orthopnea. The electrocardiogram revealed left bundle branch block and echocardiography showed severe dilatation of the left ventricle with an estimated ejection fraction (EF) of 10% and moderate to severe mitral regurgitation.
During the hospitalization, due to metrorrhagia and abdominal pain, imaging exams were made and a pelvic mass suspicious of leiomyosarcoma was detected. She was proposed to total hysterectomy and bilateral salpingectomy.
In a multidisciplinary discussion with cardiology and gynecology, it was decided to proceed with the surgery and preoperative levosimendan infusion was initiated. Noradrenaline (NA) was required to balance its vasodilator effects. An epidural catheter was inserted (T12-L1 level) and graded epidural doses of ropivacaine 0.75% were administered under vigilant monitoring. A total of 8mL was required to achieve T6 sensory block dermatome level. NA infusion was maintained intraoperatively with hemodynamic stability. The rest of the surgery went uneventful. The patient was transferred to the intermediate care unit for clinical monitoring.
Discussion: The major anesthetic concern in our patient was maintenance of hemodynamic parameters. In general anesthesia, airway instrumentation leads to sympathetic stimulation and use of anesthetic agents can lead to hypotension. Epidural decreases stress response to surgery and reduces afterload, increasing left ventricular forward flow and cardiac output. Compared with spinal anesthesia, epidural anesthesia with incremental low doses of local anesthetic drugs avoids hypotension and provides postoperative analgesia.
References:
1. Chen, CQ et al. “Anesthetic management of patients with dilated cardiomyopathy for noncardiac surgery”. Eur Rev Med Pharmacol Sci (2017)
Learning points: Management of patients with low EF is a challenging condition for anesthesiologists due to its associated complications and risks. Graded epidural anesthesia was a safe alternative with multiple advantages that allowed us to maintain hemodynamic stability.

01AP14-04
Percutaneous stereotactic radiofrequency ablation of a paraganglioma below aortic bifurcation in a patient with cyanotic congenital heart disease. Case report

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Background: Cyanotic congenital heart disease (CCHD) present with systemic hypoxemia and hypoxia, has diverse multisystem effects. In the last decade, scientists hypothesized that exposure to chronic hypoxia in CCHD would increase the risk for developing pheochromocytoma and paraganglioma(PGL)[1].
Case Report: 26-year-old female, ASA P4 complex congenital heart disease (cardiac isomerism, total atrioventricular septal defect, pulmonary valve stenosis, single aortic valve) undergoing elective stereotactic radiofrequency ablation (SRA) for asymptomatic PGL inferior to the aortic bifurcation.
The procedure was performed under general anesthesia, followed by left radial artery catheter and central venous catheterization. The surgery had 4 cycles of SRA, in each cycle presented with release of catecholamines, there was need to increase nitroglicerin until it peaked 6 mcg/kg/min, associated with intermittent bolus of 20 mcg nitroprussiate, reaching a total of 1000 mcg. Also, due to increase in cardiac frequency, the use of 25 mcg esmolol. In a short time, noradrenaline 0,05 mcg/kg/min was used. The patient only experienced pressure lability during the ablation. After the procedure a normal pressure was achieved without any drugs.
Three days after the procedure, the patient complained of abdominal pain, refractory a common analgesics, CT scan shows extensive pneumoperitoneum. An urgent exploratory laparotomy was performed, during the intraoperative period, pressure liabilities were not observed, and a small burn injury at the ileum was found. Enterectomy and anastomosis were successfully performed. Patient had a full recovery after these procedures.
Discussion: A SRA for PGL is a challenge for anaesthesiologists, as it increases the periods of catecholamine release in large amounts. In this case there were 4 key moments of catecholamine release. Bearing in mind that it increases the risk of acute myocardial infarction, stroke, hypoglycemia, arrhythmias, cardiomyopathy [2].
References:
1. J Clin Endocrinol Metab. 2015 Apr;100(4):1325-34.
2. J Clin Hypertens (Greenwich). 2002 Jan-Feb; 4(1): 62–72.
Learning Points: CCHD associated with paraganglioma is a rare disease, with difficult perioperative care. The need to use high dose of vasopressors to stabilize the blood pressure during SRA was important as it would worsen the pulmonary circulation. Planning was the key to successful perioperative management.

01AP14-05
Anaesthesia management of the mine-blast injury to the brachial artery: a case report

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Background: In the period from February 24 to March 31 2022,296 patients with mine-blast and gunshot wounds were admitted to the Kyiv regional clinical hospital.75% from them were civilians and 25% were in camouflage. Among the civilians 8% had damage to the main vessels (subclavicular, femoral and upper extremities). Most of them were in severe hemorrhagic shock.
Some patients had cardiac arrest even at the pre-hospital stage in the ambulance. In 3 cases cardiac arrest occurs when access to damage vessels was obtained. Here is an example of the one positive result of treatment.
Case report: Patient M,56 years old,was admitted to the hospital with a diagnosis of mine-blast injury combined shrapnel damage to the lower limbs, back, lower back, upper limbs with damage to the left brachial artery without injury to left the brachial vein. The patient was transported by an ambulance 20 minutes after the injury. The patient is a civilian, not a military officer.
At the time of admission, patient's condition was serious, caused by significant blood loss and a state of shock. Pulse was -120 per min, blood pressure 80/40 mm.Hg, SPO2-96%. The initial management of the patient was conducted according to the principles of the advanced trauma and life support (ATLS) guidelines for trauma management and damage control resuscitation.
Primary survey, EKG, X-rays of thoracic, abdominal cavity, extremities, Pocus and Fast protocol, point of care laboratory IV access. There were no special deviations except for the level of hemoglobin 75g\l.Transfution of blood components were initiated at the emergency department.35 minutes after patient's stabilization he was transvered to the surgery room. Surgery was performed with revision of the wound, stopping of arterial bleeding, saphenous vein bypass graft to the left brachial artery. The total time of the tourniquet on the limb to the start of the surgery was 1 hour.
Discussion: By taking to consideration the nuances of the correctly stabilization of the patient, anesthesiology monitoring and surgical intervention it gives a great chance to save the limb and life to the patient.
References:
1. Zellweger R, Hess F, Nicol A, et al. An analysis of 124 surgically managed brachial artery injuries. *Am J Surg.* 2003;188:240–245.
2.Yavuz S, Tiryakio_lu O, Celkan A, et al. Emergency surgical procedures in the peripheral vascular injuries. *Turk J Vasc Surg.* 2000;1:15–20.
Learning points: Damage control resuscitation and team work are bringing succes.

01AP14-06
The dynamics of atrial sept defects and anesthesia – a case report

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Background: Atrial septal defect (ASD) is a common congenital heart defect (CHD) and may be encountered in patients presenting for anesthesia. The flow mechanism is predominantly a left to right shunt with long-term maladaptive changes in untreated patients.
General anesthesia affects systemic vascular resistance (SVR) and pulmonary vascular resistance (PVR), altering the flow dynamics of the shunt, with increased risk of hypoxic shunt phenomenon and paradoxical embolisms. Perioperative morbidity and mortality risk is particularly high in emergent cases.
Case Report: A 70-year-old women presented at the Emergency Department with a cervical hematoma. The patient had an uncorrected ASD as well as dilated cardiomyopathy, heart failure with ejected fraction of 29%, and pulmonary hypertension. Anesthetic approach included preemptive placement of an arterial line for a reliable hemodynamic monitoring and a central venous access for administration of vasoactive drugs.
Noradrenaline perfusion was started previously to the induction of general anesthesia. Special care was taken to avoid air embolism via intravenous lines. General anesthesia was induced with etomidate and maintained with sevoflurane. Mechanical ventilation was performed with a tidal volume of 6mL/kg and a positive end-expiratory pressure of 5cm H_2O. The inspired fraction of oxygen wad titrated to the minimum necessary. The procedure occurred uneventfully. Postanesthetic care was successfully assured by a cardiology intensive care unit.
Discussion: Anesthetic care of patients with left to right shunts requires strict management as to minimize physiologic changes in SVR and PVR - the cornerstone to avoid right to left shunt and its complications.
An emergent scenario prevents further investigation and optimization of the patient's condition. Anesthetic agents with a more stable cardiovascular profile such as etomidate is preferred. Avoiding hyperoxygenation and hyperventilation as well as protective lung ventilation promotes hemodynamic stability.
References:
- DOI: 10.1097/ACO.0000000000000849
- DOI: 10.1097/ACO.0000000000000468
Learning Points:
- Untreated CHD frequently have a high risk perioperative morbidity and mortality, particularly in emergent cases.
- Avoiding right to left shunt is essential to minimize complications. Therefore, knowing the physiology of the shunt is crucial to guide clinical decisions.

01AP14-07
Expect the Unexpected

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Background: Chiari malformation encompasses 4 different types of craniocervical junction malformations with downward dislocation of the cerebellar structures and associated anomalies[1,2,3].
Chiari type 1 malformation (CM1) is a congenital condition characterized by abnormally cerebellar tonsils herniation (> 5 mm) below the foramen magnum[1].
The most frequent symptoms are dizziness and occipital headaches. 30% remain asymptomatic[3].
We report an incidental finding of CM1 after general anesthesia (GA).
Case report: A 64-yr-old female was admitted for a bronchoscopy under GA due to chronic cough. She had hypoacusia, sleep apnea, poorly controlled hypertension and diabetes type 2, class 1 obesity, dyslipidemia, HCM and CKD stage IIIa.
Airway evaluation revealed no signs of difficult airway management and she was classified as ASA PSIII. Under standard ASA monitoring with BIS and TOF, GA started with a TCI of propofol, rocuronium, dexamethasone, and lidocaine.
After Sugammadex administration, neuromuscular block was assessed with full recovery and the LMA i-gel removed. During the 40 min procedure, she remained hypertensive. At PACU she felt dizziness and presented an ataxic gait.
Neurologic observation noted bilateral horizontal torsional nystagmus and positive Romberg sign. Emergent CT showed a herniation of the cerebellar tonsils. The patient was discharged by Neurology after 3 days without symptoms.
Discussion: CM1 is a congenital condition estimated to be present in 1:1000 or 5000. Our patient had leading risk factors for heart disease and stroke, and symptoms that were consistent with an acute cerebral event or space occupying lesion, but CT was diagnostic of CM.
Probably the neck's hyperextension, increased the pressure of the bony edges of the foramen magnum[2] and the already impacted neural elements suffered additional compression, leading to these acute symptoms.
Retrospectively, hypoacusia and sleep apnea[3] might be related with evolving characteristics of CM1. A literature search reveal no cases of incidental CM1, diagnosed postoperatively after an uneventful GA.
References:
1. Anesth Pain Med (2012), 7, 166-169
2. J. Emerg Med, 30(3), 295–298
3. Am. J. Otolaryngol., 23(2), 99–104
Learning points: If previously diagnosed, a different anesthetic approach would be expected, namely difficult airway, autonomic dysfunction, prevention of an increase in intracranial pressure and abnormal sensitivity to neuromuscular blockade[1].

01AP14-08
Diagnosis of Pseudocholinesterase Deficiency during electroconvulsive therapy – a case report

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Background: Succinylcholine (Sch) is disappearing from our current practice but it still is the most used neuromuscular blocking agent (NMBA) for electroconvulsive therapy (ECT) 1 , a procedure in which depth of anesthesia and neuromuscular block is often based on observation, making clinical suspicion of Pseudocholinesterase Deficiency (PD) a hard task.

Case report: A 34-year-old female, healthy, irrelevant anesthetic personnel or family history, 60kg, presented to the first of a serie of twelve ECTs in the context of a pharmacotherapy-resistant schizophrenia. Continuous electrocardiography and heart rate, pulse oximetry and blood pressure were monitored.

General anesthesia was induced with Propofol 80mg followed by 60mg of Sch. ECT was administered producing a convulsion lasting 22 seconds and an electrographic seizure lasting 29 seconds. After the seizure, 24 minutes passed until motor function was fully recovered, during which the patient was mildly tachycardic and hypertensive. The possibility of PD was considered. BIS monitor values, then applied, were 55-65 until the anesthetic emergence. Neurostimulator was malfunctioning.

Ventilation was maintained resorting a face mask. Brice Interview didn't point to awareness. Laboratory work revealed a serum cholinesterase level of 3745U/L (5320 – 12920 U/L). Enzyme activity measurement, dibucaine number, wasn't available. Subsequent ECTs were performed with Rocuronium and spontaneous ventilation was immediately resumed after Sugammadex.

Discussion: Based on its rapid onset and short duration of action Sch is the most used NMBA for ECT. But Sch problems did not vanish. It has a significant number of contraindications, serious side effects, risk of malignant hyperthermia and unpredictable paralysis duration, as a result of genetic pseudocholinesterase variability.

Dibucaine number is frequently not available and cholinesterase level alone does not translate to function. Most important, there are safer, although costly, alternatives.

Diagnosis of PD can be a difficult task during ECT because it can be masked by the sympathetic response triggered by the seizure, the post ictal state and the BIS value not corresponding to the patient's level of consciousness[2].

References:

1. https://doi.org/10.3390/life11090981;
2. https://doi.org/10.1093/bja/88.2.184

Learning points:

-Rocuronium-sugammadex seems to be a legitimate alternative to Sch.

-Use of neuromuscular block monitorization should be routinely used during ECT.

01AP14-09
Pitt-Hopkins syndrome: an anesthetic challenge. A case report

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Background: Pitt-Hopkins syndrome (PTHS) is a rare neurodevelopmental disorder, characterized by intellectual disability, specific facial features, and marked autonomic nervous system dysfunction, especially with disturbances of regulating respiration and intestinal mobility. These abnormalities may present challenges to the anesthesiologist.

There are almost no cases of anesthetic management described for PTHS, and we believe this is the first report in the literature of anesthesia about an adult person with PTHS.

Case report: A 34-year-old female undergoing surgical hip fixation, with PTHS causing severe intellectual disability with absent speech, agitation, chronic constipation and bilateral amaurosis. No breathing regulation anomalies, but predicted difficult airway.

We used combined anesthesia technic with general anesthesia and peripheral block of femoral and lateral femoral cutaneous nerves. No neuromuscular blocking agent or opioids were used. Airway was secured with a laryngeal mask. She was hemodynamic stable all times with unremarkable postoperative course, with early mobilization, low pain scores. No seizures, gastrointestinal problems, breathing issues or behavior alterations were reported.

Discussion: In this case none of the expected complications associated with PTHS occur and the perioperative management was linear. Because of PTHS characteristics, difficult airway management, seizures, aspiration, constipation were potential risks in this patient. Poor quality of emergence is also a problem reported. Parents perspective regards to their child's history of medications and reactions when devising an anesthetic plan is considered an asset.

References:

Bryan YF, et al. Survey of parents' perception and perspective on airway and anesthetic management in their children with Pitt Hopkins syndrome: Mapping out their clinical care odyssey. Anaesth Pain & Intensive Care 2018;22(2):155-160

Zollino M, et al. Diagnosis and management in Pitt-Hopkins syndrome: First international consensus statement. Clin Genet. 2019;95: 462–478. https://doi.org/10.1111/cge.13506de

Winter CF, et al. Phenotype and natural history in 101 individuals with PittHopkins syndrome through an internet questionnaire system. Orphanet J Rare Dis. 2016;11:37.doi:10.1186/s13023-016-0422-2

Learning points: He hope to strengthen the data available concerning PTHS for anesthetic approach, which might help develop specialized protocols for improved patient-centered care.

01AP14-10
Continuous spinal anaesthesia in a patient with heart failure with reduced ejection fraction: a case report

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Background: Heart failure with reduced ejection fraction (HFrEF) is associated with a high risk of perioperative morbidity and mortality. Anesthetic management is challenging and the major goal is to maintain perioperative hemodynamic stability. Evidence regarding the safety of anesthetic management of patients with HFrEF is lacking.

Continuous spinal anesthesia (CSA), an underutilized technique, allows titration of reduced local anesthetic (LA) doses and is associated with fewer hemodynamic changes and adverse effects than other neuraxial techniques while maintaining adequate sensory and motor block.

Case report: A 74-year-old man , ASA IV, with ischemic dilated cardiomyopathy with low ejection fraction (EF 37%), class IV heart failure (NYHA), presented with left trochanteric femur fracture for hemiarthroplasty. His medical history also included severe mitral regurgitation, an implanted CRT-D, hypertension, dyslipidemia, type 2 diabetes Mellitus and stage 3 chronic kidney disease.

The patient was monitored with ASA standard monitorization and placement of an left radial arterial line. Dural puncture was made at the L4-L5 level, using a 21G needle, and the catheter was inserted 3cm intrathecally. An initial dose of 2,5mg of 0,1% levobupivacaine and 2,5μg of sufentanil was given through the catheter.

During the procedure, another dose of 0,5mg levobupivacaíne 0,1% was administered. Perioperative hypotension was treated with norepinephrine infusion, titrated to a maximum of 6,66μg/min for medium arterial pressure >65mmHg. The surgery lasted for 60 minutes, without any apparent complications.

At the end of the surgery, the intrathecal catheter was removed. The patient was comfortable and hemodynamically stable, with no vasoactive support, and was transferred to the coronary intensive care unit for postoperative care. There were no postoperative side effects reported.

Discussion: Careful anesthetic planning is required to minimize the high risk of perioperative morbidity and mortality associated with HFrEF. While the evidence is scarce, CSA has been reported to provide adequate sensory and motor block and hemodynamic stability.

Although underutilized, CSA is a safe and effective anesthetic technique for the management of patients with HFrEF.

Reference:

Mulugeta, H. et all (2020) Local and Regional Anesthesia, Volume 13, 135–140.

Learning points: While unpopular, CSA is a safe and effective anesthetic technique for the management of patients with HFrEF.

01AP14-11
Non-cardiac surgery after recent coronary stenting

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Background: 6 months after PCI (percutaneous coronary intervention), 3,5% of the patients will be submitted to NCS (non-cardiac surgery), and incidence of ischemic events is inversely proportional to the gap between them. The preferred management is to delay elective NCS until completion of DAPT (dual antiplatelet therapy).

It is different in patients who need time sensitive NCS. SPA (Portuguese Society of Anesthesiology), ESC (European Society of Cardiology) and other scientific societies differ in this topic.

Case Report: 69-years-old men, ASA III, scheduled for radical gastrectomy with Roux-en-Y reconstruction. He had coronary disease (stable angina) and undergone angioplasty with DES (drug-eluting stent) exactly 1 month before. Also had type 2 diabetes, hypertension, dyslipidemia, and obstructive sleep apnea. He was under DAPT (aspirin and clopidogrel), statin, bisoprolol, antihypertensives and oral antidiabetics. From the PCI, he had no more anginal complaints.

Arterial line was placed and performed a balanced general anesthesia (maintenance with sevoflurane and remifentanyl). Monitoring with ASA standards, TOF ratio, BIS® and urine output. No perioperative complications were observed.

Discussion: For ESC, shortening DAPT to 1–3 months after implantation of DES is associated with acceptable rates of adverse cardiovascular events and stent thrombosis in low- and moderate-risk patients. They recommend delaying time sensitive NCS (ex: malignant neoplasms) until 1 month of DAPT.

For SPA the thrombotic risk is very high 3-6 months after implantation of DES and 1 month after bare metal stent.

It is fundamental to continue aspirin (if bleeding risk allows), statins and beta-blockers, and to weigh the risks of stent thrombosis, hemorrhage, and underlying disease.

From anesthesiology's point of view, the doubt remains: when to perform non-cardiac surgery after recent coronary stenting.

References:

1. NR S, JS B. Perioperative Cardiovascular Risk Assessment and Management for NCS: A Review. JAMA. 2020;324(3).
2. *Recomendações da SPA para manuseio perioperatório dos doentes medicados com anticoagulantes e antiagregantes*. 2014.
3. ESC Guidelines on cardiovascular assessment and management of patients undergoing NCS. 2022.

Learning Points: Multidisciplinary work (anesthesiology, cardiology, and surgery) is critical to decide the optimal timing for non-cardiac surgery after PCI and the pre-operative optimization.

01AP14-12
Central venous catheterization - which challenges in patients with head and neck tumors?

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Background: The need for central venous catheterization can result from difficult or poor peripheral access, administration of long-term drug and infusion of irritant drugs and vasopressors.[1]

Case report: A 44-years-old women, ASA IV, with esophagus squamous cell carcinoma with lymph node metastasis and food intolerance under chemotherapy underwent a Witzel feeding jejunostomy. On the 3rd postoperative day, the patient was in hypovolemic and septic shock due to gastro-intestinal occlusion and peritonitis, requiring revison of the jejunostomy under balanced general anesthesia.

Due to the patient condition, it was decided to catheterize the right internal jugular vein with ultrasound guidance. After multiple attempts, the the guidewire didn't progress along the vein, and the common carotid artery was punctered.

Due to partial respiratory failure, the patient was admitted intubated in ICU, where the left femoral vein was catheterized.

On the same day, the patient uderwent a cervicothoracic CT-scan which revealed an extensive esophageal neoformative lesion in the cervicothoracic transition, promoting invasion of underlying structures, leading to occlusion of the internal jugular vein.

Discussion: Choosing the most appropriate anatomical site for central venous catheter insertion depends on many factors including the indication, contraindications, previous line insertion sites and intended duration of use[1].

In cases of head and neck tumors can exist internal jugular vein occlusion by tumor invasion besides the high risk of vascular thrombosis and stenosis common to other tumors[2].

The multiple attempts result in an iatrogenic complication.

References:

1. Lockwood J, Desai N. Central venous access. Br J Hosp Med (Lond). 2019 Aug 2;80(8):C114-C119. doi: 10.12968/hmed.2019.80.8.C114. PMID: 31437056.

2. Saugel B, Scheeren TWL, Teboul JL. Ultrasound-guided central venous catheter placement: a structured review and recommendations for clinical practice. Crit Care. 2017 Aug 28;21(1):225. doi: 10.1186/s13054-017-1814-y. PMID: 28844205; PMCID: PMC5572160.

Learning points:

The use of ultrasound reduce the number of complications and to increase the safety and quality of central venous catheter placement[1,2].

We should predict a difficult jugular internal vein catheterization in patients with advanced head and neck tumors.

Ambulatory Anaesthesia

02AP01-01
Acute pulmonary edema in electroconvulsive therapy. Use of short acting drugs as preventive measure

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Background: Electroconvulsive therapy (ECT) can be a lifesaving treatment in some psychiatric disorders. Acute pulmonary edema (APE) is an infrequent but highly mortal complication among mayor cardiac events after ECT. The incidence of APE is reported to be 1.5 per 1,000 ECTs (1).

Case report: A 75-year-old man with major refractory depression was scheduled for ambulatory ECT. It was his 13th session with no previous complications. His medical history included hypertension, diabetes, dyslipidemia, previous APE, dilated myocardiopathy with severe systolic dysfunction of left ventricle, incomplete left bundle branch block and moderate COPD.

ECT was performed under general anesthesia. After the procedure the patient started with agitation, dyspnea, belly breathing, desaturation, hypertension and tachycardia. Intubation was required. Foamy pinky secretions came out through the endotracheal tube despite of the treatment received. An CT angiogram was performed. Pulmonary embolism was discarded, signs compatible with APE were observed.

The patient was admitted to the ICU. The echocardiogram highlined a dilated left ventricle and ejection fraction of 45% due to diffuse hypokinesia. He was extubated during the first 24 hours. Up to four different antihypertensives were necessary for an adequate arterial pressure control. The patient was discharged after five days.

Discussion: Excess catecholamines are associated with increased vascular permeability, contributing to APE development (2). As ECT incidence increases, anaesthesiologists will be required to better understand the physiological changes, complications and pharmacological actions of adjuvant drugs related to this procedure.

Cardiovascular stress could be prevented by administration of short acting drugs such as esmolol, nitroglycerin or dexmedetomidine.

References:

1. Duma A et al. Major adverse cardiac events and mortality associated with electroconvulsive therapy: A systematic review and meta-analysis. Anesthesiology.2019;130(1):83–91.

2. Bryson EO et al. Individualized anesthetic management for patients undergoing electroconvulsive therapy: A review of current practice. Anesth Analg.2017;124(6):1943–56.

Learning points: Prevention of hypertensive crisis with short acting drugs in selected patients could minimize the risk of developing APE after ECT. There are lack of studies comparing different medications regarding this issue. Updated investigations following this line would be of great interest.

02AP01-02
Propofol induced seizure-like phenomena in a young female patient after procedural sedation

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Background: Due to rapid onset and short acting hypnotic effects propofol is widely used in procedural sedation. Despite anticonvulsant properties, its rare side effect are seizure like phenomena (SLP) consisting of generalized tonic-clonic seizures, focal motor seizures, increased tonus with twitching and rhythmic movements, opisthotonos and involuntary movements[1].

We present a case of propofol–induced delayed-onset seizures resistant to antiepileptic therapy.

Case report: An 18-year-old woman was scheduled for colonoscopy under sedation. Besides GI symptoms her medical history included knee surgery. No history of epilepsy, drug abuse or recent infection was reported. A total of 200mg of propofol was used over 30 minutes.

Half an hour after emergence from anaesthesia the patient experienced generalized seizure-like movements lasting 10-30 seconds. Over 15 episodes of involuntary movements of similar duration followed in the next hour. In-between seizures the patient was awake. She received a total of 30mg of diazepam iv with no effect on duration or recurrence of seizures. Another 10-15 seizure episodes occurred in the next 12 hours, despite antiepileptic therapy with levetiracetam 1000mg iv. She was admitted to the Neurological ICU until the next morning with no further seizures.

Discussion: Propofol effects on CNS include decreased cerebral blood flow and metabolic rate[2] but there have been reports of its proconvulsant properties[3].

Some systematic reviews have concluded that this phenomenon tends to occur during changes in cerebral concentration of propofol. Dramatic clinical presentation of this complication is associated with increased medical costs since most of the patients are subsequently admitted to ICU.

References:

1. Walder B, Tramèr MR, Seeck M. Seizure-like phenomena and propofol: a systematic review. Neurology. 2002 May 14;58(9):1327-32.

2. Tobias JD. Propofol: Effects on the Central Nervous System. Journal of Intensive Care Medicine. 2000;15(5):237-246.

3. Fernando SM, Fitzpatrick T, Hurdle H. et al. Recurrent non-epileptiform seizure-like phenomena secondary to propofol administration. Can J Anesth/J Can Anesth.2017(64), 783–785.

Learning Points: Seizure like phenomena is a rare and dramatic, albeit self-limiting side effect of propofol which often leads to unplanned and prolonged hospital stay and diagnostic resource utilization. Further research is needed to elucidate all propofol effects, due to its widespread use in clinical practice.

02AP01-03
Anesthetic management of a child with Cohen syndrome in outpatient surgery

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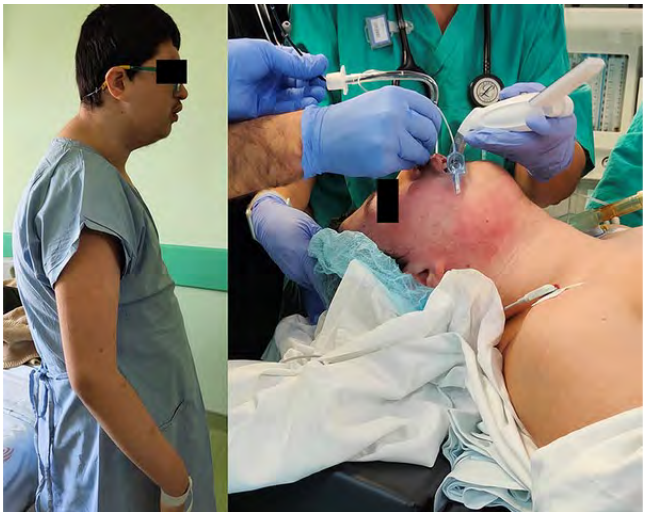
Background: Cohen syndrome is a rare autosomal recessive genetic disorder caused by mutation of VPS13B gene[1]. It leads to mental deficiency, truncal obesity, hypotonia, limb and craniofacial abnormalities which can be very challenging for the anaesthesiologist[2].
Case report: A 16-year-old male child with Cohen syndrome was referred to dental reconstruction under general anesthesia on day surgery. Pre-operative evaluation revealed mental deficiency and at physical examination kyphoscoliosis, maxillary hypoplasia, truncal obesity and hypotonia. Airway evaluation with prominent upper central incisors, micrognatia, short neck, small mouth and Mallampati score 3. Pre-operative exams without alterations. Before induction, nasal topical anesthesia with lidocaine 1% and phenylephrine was given. General balanced anesthesia was performed and there was no difficulty in mask ventilation. Intubation was performed using videolaryngoscopy (McGrath™ MAC X3 blade) with flexible fiberoptic bronchoscopy simultaneously and airway was secured with a 6.0mm nasal RAE tube. Surgery lasted 2h30 and sugammadex 100mg was administered at the end. Extubation was performed with the patient fully awake without complications. Post-operative follow-up occurred during 6h, with discharge after that.



Discussion: Anesthesia and airway management of Cohen's syndrome can be very difficult. The importance of preparation and planning how to secure the airway was critical to a good outcome in this case. Despite the airway was secured with videolaryngoscopy, the presence of flexible fiberoptic bronchoscopy guaranteed an alternative plan immediately available in an outpatient surgery facility far from other resources.
References:
1. Ishikawa, Emi et al. (2022); https://doi.org/10.17245/jdapm.2022.22.2.155
2. Rodrigues, Jonathan M et al. (2018); doi:10.7759/cureus.3330
Learning Points: Knowledge of the characteristics of a rare disorder in anesthesia literature allows anticipation of difficulties and possibility to create a plan that makes"first attempt best attempt". We should be aware of the possibility of a difficult airway caused by characteristic craniofacial deformities in Cohen syndrome.

02AP01-04
Paediatric anaesthetic management in patients with congenital metabolopathy

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Background: Multiple Acyl-CoA Dehydrogenase (MAD) deficiency is an autosomal recessive disease of fatty acid and amino acid metabolism. The deficiency is in the electron transfer flavoprotein or its oxido-reductase.
Clinical manifestations include fatal acute neonatal metabolic encephalopathy with/without multi-organ abnormalities (types I and II) and late onset acute metabolic crises, myopathy or neurodevelopmental delay (type III) triggered by prolonged fasting periods or intercurrent illness.
Case report: 5-year-old girl weighing 21.2 kg diagnosed with Multiple Acetyl-CoA Dehydrogenase deficiency (Glutaric aciduria type II), responsive to Riboflavin. History of neonatal Reye's Syndrome secondary to metabolopathy requiring venovenous haemofiltration, with neurological risk due to serious neonatal hyperammonaemia. On chronic treatment with Ubidecarenone, Carnitine, Thiamine and oral Riboflavin.
He was admitted to the paediatric ward the day before the MRI scan of the brain under sedation.
She begins with an absolute diet 8 hours prior to the procedure, starting intravenous intake, serum therapy at basal needs with 10% SG and ions, and glucose supply. Intravenous Carnitine is prescribed and the rest of the medication is administered orally after the MRI.
Heart rate, O2 saturation and etCO2 are monitored. Premedication with 2 mg intravenous midazolam, induction with sevoflurane, insertion of laryngeal mask i-gel number 2 and anaesthetic maintenance with 2% sevoflurane.
The procedure was carried out without incident and the patient was transferred to the Paediatric Intermediate Care Unit. The patient remained haemodynamically stable without neurological focality or signs of metabolic decompensation.
Discussion: In MAD deficiency, early diagnosis and rapid introduction of dietary treatment is important to prevent life-threatening metabolic crises. Treatment is usually based on low protein and low fat diets, supplemented with riboflavin (vitamin B12), carnitine and coenzyme Q10 as appropriate. The anaesthetic precautions common to all patients with myopathies should be taken. Prolonged fasting should be prevented by adequate carbohydrate intake.
Reference:
Turpin B, Tobias JD. Perioperative management of a child with short-chain acyl-CoA dehydrogenase deficiency. Pediatr Anesth 2005; 15 (9): 771-7.
Learning points: In MAD deficiency, early diagnosis and rapid introduction of dietary treatment is important to prevent life-threatening metabolic crises.

02AP01-06
Nonoperating room anesthesia in a patient with Rett syndrome: a case report

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Background: Rett syndrome (RS) is a rare inherited neurodevelopmental disorder. It affects females on the MECP2 gene. They have increased sensitivity to sedative drugs with high risk of adverse events.
Case Report: We present a 14-year-old girl with RS who received nonoperation room anesthesia (NORA) 2 times. Like most RS she had microcephaly, epilepsy, apnea-hyperventilation episodes.
Case 1: In 2021 Neuropediatric requested a brain MRI due to an increased number of seizures.
General anesthesia (GA) was induced and maintained exclusively with sevoflurane on spontaneous ventilation. No other drug was administered. The MRI lasted 30 minutes. The airway was isolated with a laryngeal mask (LMA) which was removed with a 1% sevoflurane exhaled. She was transferred to the PACU with 2l oxygen. She did not present desaturations or perioperative apnea. After 3 hours and oral tolerance, she was discharged according to the usual protocol.
Case 2: In 2022 Endocrinology requests a fine needle thyroid biopsy.
During the preparation she suffered a generalized tremor. That morning she did not take levetiracetam, we gave her the same dose iv.
Again, induction and maintenance were with sevoflurane on spontaneous ventilation, we isolated the airway with a face mask. No opioids during the biopsy. We proceeded with an early discharge.
Discussion: Episodes of pneumonia and bronchitis have been reported after GA procedures as well as severe desaturation after minimal midazolam administration in surgery with regional anesthesia[2].
Although publications on NORA in patients with RS are rare, it has been reported that the dose of propofol required for sedation may be lower[1].
Our patient received 2 NORA just with sevoflurane with a similar length of stay in the PACU to patients without other comorbidities.
References:
Som, Anirban. “Rett Sd: A Concern for the Anesthesiologists.” Journal of Clinical Anesthesia, vol. 31, 2016.
Pérez-Moreno, John Carlos. Manejo Anestésico de Un Paciente Con Síndrome de Rett Y Fractura Distal de Húmero. Rev Colombiana Anestesia, vol. 42. 2014.
Learning Points: Patients with RS have an increased sensitivity to anesthetic agents and delayed recovery. Our patient received inhalational anesthesia with sevoflurane as a single agent. No complications were identified. The patient was discharged according to usual times.
We conclude that NORA alone with sevoflurane could reduce periprocedural complications. This would allow outpatient treatment of patients with RS.

02AP01-07
Pneumoperitoneum and hypertensive pneumothorax during a mucosectomy: an unexpected and challenging complication for anaesthesia

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Background: The mucosectomy is an endoscopic technique used in gastroenterology for diagnostic and treatment of gastrointestinal tract superficial lesions. For this technique a constant flow of air or CO2 is necessary.
In this case we present a possible, yet unusual, complication associated with this endoscopic technique with severe clinical implications and a major challenge for the anaesthesiologist.
Case report: A male, 82-years-old patient with an history of arterial hypertension, DPOC and obesity, is proposed for a gastric mucosectomy of a sessile lesion in the lesser curvature of the stomach under general anesthesia.
After 3 hours into the procedure, abdomen distention of the patient occurs accompanied with a sudden rise of etCO2 and airway tract pressure. There is also haemodynamic instability and hypoxemia. Pneumoperitoneum is observed and a pulmonary echography also confirms a hypertensive pneumothorax. The anesthesiologist decides to interrupt the procedure immediately and needle decompression of the pneumothorax ensues with one *ABBOCATHR®* needle 14G inserted on the 2nd intercostal space in the midclavicular line.
Two *ABBOCATHR®* needles 14G are also inserted for abdominal gas decompression. Afterwards a pulmonary thoracic chest tube is inserted for drainage, resulting in normalization of SpO2 and airway tract pressure accompanied by haemodynamic stability. Arterial gas blood test (ABG) detects a sudden haemoglobin drop with 4 units of erythrocyte concentrate and 4 units of plasma being administered.
The gastroenterologist (GE) performs an endoscopy where a gas dissection between the muscular and mucosa’s layers with a considerable blood clot was found.
The probable cause was the air translocation through the mucosa due to long duration of the procedure. The patient is then transferred for an intensive care unit (ICU).
Discussion: The mucosectomy can present severe complications requiring the anesthesiologist to be vigilant. In this case a rare complication of endoscopic mucosectomy with pneumoperitoneum and hypertensive pneumothorax needing immediate care and intervention of the anesthesia team was fundamental for the patient.
References:
1.A Rai [1], S Iftikhar, **Tension Pneumothorax Complicating Diagnostic Upper Endoscopy: A Case Report,** doi:10.1111/j.1572-0241.1999.00958
2. Sang Yun Song, Kyo Seon Lee, Kook Joo Na, and Byoung Hee Ahn, **Tension Pneumothorax after Endoscopic Retrograde Pancreatocholangiogram,** doi:10.3346/jkms.2009.24.1.173

02AP01-08
Methylene blue - the perfect liar

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Background: Methylene blue (MB) is currently used in breast surgery to help identify malignant tissue and for the sentinel lymph node biopsy. It acts on reducing the ferrous ion of hemoglobin to the ferric state and in some patients can induce methemoglobinemia. It has the capability of absorbing most of the pulse oximeter light emission generating a false desaturation and a blue grayish skin color that can be misleading, making false diagnosis as anaphylaxis or respiratory insufficiency.
However, because there are some cases of pulmonary edema following its administration, secondary desaturation should lead to further investigation so it could rule out some more serious outcomes.
Case Report: We present a case of an 84-year-old female, with a history of hypertension, *diabetes* and auricular fibrillation admitted for a bilateral breast lumpectomy and sentinel lymph node biopsy in an outpatient surgery regimen under general anesthesia.
After administration of MB, the patient presented with desaturation in pulse oximetry, with a SpO2 from 97-88%, without hypotension and normal capnography. Physical examination showed a bluish discoloration of the skin and mucosa and chest auscultation was normal.
After checking the position of the endotracheal tube and verifying the equipment, a sample of arterial blood gas was taken. Besides the brown color blood and methemoglobin's fraction (FMetHb) 13.6% no alterations were found.
At the end of surgery, we proceeded to tracheal extubation and she had no further complication during the postoperative period. By this time, the bluish sky color improved but it was noticed a blue color urine with no alterations on its output. Despite the good clinical state, she stayed for clinical monitoring and was discharged on the 1st postoperative day.
Discussion: This case highlights a secondary effect of MB administration that should be recognized since his wide use in general surgery. These side effects should prompt further investigation to exclude some important differential diagnosis or consequences of its use. A blood gas sample and chest auscultation are the key elements to identify what is the true cause of the desaturation.
Learning Points: The use of MB during surgery can mimic arterial oxygen desaturation on pulse oximetry and methemoglobinemia on arterial blood gas. Even with high suspicion of the desaturation cause, we should always exclude other diagnoses as the drug can bias our judgment.

02AP02-01
Day case surgery evaluation of two different types of supraglothic devices in the prone position

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Background and Goal of Study: For day case surgery, laryngeal mask airway in prone position is a suitable airway management strategy. There haven't been many studies done on the Supreme™ mask and the i-gel™ mask in the prone position for day-case surgery. This study compares how long and how difficult it is to position patients in the prone position for day-case surgery.
Materials and Methods: Due to local ethics committee approval, 100 adult patients scheduled for any day-case surgery were given written informed permission. They were then assigned at random to either Proseal™ laryngeal mask (group S) or I-gel™ laryngeal mask for airway management (group I).
Patients having a BMI more than 35 mg.kg-1 or anticipated difficult airway were eliminated. In the operating room, each patient placed themselves in a prone position with their heads positioned laterally. SpO_2, a three-lead ECG, the bispectral index, and NIBP were all constantly tracked. After starting an IV and taking the patient's baseline vital signs, fentanyl (0.1 $mcg.kg^{-1}$) and propofol were used to induce anesthesia while the patient was instructed to breathe 100% oxygen through a face mask (2.5 mg kg^{-1}, given over 20 seconds).
An expert anesthesiologist connected a number 3 or 4 laryngeal mask to an anesthesia machine (VT=6-8 $mL.kg^{-1}$; RR:12 $r.min^{-1}$; RR was modified to $ETCO_2$=30 mmHg, and spontaneous breathing was permitted) when BIS dropped below 60. The head should be put in the lateral position when inserting the mask (difficulty grade 1), but if that is not possible, the head is stretched and elevated in the sagittal plane, inserting the mask in a "sniffing" prone posture (difficulty grade 2).
If assistance or repositioning was required after more than two attempts, grade 3 difficulty was assigned. The Supreme mask cuff had a 60 mmHg air pressure. Vital signs, the time it takes to put on the mask (T mask), get CO_2 (T CO_2), start the induction (T ind), stop the bleeding, and there were notes of sore throat.
Results and Discussion: All patients had effective implantation of gastric tubes and ventilation.

	Age (years)	Height (cm)	Weight (kg)	Sex (M/F)	ASA (I/II/III)	T_ind (sec)	T_mask (sec)(*)	T_CO_2 (sec)
S group	43,2 ±15,47	161 ±8,6	77,7 ±12,4	28/22	40/8/2	46,8 ±9,6	16,5 ±11,9	15,7 ±8,1
I group	39,3 ±12.1	159 ±7,9	75,4 ±11.8	26/24	37/10/3	44,8 ±8,9	9,2 ±4,1	16,8 ±6,7

Table 1 (*)p<0,05

Conclusion(s): The Supreme mask requires more time and effort to position in the prone position for day-case surgery than the I-gel mask.

02AP02-02
The impact of pre-anesthetic appointment in outpatient surgery cancellations

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Background and Goal of Study: In addition to the well-known financial burden of late surgical cancellation, canceling elective surgeries on the scheduled date can also affect the motivation of the surgical team and have a relevant socio-emotional impact on patients. The careful selection of patients and preoperative assessment are essential to ensure efficiency and quality of resource management.
The present study is sought to evaluate the outpatient surgery cancellations rate, reasons, and impact of pre-anesthetic appointment in outpatient surgery cancellations rate.
Materials and Methods: In this cross-sectional study, a consecutive sampling of all patients proposed for outpatient surgical procedures with anesthesia at the Ambulatory Surgery Unit (ASU) of a tertiary Portuguese hospital, from March 2019 to February 2020. The ASU protocol comprised a pre-assessment by the surgeon that then proposed for outpatient surgical procedure indicating the patient's risk.
Accordingly, the patient could be referred to a nursing preoperative screening appointment and for a pre-anesthetic appointment. Data related to surgery cancellation and pre-anesthetic appointment were collected independently, by blinded investigators, from patients' clinical records. Comparisons were made with chi-square test.
Results and Discussion: There were 1053 (22.0%) cancellations of a total of 4792 procedures scheduled. Cancellation rate was significantly associated with the surgical specialty ($p<0.001$) and were more frequent for neurosurgery procedures (3 out of 8, 37.5%), followed by maxillofacial (10 out of 33, 30.3%) and orthopedic (435 out of 1492, 29.2%). Most of the cancellation regarded logistical issues (5.6%), followed by patient refusal of surgery (4.7%), patient health status changed (4.6%), others non specified (3.3%), unavailability of human resources (2.7%) and patient not attending (0.9%).
During the considered period, 831 (17.3%) patients were evaluated by nursing preoperative screening appointment and the cancellation rate among these was significantly lower than in those without nursing screening (18.2% vs 22.8%, $p=0.004$). A total of 350 (7.3%) patients were referred to pre-anesthetic appointments, the cancellation rate among these was also significantly lower than in those without pre-anesthetic appointments (16.9% vs 22.4%, $p=0.019$).
Conclusion(s): Pre-anesthetic appointments in outpatient surgery significantly reduced cancellations rate.

02AP02-03
Opioid prescribing pattern in elderly patients undergoing outpatient surgery

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Background and Goal of Study: The increasing concern about the epidemic in opioid prescribing is not exclusive to countries such as the United States, since its misuse can lead to dependence and even death due to overdose. Recently, the role of professionals who prescribe opioids in the context of major outpatient surgery has gained relevance. In this regard, prescribing opioids to geriatric patients requires greater caution due to the more pronounced side effects of opioids in this population.
The aim of the study was to analyze the prescription of opioids in geriatric patients undergoing major ambulatory surgery, since there is little published information on this subject.
Materials and Methods: A cohort study of patients undergoing outpatient surgery who were divided into two groups, geriatric group (GG)>65 years and younger group (YG)<65 years of age was performed. Anthropometric data, ASA classification, type of surgery, anesthetic technique, expected postoperative pain (mild, moderate, severe) and opioid prescription at discharge were collected. A telephone call was made to evaluate postoperative pain using a verbal numerical rating scale (vNRS) at 24h and one week after discharge.
We collected the consumption of opioid analgesics in these two periods. Statistics were performed using the SPSSv20 program. Data are shown as means, medians, IQR and percentages. Comparisons between groups were performed using Student's t-test for independent samples, or Mann-Whitney U test and Chi-square test or Fisher's exact test when appropriate.
Results and Discussion: A total of 880 patients (163>65 years) were consecutively evaluated in a 3-month period. Mean age in GG was 74±6 and 44±13 in YG, without differences in the proportion of men/women. ASA III patients were higher in GG: 36% vs 15%, $p<0.001$. There was a higher proportion of diabetic patients in GG: 17% vs 5.4%, $p<0.001$. Orthopedic surgery were most common in GG: 60% vs 42%, $p<0.001$. The predicted moderate-intense pain according to the surgery was higher in YG 70% vs 60%, $p=0.019$. Intraoperative local anesthesia was used mor frequently in GG 83% vs 74%, $p=0.008$; however, the administration of dexamethasone was lower in GG 41% vs 54%, $p=0.002$. The prescription of minor opioids was performed in 12% of patients and was higher in GG: 17% vs 11%, $p=0.018$. Median (IQR) vNRS at 24 h was lower in GG: 3 (1-4) vs 4 (2-6), $p<0.001$; and at 7 days GG: 2 (0-3.75) vs 2 (0-4), $p<0.04$. There were no differences in opioid use at 24 h and 7 days (~10% and 8%) respectively.
Conclusion(s): The results of our study have shown that, although the prescription of opioids has been infrequent in patients who underwent day surgery, it was higher in elderly patients. This could be related to a higher frequency of orthopedic interventions.
The study has reflected an insufficient prescription of adjuvants such as dexamethasone in elderly patients probably in relation to a higher proportion of diabetes in this group. While the use of opioids is not desirable, especially in the elderly patient, in procedures with anticipated intense postoperative pain their administration as part of analgesic treatment or as rescue may improve pain control and patient comfort.

02AP02-04
Implementation of a major outpatient surgery program in robot-assisted laparoscopic radical prostatectomy in a tertiary hospital

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Background and Goal of Study: Prostate cancer is the most common type of tumor in men worldwide. Radical prostatectomy is a therapeutic option for localized prostate cancer. During last decades, new surgical techniques have been proposed to replace open surgery, such as laparoscopic surgery and robot assisted surgery. Improvements in surgical and anesthetic techniques allow outpatient surgery for more complex surgeries[1].
The aim of outpatient surgery is to provide the same efficacy and safety as inpatient surgery. Outpatient robot assisted radical prostatectomy (ORARP) has not yet been widely adopted as there are insufficient data demonstrating its safety and feasibility. The project aims to improve clinical care through the audit process of our experience in ORARP and to provide data for future research.
Materials and Methods: Data from 11 patients proposed for ORARP was collected between January and November 2022. Patients with localized disease who underwent RARP without pelvic lymph node dissection, were included. Exclusion criteria were IV ASA classification, BMI >35 Kg/m2, age >74 years, antiplatelet and anticoagulant therapy, intraoperative bleeding >500 ml, and living away from the hospital.
Results and Discussion: 11 patients signed the informed consent document to undergo surgery without admission: 9.1% were ASA I, 63.6% ASA II and 27.3% ASA III. Mean age was 64.6 years (SD±8.2). 45.5% underwent ORARP while 54.5% were discharged the day after surgery. Reasons for delayed discharge were an accidental ureter section (n=1), pain control (n=1), patient refusal (n=1) and lack of experience of the urology team in the early discharge protocol (n=3). 3 patients in ORARP group consulted the emergency department (hematuria, acute urinary retention after urinary catheter removal and fever) as opposed to 2 patients in the inpatient group (hematuria and feeling of oliguria despite a correct functioning urinary catheter).
Conclusion(s): None of the ORARP patients had serious complications. 4 patients did not achieve surgery without admission. This could have been avoided by improving interdisciplinary communication. It appears that outpatient RARP is safe and feasible in selected patients. In the future, we intend to design a prospective study with a larger sample size to confirm our results.
Reference:
1. Banapour P. et al. J Robot Surg . 2019;13(2):261–5.

02AP02-05
Satisfaction and pain perception related to anaesthetic technique for ambulatory inguinal hernioplasty: a survey

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Background and Goal of Study: Inguinal hernioplasty is commonly performed in ambulatory surgery though there is no clear consensus on the anaesthetic technique. Both general anaesthesia (GA) and locoregional anaesthesia (LRA) are effective options.
The main objective of this study was to evaluate the influence of the anaesthetic technique for ambulatory inguinal hernioplasty on pain perception and patient satisfaction.
Materials and Methods: Prospective descriptive study from a survey of ambulatory patients who underwent inguinal hernioplasty from 2020 to 2022 in our hospital. The main variable was the relationship between anesthetic technique, pain perception and level of satisfaction.
To assess pain and postoperative satisfaction a telephone survey was made 24 hours after surgery assessing the maximum level on the VAS scale(0-10) during the first 24 hours and the level of satisfaction (not satisfactory, adequate, satisfactory).
Statistical analysis was performed using SPSS 25.0. Chi2 test was used for qualitative variables and Student's t test for quantitative variables. A p value<0.05 was considered statistically significant.
Results and Discussion: Our sample was 373 patients with a mean age of 58.0 ± 13 years. 82 patients were ASA I, 204 ASA II and 87 ASA III. Surgery was performed under GA(68%) or LRA(32%). Most patients (63.5%) were operated by open approach and 36.5% by laparoscopic surgery. Young patients, ASA I-II and operated with laparoscopic technique underwent GA more frequently than LRA (p< 0.0001).
Regarding the level of pain 71.8% of the patients described pain 2-3 on the VAS scale during the first 24 h after surgery with greater perception of pain in patients with LRA (p=0.001). The degree of satisfaction achieved after surgery was higher after GA although it did not reach statistical significance possibly due to the size of the sample or the use of qualitative scales to measure satisfaction.
Our study is limited to ambulatory surgery patients and the results may not be extrapolate to patients with high anesthetic risk who, in our setting, are operated in our associated tertiary care hospital.
Conclusion(s): Both GA and LRA are two effective options for inguinal hernioplasty. Postoperative pain perception was better in those who underwent GA. The degree of satisfaction was higher after GA, although it did not reach statistical significance. GA is preferred over LRA in young patients, with low anesthetic risk, and laparoscopic surgery.

02AP02-06
Target-controlled infusion anesthesia with spontaneous breathing for transperineal fusion magnetic resonance imaging-guided prostate biopsy

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Background and Goal of Study: European Association of Urology prostate cancer guidelines recommend transperineal prostate magnetic resonance imaging (MRI)-guided biopsies of suspicious lesions. To ensure complete immobility, this procedure is usually performed in the operating room under general anesthesia (GA). However, the long operating room waiting list leads some teams to opt for the use of local anesthesia (LA), although moderate to severe pain has been reported during the procedure.
In our center we started to perform this procedure under GA maintaining spontaneous breathing in the urologic diagnosis unit, outside the operating room.
The aim of our study is to assess if GA with target-controlled infusion (TCI) of propofol(P) and remifentanil (R) maintaining spontaneous breathing provided optimal and safe conditions during the procedure, promoting a fast recovery and patient and surgeons' satisfaction.
Materials and Methods: After approval by our local Ethics Committee (HCB/2022/1260) a retrospective study was conducted in patients who underwent transperineal prostate MRI-guided biopsy from January 2020 to March 2022. Age, ASA score, comorbidities, body mass index (BMI), dosage of P and R, anesthesia duration, immediate complications and 24h post-procedure phone call assessment (haematuria, suppuration, pain, nausea or vomiting) were collected. Statistical analysis was performed with SPSS v27.
Results and Discussion: 91 patients, mean age of 69 years and 70% ASA II, were included. Main comorbidities: hypertension, dyslipidaemia, BMI>30 and diabetes mellitus. Median drug target was 2 mcg/ml for P [1, 3] and 2 ng/mL for R [2, 2]. Mean dose of total P and R was 247,03 mg (78,1) and 143, 43ng (46,6) respectively. Mean duration was 30 minutes.
All except 2 patients (afebrile shivering and haemodynamic instability) were discharged the same day. No other intraoperative or postoperative events were reported, including intraoperative movement. Only one case of hematuria and one infection of the puncture site were reported, both treated in an ambulatory setting.
Conclusions: The increase in ambulatory procedures makes it necessary to plan an anaesthetic technique guaranteeing short length of stay and maintaining patients' safety and surgeons' satisfaction.
The use of TCI in spontaneous breathing could improve the quality of care and patients' safety in an ambulatory setting, delivering adequate immobility and analgesia for a faster and more efficient procedure.

02AP02-07
Low-dose spinal hyperbaric prilocaine in patients undergoing transperineal magnetic resonance ultrasound fusion guided prostate biopsy

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Background and Goal of Study: Magnetic resonance (MR) ultrasound fusion (UF) guided prostate biopsy is a relative emergent technique associated with an increased likelihood of detecting clinically significant prostate cancer. This procedure can be safely performed in an outpatient setting; however, the anaesthetic method for this procedure has not been standardized.
We aim to evaluate the efficacy of low-dose spinal hyperbaric prilocaine for MR-UF guided prostate biopsy in day surgery.
Materials and Methods: One hundred and three patients (48–84 years/ American Society of Anesthesiologists grade I–III) were enrolled in this study. Under aseptic conditions, the spinal anaesthesia was performed with the patient in a sitting position and the anesthesiologist administered a dose of 2% hyperbaric prilocaine. The prilocaine dose used was under anesthesiologist criteria.
The patients remained in a sitting position for at least 2 min until they were brought into lithotomy position for biopsy. We measured expansion of the sensory and motor block, evaluated times to walk, void and being eligible for discharge, and determined the demand of analgesics.
Results and Discussion: 101/103 patients were available for analysis. The performance of the biopsy was possible in all patients. The mean total time in operating room was 42 ±11 min. Two patients received 24 mg of prilocaine, and the rest of patents received 20 mg. The maximal expansion of the sensory block was to the T12 dermatome in 13; T11 in 7; T10 in 9; L5 in 12; L4 in 13; L3 in 6; L2 in 4; L1 in 17 patients and below S5 in 20 patients. The motor block was Bromage score 0: in 74; 1: in 18; 2 in 5 and 3: in 4 patients. Hypotension and bradycardia requiring treatment occurred in 6 and 4 patients respectively. The mean time when patients were discharged was: 70 ± 21 min. Thirteen patients experienced urinary retention that was revolved with single in and out evacuation.
Conclusion: Hyperbaric prilocaine can be applied in dosages of 20 mg for MR-UF guided prostate biopsy. Because of sufficient analgesia, missing motor block and shorter recovery times, hyperbaric prilocaine can be recommended for outpatient MR-UF guided prostate biopsy.

02AP02-08
Hospital readmissions after ambulatory surgery

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Background and Goal of Study: There are important advantages of ambulatory surgery when compared to inpatient surgeries, such as reductions in waiting times, hospital costs and the risk of nosocomial infection. Ambulatory surgery advantages dissolve in cases in which an emergency occurs, or an unplanned hospital admission is required. The purpose of this study is to determine the readmission rate and respective reasons within 30 days after ambulatory surgery at a major ambulatory surgical center.
Materials and Methods: A retrospective study was carried out, including patients admitted to the ambulatory surgical service of a tertiary Portuguese hospital, from January 2019 to December 2020. All unplanned readmissions were identified through databases and registers.
The unplanned hospital readmissions were categorized as emergency room visits, re-interventions or inpatient admissions. Fisher's exact tests was used for statistical analysis using IBM SPSS v28.
Results and Discussion: Of a total of 15014 outpatient elective procedures, 83 (0.6%) resulted in unplanned admissions, corresponding to 39 (47.0%) unplanned inpatient admission, 23 (27.7%) re-interventions and 21 (25.3%) emergency room visits - 19 (90.5%) for uncontrolled postoperative pain, 1 (4.8%) surgical site hemorrhage, 1 spontaneous pneumothorax.
Of the procedures that resulted in unplanned hospital readmission, 38 (45.8%) were of general surgery, 17 (20.5%) of orthopedic surgery, 11 (9.6%) of vascular surgery and 10 (8.8%) of gynecology. Unplanned readmission rate was significantly higher in general surgery (2.0% vs 0.3%, $p<0.001$) compared to other specialties. Among general surgery procedures, breast surgery (8 out of 109, 7.3%) and laparoscopic cholecystectomy (12 out of 202, 5.9%) presented significantly higher readmission rates, compared to other procedures ($p<0.001$).
Conclusion: Unplanned readmission rate in our hospital is low and is mainly related to general surgery procedures. Uncontrolled postoperative pain represents most of the urgency services attendance motive.

02AP02-09
A prospective randomized controlled monocentric study comparing digital sedation versus intravenous sedation among patients undergoing colonoscopy

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Background and Purpose: This trial evaluates performance of colonoscopy using Digital Sedation (DS) with Oncomfort Sedakit™ device as primary outcome, compared to intravenous sedation (IVS).
This study evaluates, inter alia, safety, drug sparing, patient experience as secondary outcomes. It may facilitate the screening of colorectal cancer, improving patients comfort and lowering anxiety.
Methods: This prospective RCT started after approval of the ethical committee. Adult patients scheduled for screening or diagnostic colonoscopy under IVS were recruited after providing their written informed consent. Patients with known intestinal disease, low auditory or visual acuity, head or face wounds, schizophrenia, dizziness, non-proficiency in French or Dutch were excluded. 90 patients were randomized (2:1) between two arms: DS group (n=60), with rescue IVS (propofol) if needed and IVS group (n=30). ECG, NIBP and SpO2 were used. In both groups, IVS started with doses of 1 μg/ml to 6 μg/ml (TCI – Schnider model) and titrated incrementally by 0.5μg/ml. Doses were adapted according to the observed level of comfort and patient's need.
The primary outcome was the cecal intubation rate to confirm feasibility and performance of DS. Secondary outcomes were patient experience measured by VAS and Likert scale, need for rescue IVS, average drug consumption, frequency of adverse events and physicians experience. Means, standard deviations, frequency values and ratio values were used for descriptive statistics.
Results: There was no significant difference between groups for cecal intubation. In the DS group, rate of rescue IVS was 63.6% and there was a significant reduction of total dose of propofol (mg/kg) in the DS group as compared to IVS (1.15 vs 4.41, $P<0.0001$). Patients in the DS group experienced higher pain and lower comfort ($P<0,0001$). Nevertheless 80% of them recommend DS. Time spent in the recovery room was significantly shorter ($P<0.05$).
There was no difference between groups for apnea episodes, desaturation episodes and adverse events. Evaluation by the anesthesiologists was lower in the DS group ($P<0.05$) and stress was significantly higher ($P<0.05$).
Conclusion: DS is a suitable and effective alternative to IVS. Despite a relatively high rate of rescue IVS and a lower general comfort for patients and anesthesiologists during the procedure, which can be explained by apprehension of this new technology, there is a benefit in terms of drugs sparing and recovery.

Regional Anaesthesia

03AP01-01
Our application of neuronavigation guided deep cervical plexus block for postoperative analgesia in two cases

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Background: Deep cervical plexus block (dCPB) can be used for analgesia of head and neck surgeries[1]. In this case report, we aimed to share our experience of dCPB with neuronavigation[2] guidence in addition to ultrasound (USG) to increase the safety of block.
Case report: 42 years old male patient, scheduled for radical mastoidectomy and a 58-year-old male patient, scheduled for subtotal temporal bone resection due to squamous cell carcinoma without any known additional disseases were taken to the operating table.
In supine position under general anesthesia, 3-dimensional (3-D) images of tumors and target areas of dCPB were marked within 0.2-millimeter margin of error with help of neuronavigation according to MRI and CT images.

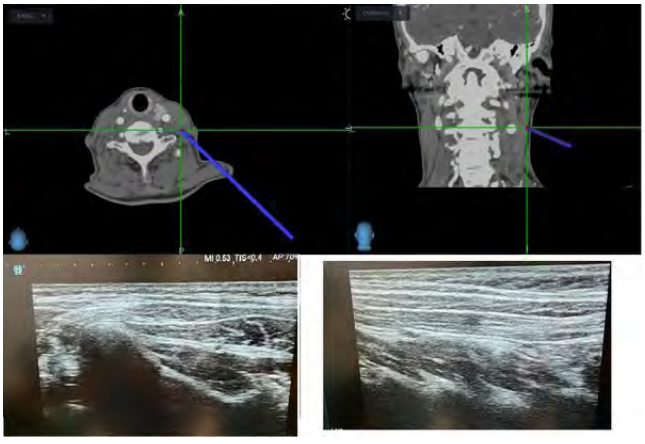

Figure 1: Combination of neuronavigation and USG images.

	1st hour	4th hour	12th hour	24th hour
Patient 1	3	2	2	3
Patient 2	2	2	3	3

Table 1: Postoperative VAS scores

Under the guidance of marked point, USG guided dCPB was applied from the C3 level with 8 mL of 0.25% bupivacaine preoperatively. Patients were extubated after surgeries and transferred to service.
The Visual Analogue Scale (VAS) scores of the patients within postoperative 24 hours period were recorded.
Patients were questioned for chronic pain after 2 months.
No complications were observed.
Discussion: Technological advances have increased safety and accuracy for many procedures (2).
Although, clinical studies are needed to claim, we believe with additional guidance methods to increase safety, dCPB or any other nerve blocks will be preferred more.
References:
Li J, Szabova A. Ultrasound-Guided Nerve Blocks in the Head and Neck for Chronic Pain Management: The Anatomy, Sonoanatomy, and Procedure. *Pain Physician*. 2021;24(8):533-548.
Watanabe et al. The Trans-Visible Navigator: A See-Through Neuronavigation System Using Augmented Reality. *World Neurosurg*. 2016; 87:399-405. doi:10.1016/j.wneu.2015.11.084
Learning Points: We aimed to attract attention to the usage of technological advances and its possible benefits for patients by making nerve block techniques safer and easier to perform.

03AP01-02
Continuous cervical Erector Spinae Plane Block with a catheter for brachial plexus surgery: a case report

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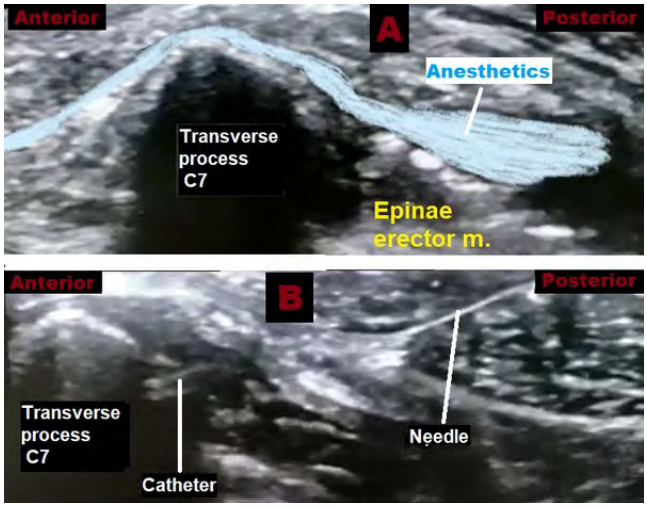
Background: Erector spinae plane block (ESPB) was first reported by Forero[1]. Its use became a common practice at the thoracic and lumbar levels for several surgeries[2]. We report a case of continuous cervical ESPB analgesia for 6 days.
Case report: 40-year-old male, ASA P1, undergoing elective surgery for muscle transfer and neurotization of the gracilis muscle to the biceps region, due to left brachial plexus injury, left upper limb paralysis at the elbow and paresthesia distal to the deltoid muscle.
The procedure was performed under spinal anesthesia (L4-L5) 20 mg isobaric Bupivacaine, multimodal general anesthesia and ESPB at the left transverse process (TP) of C7 guided by ultrasound with 10 mL of 0.2% Levobupivacaine(fig. A), ensuing a catheter insertion at the left posterior TP of C7(fig. B). Infusion test assured spread between the deep cervical muscles and the middle and posterior scalene muscle. Opioid supplementation wasn't required and analgesia maintenance was managed infusion through the catheter. Postoperative upper limb analgesia was promoted with patient-controlled analgesia (PCA) infusion pump at the catheter with 0.1% Levobupivacaine (3mL/h flow, 3mL bolus). Pain in the upper left limb was only reported at night, between 48h-96h, solved with a pump request once every 24h. No pain reported after 96h. No sign of local anesthetic intoxication. The PCA was removed on the 5th day followed by hospital discharge. Contact by telephone on the 30th day, no pain reported after discharge.



Discussion: As the brachial plexus was part of the surgical approach and necessity of neuromuscular monitoring it has made regional anesthesia more complex. Therefore a continuous cervical ESPB was chosen for perioperative pain management, aiming decreased use of opioid, sensory block only and postoperative analgesia.

References:

1. Reg Anesth Pain Med.2016 Sep-Oct;41(5):621-7.
2. Minerva Anestesiol.2019 Mar;85(3):308-319.

Learning Points: Cervical ESPB with a continuous catheter PCA enables an approach to perioperative analgesia in upper limb surgery, ensuring a safe anesthetic technique, better pain management, lower opioid consumption, postoperative patient satisfaction.

03AP01-03
Dual-site nerve blocks for elbow surgery

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Background: Combining regional anaesthesia blocks at different anatomical locations targeting the same nerves supplying the surgical site may improve the success, and speed of onset of surgical anaesthesia, prolong block time and prevent the need for rescue blocks or conversion to general anaesthesia. Although the evidence is scarce, few combination techniques have been described in the literature for elbow surgery, including interscalene and axillary brachial plexus block, supraclavicular and axillary brachial plexus block [1].

This case report describes a novel approach of combining supraclavicular and infraclavicular brachial plexus block for elbow surgery in a high-risk patient.

Case report: A 63-year-old patient with a known difficult airway required surgery for open reduction and internal fixation of a complex left elbow fracture. The patient was unfit to have general anaesthetic due to an undiagnosed cardiac condition leading to arrhythmias and loss of consciousness, which caused her hospital admission and elbow fracture.

The patient was under cardiologist care in the perioperative period. The cardiology team requested a 24-hour ECG that revealed sinus arrhythmias with heavy ventricular and supraventricular ectopic burden and an echo, which showed moderate LV impairment with septal hypokinesia-akinesia with normal plasma troponin levels.

After consenting and agreeing to the anaesthetic technique, the patient was transferred to the theatre and connected to appropriate anaesthesia monitoring. Then, an ultrasound-guided infraclavicular followed by a supraclavicular brachial plexus was administered using safe doses of levobupivacaine. The intercostobrachial nerve was visualised using the ultrasound and blocked as it crossed the conjoint tendon in the axilla.

Discussion:

Block completion to knife to skin	13 minutes
Total surgical time	150 minutes
Tourniquet time	130 minutes
Intraoperative pain score (0-10)	0
Return of normal sensory function	22 hours 30 minutes postoperatively
Recovery of motor function	11 hours 30 minutes postoperatively
First pain (0-10) scored >0	23 hours postoperatively (Dynamic pain score of 3)

References:

1. Urmey WF. Combined Axillary-Interscalene (Axis) Brachial Plexus Block for Elbow Surgery Regional Anesthesia: The Journal of Neural Blockade in Obstetrics, Surgery, & Pain Control 1993;18:88.

Learning points: Combined supraclavicular and infraclavicular brachial plexus block for elbow surgery is a safe technique and may improve block efficacy compared with single site block.

03AP01-04
Awake spine surgery in a lung hypoplasia patient: a case report

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Pulmonary hypoplasia is a rare anomaly in which gross morphology of the lung is preserved, but there is a decrease in number or size of airways, vessels, and alveoli. Consequently, there is an enlargement of the contralateral lung. This compensation often results in a more fragile tissue with abnormal blood flow.

Therefore, anesthetic management for these patients often poses a challenge, especially if there are other comorbidities. Intermittent positive pressure ventilation (IPPV) increases the risk of barotrauma, pneumothorax and interstitial emphysema on the unaffected side.

As a result, a lung protective strategy with low tidal volume and increased respiratory rate are recommended.

Additionally, airway resistance can be increased, requiring higher peak pressure to overcome resistance and prevent shunting and hypoxemia. Moreover, positioning of a patient intraoperatively is also an important factor to consider.

A 54-year-old male, ASA III, diagnosed with L4-S1 discal hernia, was scheduled for endoscopic lumbar decompression. His past medical history included previous open L4-L5 discectomy, hypertension, diabetes, dyslipidemia and obesity (BMI 41 kg/m2). He had been diagnosed with hypoplasia of the right lung in his teenage years, without other developmental defects.

It had no bearing on everyday life tasks. After obtaining patient consent, a median subarachnoid block at L2-L3 level was performed with hyperbaric bupivacaine 0,5% 12,5 mg and sufentanyl 2,5 mcg.

The patient was placed in prone position and the adequacy of block for surgery was tested before the incision, following sedation with propofol infusion. Oxygen was administered via nasal cannula at 2Lmin^{-1}. Surgery lasted 130 minutes and was uneventful. The patient remained hemodynamically stable during the whole procedure and at the end of it, he was transferred to post-anesthesia care unit.

Any adverse event was reported during recovering phase and the patient was safely discharged home in less than 24h post-procedure, with adequate pain control and sensory-motor block reversal.

Regarding the side effects of general anesthesia and IPPV, neuraxial anesthesia has been explored as alternative to overcome the challenges faced with ventilating a patient with pulmonary hypoplasia.

Moreover, in minimally invasive procedures for lower spine surgery, subarachnoid anesthesia has gained popularity due to improved patient comfort, allowing outpatient surgery and avoid general anesthesia complications.

03AP01-05
Use of Bilateral Brachial Plexus (BP) catheters via costoclavicular approach with Programmed Intermittent Boluses (PIB) of Local Anaesthesia (LA) for analgesia, sympatholysis and improved graft survival following complex microsurgical repair of damaged structures in both hands

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Background: Complex hand injuries and surgical repair pose challenges for analgesia and graft survival. Regional anaesthesia (RA) may improve outcomes by providing vasodilatation, sympathectomy-like effects and analgesia. The costoclavicular space for brachial plexus catheter placement enables LA spread to all three cords.[1]
We describe the use of a multimodal regime incorporating PIB of LA via bilateral costoclavicular catheters to achieve opioid-sparing analgesia and optimise flap survival of both hands post-operatively.
Case report: A 41-year-old man sustained bilateral open hand blast injuries following a firecracker explosion. Extensive repair including nerve graftings and free flap transfers were planned. Costoclavicular catheters were placed under ultrasound guidance and ropivacaine 0.2% 25ml was deposited to each side prior to general anaesthesia. Surgery lasted for 12 hours with top ups of 5ml each side hourly after the 4 hour mark from catheter insertion.
Post-operatively, he had oral paracetamol, etoricoxib, tramadol, gabapentin and oxycodone, with delivery of PIB 5ml ropivacaine 0.2% 3 hourly to each side. Numeric pain scores at rest were 0-1 and 2-4 on movement. Breakthrough doses of oxycodone 5mg were between 1-4 per day while the catheters were in-situ (total 4 days). Opioids were tapered off after catheter removal.
Occupational therapy was well tolerated and he was very satisfied with the analgesia regime. There were no adverse complications. The surgeons were pleased with the aesthetics and functional outcome of both hands.
Discussion: The use of RA enabled complex surgery without high dose opioids. Bilateral BP catheters are rarely used due to potential issues such as risks of pneumothorax and LA toxicity. However, careful placement of costoclavicular catheters with optimal LA titration can harness the benefits of RA without complications and avoid side effects of high opioid use. Sympatholysis and vasodilatation from RA may contribute positively to the viability of free flaps.
Reference:
1. Karmakar MK et al. Benefits of the costoclavicular space for ultrasound-guided infraclavicular brachial plexus block: Description of a costoclavicular approach. Reg Anesth Pain Med 2015;40:287-8
Learning Points: PIB of LA via costoclavicular catheters as part of multimodal analgesia is a feasible method for providing excellent pain control, ensuring tissue survival and facilitating rehabilitation following complex upper limb reconstructions.

03AP01-07
Regional anesthesia for supracondylar amputation in a frail patient – case report

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Background: Frailty is a multidimensional condition characterized by loss of functional reserve, which results in increased vulnerability to adverse outcomes following surgery.[1-3] Its prevalence increases with age and can reach more than 50% in patients above 85 years.[1-2]
As the population ages, frailty will be increasingly seen in surgical patients receiving anesthesia and appropriate anesthetic plans should be designed to fit the patient needs and improve their outcome.
Case report: Woman, aged 87 years, ASA IV, proposed for urgent supracondylar amputation of the left lower limb due to acute ischemia. Relevant medical history included poorly controlled diabetes mellitus, decompensated chronic kidney disease, auricular fibrillation, congestive heart failure and dementia.
The patient was monitored under ASA standard. Mild sedation was achieved with 2 mg midazolam and 25 μg fentanyl. Ultrasound-guided left femoral and sciatic blockades were performed with 0.5% ropivacaine (20 mL each). After 15 minutes, the blockades were tested and deemed adequate for surgery. The patient remained stable throughout the surgery (30 minutes) and in the post-anesthesia care unit.
No complications were documented in the perioperative period. Adequate post-operative analgesia was achieved with scheduled paracetamol and metamizole. The patient was discharged 5 days after surgery, without complications.
Discussion: There is no significant evidence to support a single best anesthetic plan for frail patients.[1-2] Anesthetic management will depend on surgical requirements and patient comorbidities.
While general anesthesia can affect cardiovascular, pulmonary and cerebral functions, neuraxial anesthesia is associated with hypotension and potential complications (including epidural hematoma, infection and post-dural puncture headache).[1]
In this case, regional anesthesia was adequate for the surgery and contributed to post-operative analgesia.[1-2]
References:
1. Local Reg Anesth. 2018; 11: 61-73.
2. Local Reg Anesth. 2022; 15: 71-75.
3. Anaesthesia. 2019; 74 (Suppl.1): 80-89.
Learning points: Frail patients are highly vulnerable to physiologic changes in the perioperative period and frailty-specific anesthetic plans are required to minimize these changes should be advocated.

03AP01-08
Pneumothorax following shoulder arthroscopy and interscalene block. A case report

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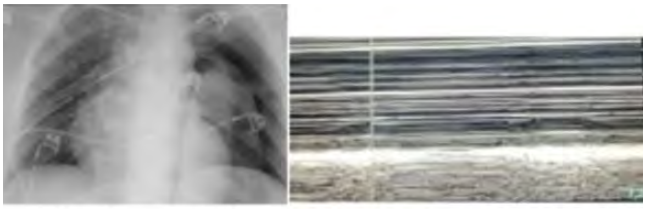
Background: Interscalene brachial plexus block provides adequate anesthesia and postoperative analgesia for shoulder procedures[1]. Pneumothorax is a rare complication described after shoulder arthroscopy with or without interscalene block.
Case report: A 31-year-old man underwent left shoulder arthroscopy due to a glenoid lesion. General anesthesia combined with interscalene plexus block in-plane ultrasound (US) guided is performed, 50mg of bupivacaine was injected.
Afterwards, during anesthetic awakening, ventilatory assistance is required due to desaturation. After extubation, was maintained SatO2 92% with a 50% venturi mask and mild dyspnea. In post-anesthesia resuscitation unit, auscultation reveals absence of breath sounds and US shows absence of pleural sliding, barcode sign and lung point sign, diagnosis of pneumothorax. A chest tube is placed.
Discussion: Interscalene block was first described in 1970 by Winnie. It has been shown to improve postoperative pain control, decrease hospital stay, and optimize the outpatient surgery. Complications, although infrequent, can be potentially serious, including pneumothorax (0.2-3%)[1].
Pneumothorax is a complication with low incidence after shoulder arthroscopy whether or not interscalene block is performed. Multiple risk factors have been described such as: patient position, pulmonary hyperinflation due to smoking or asymptomatic pleural bullae, interscalene block, prolonged surgical time, size of the rotator cuff tears and the pressure of the irrigation system.
The use of US has increased the safety of performing nerve blocks, reducing complications. The high sensitivity compared with chest X-ray and similar specificity make US the best technique to assess the extent of pneumothorax.



Chest x ray with pneumothorax

Stratosphere sign in US

Reference:
1. Robert Li, MD, Ajay Lall, MD, MS, Everett Lai, BS, and Konrad I. Gruson, MD. Tension Pneumothorax After Ultrasound-Guided Interscalene Block and Shoulder Arthroscopy. The American Journal of Orthopedics. October 2015. E407-E410.
Learning points: Pneumothorax should be suspected in case of desaturation and dyspnea after shoulder arthroscopy with or without interscalene block. US is the best technique for diagnosis.

03AP01-09
Combination of ultrasound-guided infraclavicular and intercostobrachial nerve block for surgical anaesthesia of an open low transcondylar humerus fracture in a patient with end-stage COPD

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Background: Ipsilateral phrenic nerve blockade is a common adverse event after blockade of the brachial plexus above the clavicle, which can result in respiratory deterioration in patient with preexisting pulmonary condition. The following case study is to demonstrate the phrenic nerve sparing potential and effectiveness of blocks below the clavicle as an anaesthetic method in an elderly patient with severe COPD, who suffered an open humerus fracture.
Case Report: A 80 year old male, ASA IV patient has had suffered a low transcondylar fracture of the humerus. He had severe COPD (GOLD D, FEV1 < 20%) with bullous emphysema, considering these, traumatologists decided to treat it conservatively. Six weeks later the broken humerus cut through the skin, resulted in an open fracture.
On presentation he had tachypnoe without dyspnoe at rest, SpO2 88% on room air, constantly using his auxiliary respiratory muscles. The surgical plan was a bicolumnar plate fixation through a combined medial and lateral approach on the distal two-third of the humerus in three hours in a supine position.
Our aim was to carry out surgical anaesthesia avoiding general anaesthesia, positive pressure ventilation and phrenic nerve palsy. After assesing anatomical landmarks and Ultrasound (US) anatomy we decided to chose a single shot US-guided infraclavicular block with 20 mL of bupivacaine 0.4% with 2 mcg/mL adrenaline as adjuvant and an additional intercostobrachial nerve block with 4 mL lidocaine 1% and 8 mg of iv dexamethasone (1).
For rescue analgesia we performed US-guided axillary nerve block. The blocks provided complete analgesia with intact diaphragmatic movement on US.
On ABG was no sign of CO2 retention, so we used a high-flow nasal cannula oxygen supply with low FiO2 during the operation in order to avoid the use of CPAP, NIV. Sedation with fractionally given low dose clonidine and ketamin boluses were administered during the procedure. The sedation recorded at -1 evaluated using RASS scale. He had no pain during the 3 hours long operation, pulse rate, SpO2, BP were stable.
Discussion: Our regional technique resulted in a safe and effective anaesthesia in a high risk patient with potential hazardous consequenties of narcosis.
References:
1. Petrar S D, RAPM 2015;40(2):133–138
Learning Points: US-guided infraclavicular block was phrenic nerve sparing and effective, with this alternative method we were able to avoid the positive pressure ventilation in a high risk patient.

03AP01-10
Two probable cases of unintended subdural block following a subarachnoid injection

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Background: Subdural block remains an underdiagnosed complication of neuroaxial anesthesia and is more frequently described after attempted epidural anesthesia. It can have a variable presentation and radiological confirmation is not always feasible nor needed. We present two cases of probable subdural block after spinal anesthesia.

Case Report: A 38-year-old woman, 39 weeks pregnant, ASA II, was admitted for an elective cesarean under sequential combined spinal epidural anesthesia. This technique was performed in sitting position at L3-L4 interspace. 11mg of hyperbaric bupivacaine 0.5% were administrated intrathecally and the patient was held in supine position. A few seconds later, she complained of asymmetrical weakness of the upper limbs and had hypotension and bradycardia. She had lower body sensory block as expected, but no motor block at this level. It was possible to perform the procedure. Epidural catheter was removed. She was fully recovered after 3h.

A 60-year-old female, ASA II, diagnosed with avascular necrosis of the femoral head, was scheduled for total hip arthroplasty. We performed an analgesic ultrasound-guided lateral femoral cutaneous plus a femoral nerve block and a paramedian subarachnoid block at L3-L4 level with 9 mg of isobaric bupivacaine 0.5% and 2mcg of sufentanil.

After 20 minutes, the patient presented with a patchy block, maintaining thermal sensitivity at L5 level, without any type of sensitivity in the upper levels, kept mobility of the foot but was unable to flex the knee. Furthermore, she kept pain during the abduction of the leg. Conversion to general anesthesia was decided.

During the procedure, she had significant hypotension. She was safely discharged from the post-anesthesia care unit 1 hour after surgery only with sensory-motor block in the area of the peripheral nerves blocked.

Discussion: Both cases show an atypical spinal anesthesia and some usual and unusual presentations of subdural block that have already been described in literature. It is known that differences could be related to anatomical variations and to the amount of drug actually injected into de subdural space.

Both of them had a favorable outcome, without any major adverse event, such as loss of conscience nor respiratory depression.

Reference:

Ann Acad Med Singap. 2002 Jul;31(4):525-7. PMID: 12161892.

Learning Points: The differential diagnosis of a possible subdural block should be considered in cases of atypical spinal anesthesia.

03AP02-02
Comparison of methods of analgesia in patients after pancreatic surgery: a retrospective study

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Background and Goal of Study: To compare the effectiveness of postoperative analgesia by methods of the epidural blockade and rectus sheath block in the early postoperative period in patients after pancreatic surgery.

Materials and Methods: A retrospective analysis of inpatient case histories of patients after pancreatic surgery at Ilyinsky Hospital for the period from 2019 to 2021 (n=92) was carried out.

For the study, 78 cases were selected, which were divided into two groups:

the first group (n=46) - patients who received epidural blockade (EB) with a local anaesthetic in the postoperative period;

the second group (n=32) included patients who underwent rectus sheath block (RSB) followed by the introduction of a local anaesthetic solution.

Results and Discussion: The level of pain on the visual analogue scale was statistically significantly higher in the first group on the first (1.07 (0.50-1.80) and 0.48 (0.08-1.13), respectively, p=0.013) and the second day (0.82 (0.25-1.33) and 0.33 (0.06-0.75), respectively, p=0.021), no differences were found on the third day (p=0.060).

The frequency of additional use of opioid analgesia did not differ between the study groups (on the first day p=0.233, on the second day p=0.570 and on the third day p=0.092). The use of norepinephrine infusion in the early postoperative period (p=0.842), daily and cumulative water balance (on the zero-day p=0.851, on the first day p=0.883, on the second day p=0.319, on the third day p=0.718 and the cumulative balance p =0.707) and verticalization time (p=0.800) also showed no significant difference.

Orthostatic reactions during early mobilization were noted significantly more often in the EB group than in the RSB group (n=10 (21.7%) and n=1 (3.2%), respectively, OR 8.333, 95% CI: 1.008-66.667, p =0.042). The appearance of the first stool was more common in the EB group (3 (2-4) days, vs. 4 (3-5) days in the group with RSB, p=0.027).

There was no statistically significant difference between the groups in the development of infectious complications (p=1.000), gastrostasis (p=0.144), in-hospital mortality rate (p=0.460), ICU-days (p=0.305) and lengths of stay (p=0.776).

Conclusion(s): The study obtained data showing the comparability of the use of methods of analgesia, such as epidural blockade and rectus sheath block in patients after pancreatic surgery.

03AP02-03
Comparison of peripheral nerve block versus spinal anaesthesia in foot or ankle surgery: a systematic review and meta-analysis of RCTs with trial sequential analysis

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Background and Goal of Study: The purpose of this study was to perform a systematic review and meta-analysis of RCTs with trial sequential analysis (TSA) examining perioperative outcomes following peripheral nerve blocks (PNBs) and Spinal anesthesia (SA) during elective foot and ankle surgery.

Materials and Methods: We registered it in the PROSPERO network (CRD42021229597). Two investigators independently performed searches in the PubMed, EMBASE, and Cochrane Central Register of Controlled Trials databases on 28 June 2021 and updated it through weekly e-mail alert.

The primary outcome was the pain scores during surgery and postoperative period.

The secondary outcomes were the block performance time, patient satisfaction, postoperative analgesic requirements, adverse effect such as hypotension, bradycardia, post dural puncture headache (PDPH), conversion to general anesthesia, urinary retention.

Results and Discussion: This meta-analysis of 8 RCTs, including 745 patients (of whom 372 patients were performed PNBs and 373 patients were performed spinal anesthesia) demonstrated that block performance time (WMD: 7.470; 95% CI 6.072 to 8.868; $I^2 = 88.66$), onset of sensory (WMD: 5.098; 95% CI 0.783 to 9.414; $I^2 = 99.58$) and motor block (WMD: 7.80; 95% CI 2.78 to 12.83; $I^2 = 98.98$), duration of sensory and motor block were significantly shorter, and SBP at 30 min and DBP at 30 min were significantly lower in the SA group compared to PNB group.

In these outcomes, cumulative *Z* curve crossed the trial sequential monitoring boundary, which suggested the results of TSA were reached a sufficient level of evidence, therefore conclusive. Also, this meta-analysis showed that PNB was associated with the reduction of postoperative analgesic requirements, incidence of hypotension and vasoactive medication, decrease of HR at 30 min.

However, cumulative *Z* curve did not cross the trial sequential monitoring boundary, because of sparse data or not reaching significant level when controlling the risk of potential false-positive findings. In terms of conversion to general anesthesia, urinary retention and PDPH, there were no evidences of differences in conventional meta-analysis and trial sequential analysis.

Conclusion(s): Block performance time, onset of sensory and motor block, duration of sensory and motor block were significantly shorter, and SBP at 30 min and DBP at 30 min were significantly lower in the SA group compared to PNB group.

03AP02-05
Postoperative coagulopathy and epidural catheter removal practices: an audit

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Background and Goal of Study: Major oncological surgeries and associated significant perioperative blood loss results in immediate postoperative coagulopathy, which may extend beyond 4thpostoperative day and complicate epidural catheter removal. We therefore planned the study with the aim of reviewing the practices of epidural catheter removal in such patients at our hospital.

The primary aim of our study was to identify the percentage of patients with deranged coagulation profile in the postoperative period potentially delaying/interfering with epidural catheter removal.

Materials and Methods:

Study Design: Prospective observational study

Ethics: Approval from hospital IEC

Registration: Clinical Trial Registry of India CTRI/2021/01/030571 [Registered on: 19/01/2021]

Statistics and Analysis of Variables: Descriptive analysis was performed to identify distribution of variables under study. Normal distribution of the values was tested using the Kolmogorov–Smirov test and homogeneity of variance was tested using Levene's test. The primary endpoint analysis was done using descriptive statistics frequency and percentage with 95% confidence interval.

Results: Seventy four patients (23.4%) had deranged coagulation in the immediate postoperative period which could potentially delay epidural catheter removal and increase risk for an epidural hematoma. Sixty (19%) patients with deranged INR received Vitamin K to correct the coagulation parameters and 10(3.16%) patients were transfused blood products to correct coagulation prior to epidural catheter removal.

A TEG was performed in 12 (3.8%) patients to evaluate the clotting process and help guide transfusion of blood products prior to epidural catheter removal. Median epidural catheter in-situ days was 4 (IQR: 0-6) and over 90% of the epidurals removed by 4th postoperative day. Median blood loss was 1000 ml (IQR: 650 - 1800).

In our study 1(0.3%) patient had a documented epidural hematoma (on postoperative day 3 with epidural in situ) which was immediately evacuated surgically (in 6-8 hours) with subsequent improvement of motor function.

Conclusion(s): Following major oncological surgeries, we found that 1/5th of patients had a deranged coagulation profile which potentially increases risk of epidural hematoma as well delay in epidural removal, risking infection and epidural abscess. Viscoelastic tests may have a role in guiding epidural catheter removal but requires further evaluation with high quality large studies.

03AP02-06
Axillary brachial plexus block for hand surgery: Peripheral nerve block top-ups, local anaesthetic mix and adjuncts

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Background and Goal of Study: Regional anaesthetists frequently mix local anaesthetic (LA) solutions, add adjuncts or perform peripheral nerve block top-ups to improve the speed of onset and extend the sensorimotor block effects. However, are these techniques effective in clinical practice?
This service evaluation project aims to answer this question by analysing the anaesthetic practice of performing axillary brachial plexus block for hand surgery.
Materials and Methods: Retrospective data were collected from anaesthetic charts and electronic records between June 2020 and May 2022. Fifty-two patients who underwent axillary plexus block for hand surgery were included. The following data were collected: (A) the type of LA solution and adjuncts used, (B) whether peripheral nerve block top-ups (median, ulnar, radial) were performed or not. These were analysed against the following outcomes: (1) total anaesthetic time, (2) intraoperative and postoperative analgesic opioid requirements, and (3) length of stay in the recovery unit and hospital stay. All data were found to be non-parametric and were analysed with Kruskal-Wallis and Mann-Whitney U tests.
Results and Discussion: There is no statistically significant difference in median anaesthetic time between the LA solutions, other than 0.5% levobupivacaine/1% lidocaine being longer than others (Figure 1).
There is no statistically significant difference found in intraoperative (p=0.87) or postoperative (p=0.43) analgesic opioid requirement, nor in time spent in the recovery unit (p=0.44) or in the length of hospital stay (p=0.64) when comparing the different LA solutions. There is no statistically significant difference (p=0.2) in the anaesthetic time between patients receiving peripheral nerve block top-ups (40min) versus no top-ups (35min).

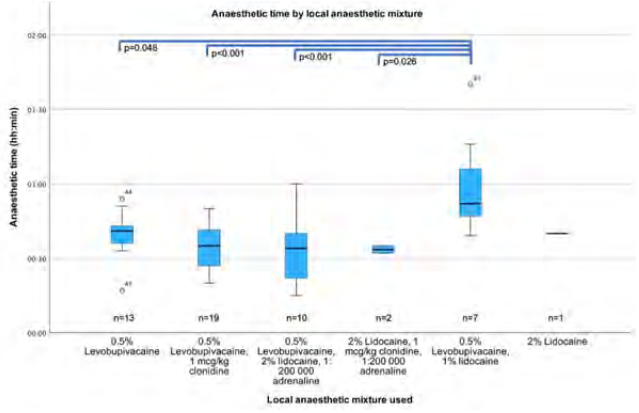

Figure 1.

Conclusion: The 0.5% levobupivacaine/1% lidocaine mix resulted in a longer anaesthetic time. Otherwise, no other statistically significant differences were detected within the above-measured parameters.

03AP02-07
Effects of the eighth cervical nerve root block performed during interscalene brachial plexus block on the surgical anesthesia in the posterior aspect of the shoulder in patients undergoing arthroscopic shoulder surgery

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Background and Goal of Study: Posterior portal placement during arthroscopic shoulder surgery causes pain in patients receiving conventional interscalene brachial plexus block (ISBPB) because it does not block the C8 nerve root innervating the posterior aspect of the shoulder.
We hypothesized that adding a C8 nerve root block to the conventional ISBPB targeting C5-to-C7 nerve roots would reduce pain upon posterior portal placement.
Materials and Methods: In this prospective, single-blinded, parallel-group, randomized controlled trial, patients were randomized to receive either C5-to-C7 (C5-7 group, n=37) or C5-to-C8 nerve root block (C5-8 group, n=36) with 25-30 ml of 0.75% ropivacaine.
The primary outcome was the pain intensity upon posterior portal placement, which was graded as 0 (no pain), 1 (mild pain), or 2 (severe pain).
The secondary outcomes were bilateral pupil diameters measured 30 minutes after ISBPB placement; the incidence of Horner's syndrome defined as an ipsilateral-minus-contralateral difference in pupil diameter <-0.5 mm; the onset of postoperative pain; postoperative numerical rating pain scores, where 0 and 10 represent no pain and the worst pain imaginable, respectively.

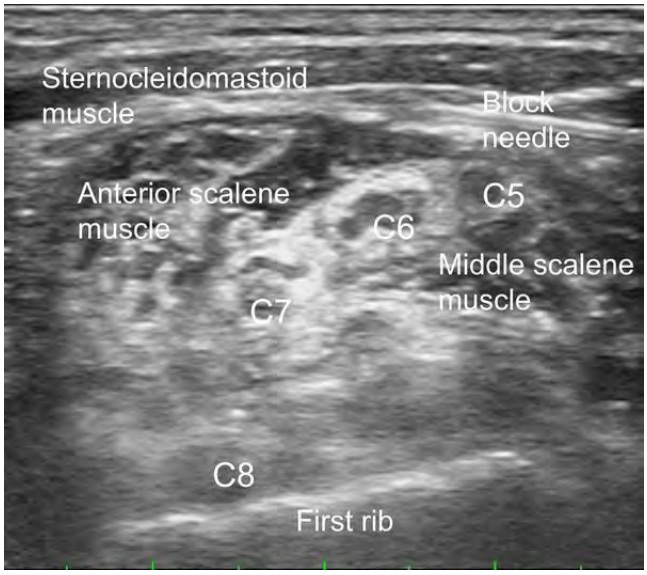

Figure 1. Ultrasound image taken after local anesthetic injection

Results and Discussion: Less pain upon posterior portal placement was reported in the C5-8 group than in the C5-7 group (median [IQR], 0 [0-0.75] versus 1 [0-1], median difference [95% CI], 1

[0 to 1], P=0.001). More patients reported no pain upon posterior portal placement in the C5-8 group than in the C5-7 group (27/36 [75.0%] versus 13/37 [35.1%], P=0.003). The incidence of Horner's syndrome was higher in the C5-8 group than in the C5-7 group (33/36 [91.7%] versus 22/37 [59.5%], P=0.001).
No significant differences were found between the two groups regarding postoperative numerical rating pain scores and the onset of postoperative pain.
Conclusion(s): C5-to-C8 nerve root block during ISBPB reduces the pain intensity upon posterior portal placement. However, it increases the incidence of Horner's syndrome with no improvement of postoperative pain compared to the conventional ISBPB (C5-to-C7 nerve root block).

03AP02-08
The influence of anterior quadratus lumborum block for robot-assisted partial nephrectomy on postoperative quadriceps strength: a prospective observational study

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Background and Goal of Study: Previous reports claimed that quadratus lumborum block (QLB) caused a decrease in quadriceps strength; however, quantitative evaluation on muscle strength is yet to be applied.
We designed this prospective observational study to investigate the incidence of quadriceps weakness after anterior QLB by quantifying the strength with a handheld dynamometer.
Materials and Methods: After Institutional Review Board approval (No. 2777) and registration (UMIN000042112), we enrolled patients undergoing robot-assisted partial nephrectomy. In all patients, anterior QLB was performed at the L2 level with 30 mL of 0.375% ropivacaine under general anaesthesia.
We evaluated maximal voluntary isometric contraction (MVIC) of each quadriceps using a handheld dynamometer (MT-100, Sakai Medical Co., Ltd., Japan) before surgery, and at postoperative days (POD) 1 and 4.
We investigated the incidence of muscle weakness, defined as a 25% MVIC reduction compared to preoperative baseline, and also defined "MVIC reduced possibly by nerve block" as a 25% MVIC reduction compared to that of the non-block side.
In addition, we assessed numerical rating scale (NRS) and quality of recovery-15 (QoR-15) scores at the same time points as the muscle strength measurements.
Results and Discussion: Of 38 included participants between November 2020 and June 2022, 8 were excluded due to refusal to undergo the postoperative muscle evaluation. The number of cases with no muscle weakness on POD 1 was 21 out of 30 (70%).
Out of the nine cases with muscle weakness, four showed an over 25% decrease in MVIC compared to the non-block side (Figure), 7 cases (77.8%) had NRS≧4, and 7 cases (77.8%) had QoR-15≦121, which is classified as moderate or poor. All nine cases ambulated within 24 h after surgery. These results showed that the main causes of muscle weakness include postoperative pain and recovery; however, we also hypothesized that four of the cases may have been affected by the anterior QLB.
Conclusion(s): In our study, the incidence of quadriceps weakness after QLB was 30%, and 13.3% may have been affected by anterior QLB; however, all of them were able to ambulate on POD1.

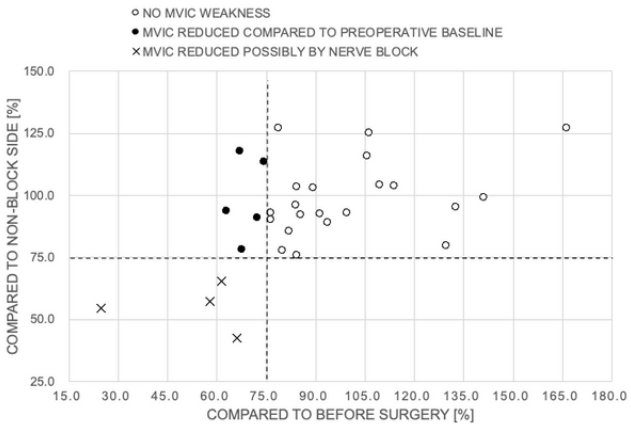

Figure. Scatterplot of patients MVIC on POD1

03AP02-09
Could addition of ultrasound-guided carotid sheath block to superficial cervical plexus block prolong postoperative analgesia in patients undergoing carotid endarterectomy?

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Background and Goal of Study: Carotid endarterectomy (CEA) is a common procedure performed under regional anaesthesia providing monitoring of cerebral function in real time. Numerous techniques of regional cervical blocks exist but superficial cervical plexus block (SCB) is one most commonly used.
The aim of this study was to compare regional anaesthesia using only superficial cervical plexus block with an ultrasound-guided carotid sheath block combined with superficial cervical plexus block for CEA.
Materials and Methods: Patients undergoing elective CEA surgery were randomly assigned into two groups: one received ultrasound-guided carotid sheath block and SCB (n=12) while another group received SCB only (n=18). Patients did not receive any premedication. All patients were ASA grade II and III and had invasive blood pressure monitoring with parameters noted every 5 minutes.
Both groups received mixture of 2 mg/kg 0.5% levobupivacaine and 2 mg/kg 2% lidocaine supplemented with saline to a volume of 50 mL. The onset and duration of sensory block and time to first analgesia were recorded.
Analgesia was measured using numeric pain rating scale (NPRS) every 2 hours, up to 12 hours after regional block was performed. A log-rank test was performed to compare a probability of NPRS≤ 3 during follow-up time, with results described as Kaplan-Meier curves.
Results and Discussion: Demographic data and surgical characteristics were comparable in both groups. Block onset time and duration of sensory block were not statistically different in both groups. Time to first analgesia was slightly higher in the group of patients receiving ultrasound-guided carotid sheath block with SCB (difference of medians 124 minutes), but the difference was

not statistically significant. Also, postoperative pain in the first 12 hours described as a probability of NPRS≤ 3 was more prominent in patients having received only superficial cervical plexus block (66.6% as opposed to 58,3%), but log-rank test showed no significant difference.

Conclusion(s): Our early research data do not show benefits of addition of ultrasound-guided carotid sheath block in prolonged postoperative analgesia i.e., time to first analgesia.

However, a larger sample size is needed for better statistical power to confirm whether the use of ultrasound-guided technique could prove more beneficial in prolonging postoperative analgesia and sensory block duration time.

03AP02-11
Analgesic effect and safety of programmed intermittent bolus infusion concomitant with serratus anterior plane block for minimally invasive cardiac surgery: a randomized, double-blind controlled trial

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Background and Goal of Study: Minimally invasive cardiac surgery (MICS) is associated with fewer complications and faster recovery compared with median sternotomy. However, postoperative pain in the lateral intercostal region after MICS can negate its benefit. The serratus anterior plane block (SAPB) provides effective analgesia for thoracic surgery, and programmed intermittent bolus infusion (PIBI) with an SAPB may potentially be useful for post-MICS pain management.

In this study, we investigated the effects of PIBI with an SAPB on postoperative pain using post-MICS fentanyl administration. We also investigated the adverse effects and plasma concentrations of ropivacaine and fentanyl to determine the safety of analgesia.

Materials and Methods: The study included 20 patients randomly allocated to the SAPB and control groups. All patients underwent preoperative SAPB followed by catheter insertion. Participants in the SAPB group received a bolus of 20 mL 0.25% ropivacaine every 6 hours postoperatively, whereas those in the control group received a bolus of 20 mL saline.

All participants received intravenous fentanyl via patient-controlled analgesia. Blood samples were obtained 10, 20, 30, and 60 min after preoperative ropivacaine infusion, during and after cardiopulmonary bypass and on postoperative day (POD) 1–5.

The primary outcome was the cumulative fentanyl usage up to POD5. We performed intergroup comparison of non-normally distributed data using the Wilcoxon test and of categorical variables using the Fisher exact test.

Results and Discussion: We observed no significant intergroup difference in cumulative fentanyl usage on POD5 (SAPB group: median [interquartile range 512 μg [457–753] vs. control group: 654 μg [439–982], P=0.96). The plasma concentration of ropivacaine did not reach the threshold for systemic toxicity in any patient.

The incidence of postoperative nausea and vomiting (PONV) was significantly lower in the SAPB than in the control group (11% vs. 63%, P=0.05), and we observed no intergroup difference in the median plasma concentration of fentanyl on POD1 (P=0.82). Further studies are warranted to determine other etiologies contributing to the lower incidence of PONV in the SAPB group.

Conclusions: Compared with the control group, post-MICS fentanyl usage was not lower in patients who received PIBI with an SAPB. The plasma concentration of ropivacaine during PIBI with SAPB was below the toxic level.

03AP02-12
Incidence and severity of post-dural puncture headache in patients undergoing subarachnoid block

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Background and Goal of Study: Post-dural puncture headache (PDPH) is a complication of neuraxial (subarachnoid or epidural) block1. Its incidence ranges from 3-40% and is affected by different factors such as age, gender, needle size and shape, number of puncture attempts and history of headache.

Due to the lack of data in the non-obstetric population, this study proposes to evaluate the incidence and severity of PDPH after subarachnoid block (SAB).

Materials and Methods: A prospective observational study was carried out in patients undergoing SAB during the last trimester of 2020. Data collected on the day of the procedure was: surgical specialty, elective or urgent surgery, gender, age, ASA status, previous history of headache, technique performer, needle type, needle caliber, number of punctures, positioning, median or paramedian, presence of blood in the skin or needle and presence of pain.

The patients were evaluated at 48 hours and 7 days after the procedure and the following data was collected: presence of PDPH, location of headache, intensity of pain, associated symptoms, treatment of PDPH, symptoms after treatment and return to deambulation.

Results and Discussion: A total of 143 patients were assessed (median age 62 years, 53% women). The incidence of PDPH 21.7% (n=31) and most PDPH cases occurred in female gender (n=20, 64,5%) and on an outpatient basis. When using 25G needles, the incidence of headache was 2.5 times higher compared to the use of 27G needles (71,0% versus 29,0%, respectively) and when using Quincke needles was twice as high when compared with Whitacre needles (64,5% versus 35,5%, respectively).

Regarding the intensity of the PDPH, the majority had a mild intensity 54.8% (n=17), 25 patients had frontal headache (80.6 %) and 15 with associated symptoms (48,4%). Of this sample, 8 patients (25.8%) already had a previous medical history of headache. The relationship between the group of PDPH showed a statistically significant difference when compared to the number of punctures, the age groups and history of previous headache.

Conclusion: More than 1 in 5 patients (21,7%) undergoing SAB in our non-obstetric population had PDPH. Female gender, history of headache, larger caliber and Quincke needle use is associated with higher incidence of PDPH.

References:

1. D. Ethiopia. SAGE open medicine,2019; 9, 20503121211051926.
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03AP03-01
Learning curve to correct identification of the vertebral interspace for epidural puncture by ultrasound imaging validation

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Background and Goal of Study: Anaesthesiologists usually palpate the spinous processes and several landmarks such as the superior iliac crest or tip of the scapula to identify the target vertebral interspace for epidural puncture (landmark method). However, anaesthesiologists often fail the target interspace in puncture that rely solely on landmark identification. Ultrasonography application facilitates the success of epidural anaesthesia by improving the rate of correct identification of the vertebral level.
The aim of this study was to determine the difference in rates of correct vertebral level identification using ultrasound-assisted and conventional landmark methods and to determine the effectiveness of repeat ultrasound-assisted identification for improving landmark identification accuracy.
Materials and Methods: We enrolled 75 patients aged 20-90 years who underwent surgery in the period between September 2021 and November 2021. Each patient was placed in the lateral position on the operating table for epidural puncture.
First, the anaesthesiologist identified the target vertebral interspace by the landmark method. This was further validated by using the ultrasound-assisted method. Briefly, using the Th12 vertebra, where the most caudal rib originates, the target vertebral interspace was identified by sliding the ultrasound probe in a parasagittal view. By using the two methods, we identified vertebral levels and measured number of vertebral interspaces from the Th12/L1 interspace. We used a cumulative sum (CUSUM) technique to analyse learning curve for identification of the vertebral level.
Results: In 21 (28%) of the 75 patients, the target interspaces determined by using the two methods were different. The landmark method incorrectly identified the target interspace caudally in 17 (23%) of the 75 patients. Figure 1 showed that the CUSUM of coincidence improved after a total of 30 cases.

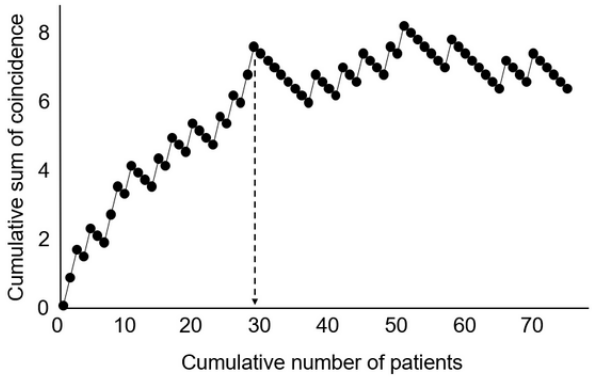

Figure1 CUSUM plot using the landmark and ultrasound-assisted methods. The plot represents the cumulative sum (CUSUM) of coincidence in the two methods (K = 0.20, σ = 0.45). The slope of the graph changed at the first local maximum: total of 30 cases.

Figure 1.

Conclusions: Epidural puncture practitioners may benefit from training to identify the vertebral interspace with the aid of ultrasonography in the first 30 cases.

03AP03-03
Plan A blocks course for anaesthetic trainees: adding extra teaching session on the management of unexpected or persistent postoperative neurological dysfunction following peripheral nerve block

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Background and Goal of Study: RAUK, in collaboration with the British Society of Orthopaedic anaesthetists, has developed an algorithm to guide the management of unexpected or persistent neurological symptoms after peripheral nerve blocks and surgery [1].
This quality improvement project assesses anaesthetic trainees' knowledge of the updated guidelines and introduces a teaching session covering this topic to an established Plan A blocks teaching programme.
Materials and Methods: A survey was submitted to anaesthetic trainees to test their awareness and knowledge of the current guidelines:
1. Do you know of any local/national pathways for the management of unexpected/persistent neurological dysfunction after peripheral nerve block?
2. Do you know what constitutes an urgent lesion and how to manage this?

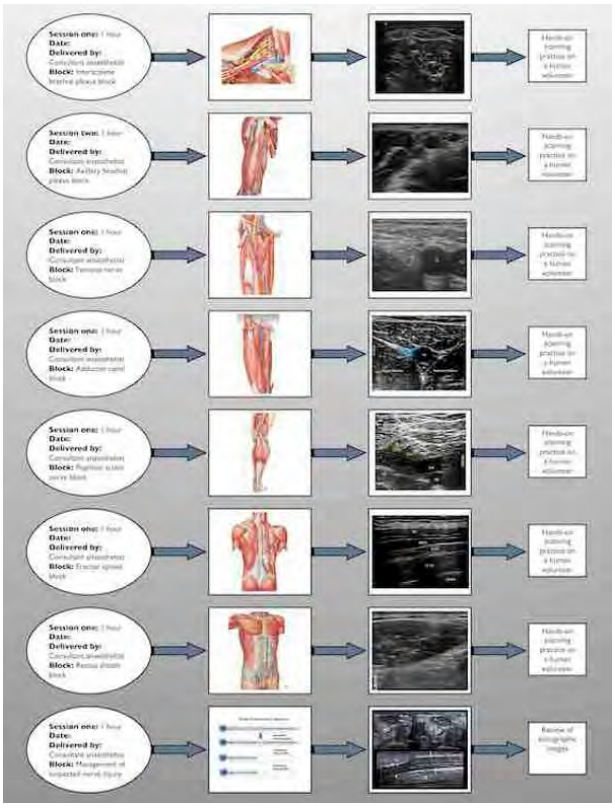

Figure. Plan A blocks course at Glasgow Royal Infirmary

Results and Discussion: Only 22% (2 of 9) of those trainees who completed the pre-teaching survey answered yes to question 1, and again 22% (2 of 9) answered yes to question 2, with only 11% (1 of 9) answering question 2 correctly as per the updated guideline.
In order to improve trainees' knowledge of the current guideline, a teaching session was added to the consultant-led Plan A blocks teaching programme. This course runs as part of the anaesthetic trainee's formal teaching programme and is repeated three times per year.
Conclusion(s): Adding regular teaching sessions on the management of persistent neurological symptoms after peripheral nerve blocks to anaesthetic teaching programmes may help improve trainees' knowledge of this critical topic.
Reference:
Peripheral nerve block follow-up and initial management of unexpected or persistent neurological symptoms after peripheral nerve blocks and surgery. Available at https://www.rauk.org/images/Documents/DEFINITIVE_RAUK_BOA_guidelines.pdf (Accessed: December 13, 2022).

03AP03-04
Study of the frequency-dependent cardiotoxicity of amide local anesthetics

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Background and Goal of Study: The cardiotoxicity of local anesthetics (LA) is related to the inhibition of the fast inward sodium current during cardiac depolarization. Ropivacaine (R) and levobupivacaine (L) are considered less cardiotoxic compared to bupivacaine (B).
However, several clinical reports have described severe complications including arrhythmias, ventricular tachycardia and even cardiac arrest with their accidental administration. Our aim was to characterize and compare the frequency-dependent cardiotoxicity of R, B and L.
Materials and Methods: Twenty-one pigs were anesthetized and instrumentalized. Three quadripolar catheters were used for stimulation and intracardiac recordings, placed in the high right atrium, right ventricular apex, and in the His bundle recording area.
After stabilization, pacing was performed at 30 mA with a programmable stimulator. Right ventricular pacing was performed for at least 10 beats at a two basic cycle length of 400 and 500 ms. This pacing protocol was performed immediately before and at 1, 5, 10, 15 and 30 minutes of the administration of R (5 mg/Kg), L (4 mg/Kg), and B (4 mg/Kg).
Results and Discussion: LA induced an intense toxicity effect in sinusal rhythm as well as in stimulated rhythm. QRS interval in sinusal rhythm increased from 68±5 to 114±24ms, (Δ 70%), p=0.018; from 71±7 to 120±20ms (Δ 75%), p=0.04; and from 75±13 to 184±38ms (Δ 148%), p=0.02 in R, L and B groups respectively. The effect was higher in the B group, p=0. 009.
The use-dependent effect at paced cycle length of 400ms increased from 95±9ms to 347±78ms (Δ 265%), p=0.018; from 98±12ms to 372±52ms (Δ 280%), p=0.018; and from 97±8 to 431±22ms (Δ 345%), p=0.02 in R, L and B groups respectively. The effect was significantly higher in animals in the B group, p=0.01. Fifteen minutes after administration of LA, an intense increment up to 33%,153% and 142% still persisted in the R, L and B groups respectively in stimulated QRS. However, QRS interval in sinusal rhythm showed values in normal range.
Conclusions: R and L have a huge cardiotoxic effect that has been shown with rapid stimulation frequencies similar to bupivacaine. A hidden cardiotoxic phenomenon has been unmasked with all three anesthetics, that persists intensely even after 15 minutes.
In accidental intoxication precaution should be maximized as well as avoiding sympathetic stimulation until cardiotoxicity parameters are completely restored.

03AP03-05
Effect of single shot femoral and sciatic nerve blocks, combined with general anaesthesia, in postoperative pain levels and phantom limb pain development in patients undergoing lower limb amputation

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Background and Goal of Study: Phantom limb syndrome and pain often presents in patients undergone lower limb amputation. Postoperative pain is common.
We studied the effect of femoral and sciatic nerve blocks, combined with general anaesthesia, in postoperative pain levels and phantom limb pain development in patients undergoing lower limb amputation.
Materials and Methods: 72 patients were included in the study. We included patients undergoing lower limb amputation 10cm cephalad or 10cm caudal of the knee, due to Peripheral Arterial Disease. We excluded patients with any form of dementia.
We assessed pain levels with numerical rating scale (NRS) 0-10. We assessed phantom limb pain with NRS, DN4 questionnaire and opioid use. Anaesthetic techniques used are described in Table 1.

	GROUP A (N=35)	GROUP B (N=37)
INDUCTION	propofol 2mg/kg IV 100mcg fentanyl IV 0,6mg/kg rocuronium IV	propofol 2mg/kg IV 100mcg fentanyl IV 0,6mg/kg rocuronium IV
MAINTENANCE	sevoflurane 0,7 MAC remifentanil 0,02-0,12 mcg/kg/min	sevoflurane 0,7 MAC remifentanil 0,02-0,12 mcg/kg/min
NERVE BLOCK	-	femoral nerve block (5cm caudal of the femoral crease) sciatic nerve block (classic posterior approach)*
INTRA-OPERATIVE	0,05mg/kg morphine IV 30mg ketamine IV 4g MgSO4 IV 60mcg clonidine IV 1gr paracetamol IV	30mg ketamine IV 4g MgSO4 IV 60mcg clonidine IV 1gr paracetamol IV

*0,5% ropivacaine (15ml for femoral, 20ml for sciatic) with U/S guided technique.
All patients from both groups received 1grX3 paracetamol IV for 3 days and 75mgX2 pregabalin P.O. from the first post-operative day through the end of the study period. Rescue analgesia: tramadol 100mg IV (max. 300mg/day).

Table 1. Anaesthetic techniques used

Post-operative pain and phantom limb pain follow-up are presented in Tables 2 and 3. We gathered data from patient anaesthesia forms and patient interview. We analyzed the data with IBM SPSS software. t-test was used.

Results and Discussion: Pain levels and opioid use are presented in Table 2. Pain levels and opioid use were lower n Group B.

	GROUP A RESC. ANALG.	GROUP B RESC. ANALG.	GROUP A NRS (MEAN)	GROUP B NRS (MEAN)
DAY 0	31%	3%	5	2
DAY 1	60%	13%	6	2
DAY 2	70%	20%	5	1
DAY 3	55%	14%	5	1
	p<0,01		p<0,05	

Table 2. Post-operative pain levels and opioid use.

Follow-up results are presented in Table 3. Pain levels, patients with DN4>4 and patients that used opioids >2/week was lower in Group B.

	GROUP A NRS>3 (SUSTAINED FOR >3H/DAY)	GROUP B NRS>3 (SUSTAINED FOR >3H/DAY)	GROUP A DN4>4	GROUP B DN4>4	GROUP A USE OF OPIODS >2/ WEEK	GROUP B USE OF OPIODS >2/ WEEK
1ST MONTH	36%	17%	34%	11%	63%	23%
3RD MONTH	38%	15%	34%	13%	35%	13%
6TH MONTH	40%	11%	40%	15%	32%	5%
12TH MONTH	37%	11%	37%	15%	22%	3%
	p<0,03		p<0,03		p<0,03	

Table 3. Post-operative follow-up results. GROUP A (G.A.), GROUP B (G.A. + nerve block)

Conclusion(s): Patients undergoing lower limb amputation due to PAD have lower pain levels, less phantom limb pain and use less opioids, when G.A. is combined with regional nerve blocks, versus G.A. alone.

03AP03-06
Feasibility study of a new epidural simulator to learn loss of resistance technique

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Background: Epidural analgesia is the most effective form of pain relief during labor yet us associated with numerous complications including accidental dural puncture and failed epidural. Anesthesiologist's experience is thought to influence success rate of epidurals and effort has been made to develop models to simulate epidural loss of resistance technique. However most models are unable to control for interindividual variations such as depth of loss of resistance or ligamentum flavum thickness. We therefore designed a bimanual haptic simulator to train anesthesiologists and optimize epidural analgesia skill acquisition.

Materials and Methods: We designed a bimanual epidural simulator with two Phantom Omni haptic devices: Device 1 is mounted by a Touhy needle and Device 2 is connected to a LOR syringe. To render resistive forces, we implemented the model and added variability in the thickness of the layers and their stiffness according to a weight-based estimation.

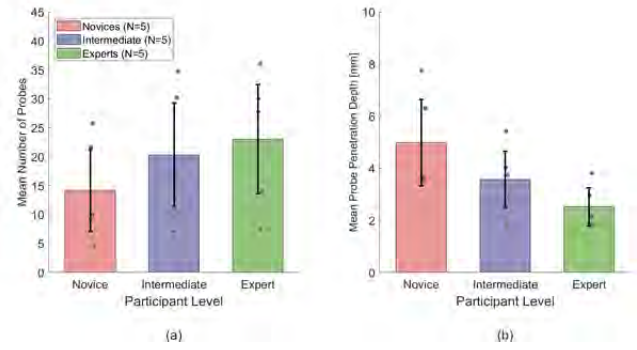
Results and Discussion: The simulator is able to distinguish between real-life novices and experts demonstrates good construct validity.

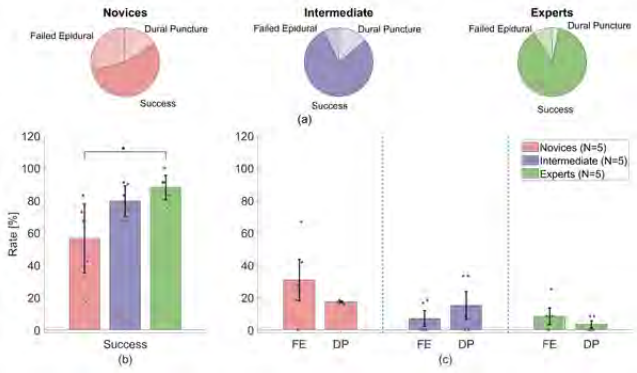
Experienced users' VAS scores were relatively high (in overall impression and suitability as a training tool) demonstrates adequate face validity.

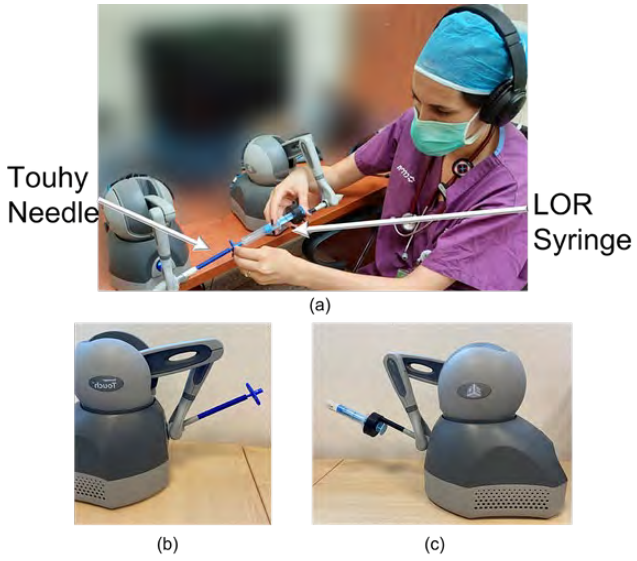
Little use of the probing method can lead to a higher chance of resulting in Dural punctures.

Expert anesthesiologists probe with the LOR syringe more than novices.

Errors of novices are bigger in size than those of experts.







Conclusion: This is a preliminary exploratory feasibility study using a robotic simulator.

03AP03-08
Effectiveness of Fascia iliaca compartment block (FICB) to the patients with hip fractures in the emergency department

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Background and Goal of Study: Patients with hip fracture experience moderate to severe pain in the emergency department. Aim of our study was to evaluate the effectiveness of Fascia iliaca compartment block (FICB) on the pain relief in patients with femoral fracture where the analgesia was performed by a trained trauma surgeon.
Materials and Methods: A prospective randimised study was conducted at the Hospital of Traumatology and orthopaedics, Riga, Latvia (April 2022 to November 2022) and enrolled 80 patients with hip fractures. All subjects were randomised into the 2 groups, using the online tool on www. randomiser. org.
Treatment group (R) was allocated to block with Ropivacaine (75-112 mg depending on the patient weight). Both groups (R and control (C)) received multimodal analgesia.
The primary outcome was the intensity of pain. Pain level was evaluated using Numerical Rating Scale (NRS) in the admission period, then 15 minutes, 1h, 2 h, 4 h and 8 h after FICB. The data were analyzed using SPSS Version 27.0.
Results and Discussion: 80 patients (60 females and 20 males) aged 40-96 years were included in the study. Pain in the emergency department after admission - in the C group 6.73 in the NRS scale, in the R group 7.13. 1 h after FICB pain in the C group was 4.48 [4.26; 4.69], in the R group 2.33 [1.97; 2.68], $p<0,0001$, 2 h after in the C 4.48 [4.19; 4.76], in the R group 2.20 [1.87; 2.53], $p< 0.0001$, 4 h after in the C group 4.13 [3.88; 4.37], in the R group 2.28 [1.95; 2.60], $p< 0.0001$, 8 h after in the C group 4.30 [3.96; 4.64], in the R group 2.45 [2.16; 2.74], $p< 0.0001$.
Analyzing patients with pain level >5 NRS points, in the C group, 25% of the patients did not exceed 5 points, while, in the R group, 97.5% did not exceed 5 points.
Conclusion(s): FICB performed in the Emergency department is an effective method that significantly reduces pain in patients with hip fractures.

03AP03-09
eLogbook: improving audit in the block room

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Background and Goal of Study: The Queen Elizabeth University Hospital 'Block Room', introduced in response to the Covid-19 pandemic to improve theatre efficiency, has been running for 18 months. Local data has previously demonstrated high uptake in the service and low block failure rates1 in previous cases (n=1029). Data collection had been manual and time-consuming, with some data points incomplete.
By implementing a site-wide electronic logbook, this project aimed to: improve ongoing audit of the service; allow real-time data collection; and increase capture rate of cases seen by the regional anaesthesia service.
Materials and Methods: An electronic logbook (eLogbook) was created to log and store case details digitally. A Microsoft Forms template was created in order to capture all relevant clinical details in spreadsheet format for analysis. Access to the form was provided to clinical staff using QR code scanning and direct links. This enabled data entry concurrent with the performance of clinical procedures. Implementation of the change was announced to clinical staff via email and posters displayed in the block room.
Project approval was sought and received from the Caldicott Guardian and information governance teams in NHS Greater Glasgow and Clyde.
Results and Discussion: The eLogbook was launched in August 2022 and has subsequently captured 100% of cases (n=37) occurring throughout the hospital site. For all cases, required clinical and procedural data was fully complete – this will allow retrospective analysis of block success, complication and failure rates to be audited more effectively. Low total case numbers have been observed compared to historical data1, attributed to service and staffing pressures.
Conclusions: Implementation of an eLogbook has been a successful intervention to increase capture of data at the time of procedure performance in the block room. Data obtained will contribute to service evaluation and audit as it becomes embedded in departmental practice.
References:
1. Beck A, Thomson I. Opportunity blocks: Launching a block room Poster presented at RA-UK Annual Scientific Meeting, May 2021, Sheffield.
Acknowledgements: Thanks to QEUH theatres staff for their ongoing support throughout this project.

03AP03-10
Artificial Intelligence for ultrasound-guided Peripheral Nerve Block procedures: assistive tool for medical image interpretation

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Background and Goal of Study: Identification of anatomical structures through reliable interpretation of the ultrasound image supported via artificial intelligence (AI) for a number of peripheral nerve block (PNB) procedures has been recently shown (1).
We aimed to assess the accuracy of AI-based real-time anatomy identification for ultrasound-guided PNB in eight block regions.
Materials and Methods: After obtaining IRB and the Council of Pharmaceuticals and Medical Devices approval (15.12.2020/E.595466), written informed consents were collected from 40 healthy volunteers (n=20 men, n=20 women). Participants' age and body mass index (BMI) were noted.
An ultrasound device (GE LOGIQ, USA) installed with AI software (Nerveblox, SmartAlfa, Turkey) were used to scan selected block (superficial cervical plexus, axillary brachial plexus, pectoralis nerve, rectus sheet, femoral nerve, adductor canal, popliteal, and erector spinae plane) regions.
AI software represents a scan success that enables confidently recognizing anatomical landmarks that appear on the ultrasound image. During scanning by a trainee, once the software indicates 100% scan success of associated anatomic landmarks, both raw

and labeled ultrasound images were saved, assessed, and validated using a 5-point scale by expert validators. Kappa test was conducted to examine the evaluation scores of the validators for each block. Independent sample t-test was used to elucidate accuracy scores. Correlation analysis was used whether the relationship (r) according to demographics (gender, age, and BMI) and block type exists.

Results and Discussion: The mean score of the overall images was 4.79±0.67. For the obese participants, the mean score was 4.78±0.65. Mean scores were highest for rectus sheath (4.98) and femoral nerve (4.93) blocks, and lowest for popliteal (4.21) and erector spinae blocks (4.69) without difference between females and males.

However, higher pecs and rectus sheath scores in males and higher popliteal scores in females were observed. In volunteers over 50 years old, the mean scores were the highest (4.81).

Conclusions: The AI technology can successfully interpret the anatomical structures in real-time sonography which would be valuable in assisting anesthesiologists to perform PNB.

Reference:

1. Gungor et al. A real-time anatomy identification via tool based on artificial intelligence for ultrasound-guided peripheral nerve block procedures: an accuracy study. J Anesth 2021; 35: 591-4.

03AP03-11
Continuous infusion of remimazolam for intraoperative sedation as a safe and effective option: a prospective clinical study

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Background and Goal of Study: The purpose of our study was to identify the appropriate dosage of continuous remimazolam that would provide satisfactory sedative and hypnotic effects to the patients, i.e., to procure a BIS score of 60 to 80 and/or Richmond sedation scale (RASS) value of -2 or -3.

Materials and Methods: 23 patients of ASA status II, III or IV undergoing surgical procedures in spinal anaesthesia were studied. After assessing for adequate quality of spinal block, and at the beginning of the surgical procedure, a bolus dose of remimazolam of 5 mg was applied, and syringe pump was set to deliver remimazolam 1 mg/mL at 15 mL/h, adjusting the rate of infusion to maintain BIS values between 60 and 80. BIS, Richmond sedation scale (RASS) and infusion rate were noted every 5 minutes. Side effects (hypotension, bradycardia, hypoxia) were monitored.

Results and Discussion: Mean patients' age was 67.3 ± 13.1 years with male frequency of 56.6%. There were 15 (65.2%) ASA II patients and 8 (34.8%) ASA III patients. When the BIS values were between 60 and 80, the median dose of infused remimazolam was 3.2 mcg/kg/min (ranging from 1.0 to 5.1 mcg/kg/min; Q1 2.4, Q3 4.1). Results are graphically represented in Figure 1.

Median time from discontinuation of infusion until full recovery of consciousness was 3.5 minutes (ranging from 0 to 8 min; Q1 1.5, Q3 5.0). Hypotension was recorded in 7 patients, with only 4 cases (17.4%) needing treatment with low doses of ephedrine. No other side effects were recorded. Patients reported satisfactory amnestic effects (86.9%) afterwards.

Conclusion(s): Continuous infusion of remimazolam with median dose of 3.2 mcg/kg/min has provided an effective and satisfactory sedative and hypnotic levels for non-healthy individuals, measured by BIS and Richmond sedation scale, with rapid offset and early recovery.

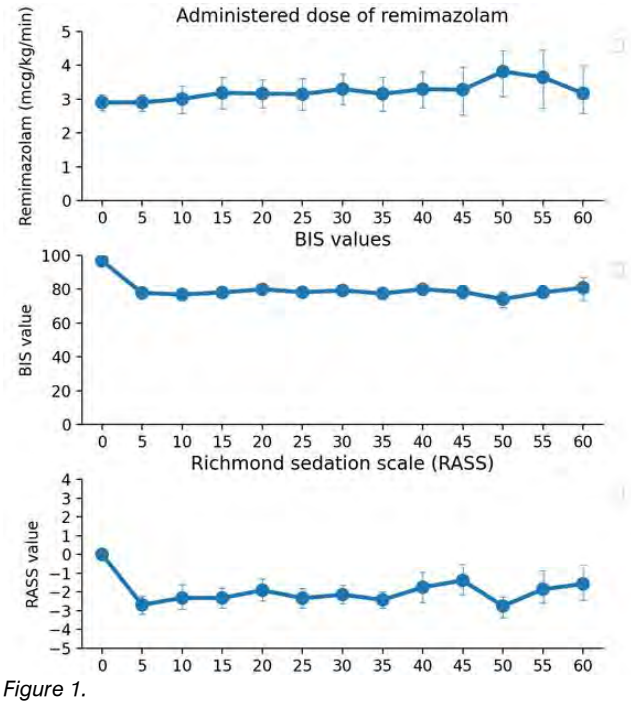

Figure 1.

03AP03-12
Modern approaches to anesthesiological maintenance of plastic surgery of the cruciate ligament of the knee

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Background and Goal of Study: The postoperative period of arthroscopic reconstruction of the anterior cruciate ligament of the knee is accompanied by severe pain, which delays the rehabilitation of patients, early return to work, increases general hospital resources and psycho-emotional satisfaction of patients.

Currently, there is no "gold standard" for analgesia during PCL reconstruction and optimal treatment of postoperative pain.

Problem. To investigate the influence of regional anesthesia techniques during knee arthroscopy on the intraoperative period, on the intensity of pain syndrome and psycho-emotional state in the postoperative period.

Materials and Methods: The study included 120 patients who underwent planned arthroscopic plasty of the anterior cruciate ligament of the knee joint. In group 1 - patients who underwent spinal anesthesia with bupivacaine solution, in group 2 modified spinal anesthesia was used, in group 3 - combined anesthesia (spinal anesthesia + peripheral blockade of the femoral nerve), spinal anesthesia + blockade of the femoral and gluteal nerves) - group 4.

Results and Discussion: When comparing the groups, it turned out that in the groups where spinal anesthesia was used, a pronounced pain syndrome was observed in the early postoperative period and

a higher level of stress markers (glucose, cortisol) was noted. Hypotension and bradycardia were noted in 16% of patients from these groups.
Patients from the groups where peripheral blocks +spinal anesthesia were used did not experience pain during the first 40 hours after surgery. Episodes of hypotension and bradycardia were noted in 6% of patients. The level of stress markers (glucose, cortisol) was within the physiological norm.
Based on these facts, we assume that the use of peripheral blockades has advantages in arthroscopic operations on the knee.
Conclusion: The results of the study indicate the effective use of peripheral blockades (femoral and sciatic nerves) in combination with spinal anaesthesia.
Acknowledgements: **Institutional Review Board Statement** The study was conducted in accordance with the recommendations of the Declaration of Helsinki and was approved by the Ethics Committee of the Shupyk National University of Health Care, Kyiv (protocol code No. 13, approval date, December 3, 2020).

03AP03-13
The use of cool sticks to assess level of spinal anaesthesia

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Background and Goal of Study: Ethyl chloride has a profound negative impact on the environment; with long lasting harmful effects on aquatic life, birds, plants and directly on our own health. (1) The use of ethyl chloride to assess neuraxial blocks has, therefore, become less favourable. An alternative way to assess these blocks is by the use of Coolsticks. CoolSticks are plastic rods with metal ends that are stored in the refrigerator. The cooled metal end tests dermatomal sensory levels through temperature perception.
This study aims to explore the use of CoolSticks as an alternative to ethyl chloride in order to reduce environmental impact.
Methods: CoolSticks were introduced to theatres at University Hospital Ayr in September 2022 as a method of testing neuraxial blocks. After 3 months of use, a 7-question survey was sent out to anaesthetic doctors. Participation was voluntary. Retrospective data of pharmacy orders and costs were collected and compared over this time frame.
Results: 16 staff members responded to the survey. 100% of staff members had used the CoolSticks to test neuraxial blocks and 81.3% (n=13) felt that it had reduced their use of ethyl chloride. Anaesthetist's perceived reduction of ethyl chloride use has been summarised in Figure 1. 75% of participants (n=16) stated that their first method of testing a neuraxial block would now be the CoolStick.

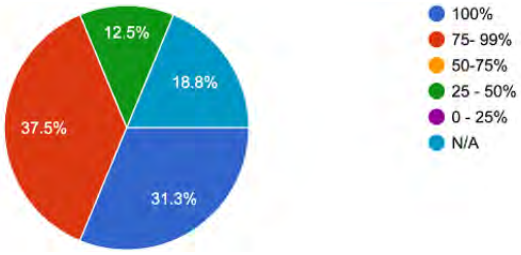

Figure 1: By what percentage has the introduction of CoolSticks reduced your use of ethyl chloride?

Ethyl chloride costs between £9-22 per bottle. Over the last six months, 32 bottles of ethyl chloride were used in the theatre department.
Conclusion(s): From this study we can conclude that the introduction of CoolSticks has reduced our use of ethyl chloride as a department. We estimate that through the introduction of CoolSticks, we will have a 50-80% reduction in use of ethyl chloride which will eventually save money and reduce our environmental impact.
Reference:
1. BOC (2021) 'Chloroethane', SAFETY DATA SHEET, 1.1, pp. 1–17. Available at: https://www.boconline.co.uk/en/images/ethyl-chloride_tcm410-631289.pdf .

03AP04-01
Ultrasonographic validation of supra-inguinal fascia iliaca block (FICB) at infra-inguinal level

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Background and Goal of Study: Fascia iliaca compartment block (FICB) has been used for the patients in proximal femoral fractures, since FICB can block the femoral nerve (FN), the obturator nerve, and the lateral femoral cutaneous nerve at the same time (1).
Thanks to ultrasonography (US), the technique is switched to supra-inguinal approach from infra-inguinal approach with classical pop sensation. The spread of injected local anesthetics (LA) to the FN periphery as well as to the iliac fascia can be confirmed ultrasonographically (2).
Some recommend ultrasound imaging of the FN area before and after FICB. However, there is no report on the effect of FICB regarding the spread of LA to FN. This study aimed to investigate whether the spread of LA around the FN by FICB affects the postoperative analgesic status.
Materials and Methods: This retrospective single-center study included patients (ASA I~III) diagnosed with proximal femur fracture (neck or trochanter) and underwent preoperative US guided supra-inguinal FICB at our facility between January and September in 2022.
We injected 30-40 ml of 0.375% ropivacaine and captured the spread of LA around the FN at infra-inguinal level following the block. Patients are divided into two groups, FN+; LA echo is observed around FN, FN-; LA is not observed.
Frequency of postoperative analgesic use and onset time to pain complaints were evaluated. Mann Whitney test and unpaired t-test were used for statistics. FICB was performed by two anaesthesiologists experienced in FICB. The spread of LA was judged by independent anaesthesiologists.
Results and Discussion: Ninety patients aged 59-102 years, 46 in the FN+ group and 44 in the FN- group, were included in the study, and the backgrounds showed no difference between the two groups.
The number of analgesics used in the two groups were 1.37 ± 0.14 times in FN+ and 1.39 ± 0.14 times in FN- group, respectively (P = 0.9341). The median time that patients complained pain was 12 hours in both groups.
This data shows the effect of supra-inguinal FICB in both groups are comparable, suggesting that LA expands above the inguinal region at the same level, but LA does not expand infra-inguinal region in some cases.

Conclusion: We performed FICB in the suprainguinal approach in this study and found no correlation between the effectiveness of FICB and the spread of the LA around the femoral nerve.

References:

1. Br J Anaesth, 2018,120: 1368.
2. Anaesthesia, 2011, 66: 300.

03AP04-02
The effect of regional nerve block on postoperative delirium in older adults undergoing hip surgery: a systematic review and meta-analysis of randomized controlled trials

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Background and Goal of Study: Peripheral nerve block reduces pain, which is a major risk factor for postoperative delirium. We performed this meta-analysis to find out whether peripheral nerve block reduces postoperative delirium in elderly patients undergoing hip surgery.

Materials and Methods: Databases of PubMed/MEDLINE, Embase, Web of Science and the Cochrane Library were searched for studies on April 26, 2022. Randomized controlled trials which investigated the effect of peripheral nerve block on postoperative delirium in elderly patients undergoing hip surgery were included.

Results and Discussion: Twenty randomized controlled trials with total 2,037 participants were included. Perioperative peripheral nerve block reduced postoperative delirium at postoperative day 3 (OR: 0.67, 95% CI [0.47 to 0.96], $p = 0.03$, $I^2 = 42\%$) but showed no difference at postoperative day 7 (OR: 1.26, 95% CI [0.76 to 2.09], $p = 0.37$, $I^2 = 0\%$).

In a subgroup analysis, sole fascia iliaca compartment block showed reduction of postoperative delirium at postoperative day 3 (OR: 0.59, 95% CI [0.37 to 0.94], $p = 0.03$, $I^2 = 2\%$) whereas sole femoral nerve block (OR: 0.47, 95% CI [0.18 to 1.25], $p = 0.13$, $I^2 = 77\%$) or other types of block (OR: 0.98, 95% CI [0.64 to 1.52], p = 0.94, $I^2 = 0\%$) showed no statistically significance with 41.8% of I^2 score and 0.18 of *p-value* for subgroup differences.

Postoperative pain score on scale of 0-10 was also reduced (MD: -0.54, 95% CI [-0.89 to -0.19], p=0.002, $I^2 = 94\%$) when peripheral nerve block was performed.

Conclusion(s): Perioperative peripheral nerve block can reduce postoperative delirium and postoperative pain until postoperative day 3. Specifically, the effect of reducing postoperative delirium was statistically significant when fascia iliaca compartment block was performed.

However, because of the wide variety of peripheral nerve blocks performed in the included studies, more randomized controlled trials are needed to investigate the effect of each peripheral nerve block on postoperative delirium.

03AP04-03
Modified thoracoabdominal nerves block through perichondrial approach versus oblique subcostal transverse abdominis plane block in patients undergoing total laparoscopic hysterectomy: a pilot randomised controlled trial

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Background and Goal of Study: Modified thoracoabdominal nerves block through perichondrial approach (M-TAPA) has gained attention for providing widespread Th7-11 analgesia. Meanwhile, laparoscopic total hysterectomy (TLH) is associated with severe post-surgical pain, including visceral and somatic pain. Evidence on nerve blocks in TLH is inconsistent.

Therefore, we hypothesised that M-TAPA is effective for TLH and conducted a pilot study comparing M-TAPA with oblique subcostal transverse abdominis plane block (OSTAPB), which is proven to be effective for TLH. We also measured plasma concentration kinetics of the local anaesthetics, which has not been previously investigated.

Materials and Methods: Following IRB approval (No. 2853) and registration (UMIN000043336), we enrolled 40 female patients aged 20–75 years with ASA-PS 1–2 who were scheduled for TLH. Patients were divided into two groups using randomisation software: M-TAPA (intervention group) and OSTAPB (control group).

Two patients in the M-TAPA group were excluded owing to change in surgical procedure. The nerve blocks were performed bilaterally after anaesthesia was induced, and 25 mL 0.25% levobupivacaine was administered per side. We measured quality of recovery-15 scores (QoR-15) before surgery and 24 and 48 h postoperatively (POD 1 and 2, respectively) as the primary endpoint.

Additionally, we measured the levobupivacaine plasma concentration at 15, 30, 45, 60, and 120 min following nerve block completion as the secondary endpoint.

Result and Discussion: The main results are shown in Table 1.

QoR-15 Mean [95% CI]	M-TAPA		OSTAPB		
Before surgery	146 [143–149]		143 [140–147]		
Postoperative Day 1	111 [98–124]		120 [109–130]		
Postoperative Day 2	125 [115–136]		130 [121–138]		
Difference of QoR-15 Mean [95% CI]	M-TAPA – OSTAPB				*p*-value
Postoperative Day 1	-11.3 [-24.9 – 2.4]				0.10
Postoperative Day 2	-7.0 [-20.5 – 6.6]				0.31
Levobupivacaine plasma concentration Mean [95% CI]	15 min	30 min	45 min	60 min	120 min
M-TAPA	1.06 [0.88–1.24]	1.01 [0.88–1.14]	0.97 [0.84–1.11]	0.92 [0.78–1.05]	0.66 [0.55–0.76]
OSTAPB	0.99 [0.84–1.14]	0.93 [0.82–1.05]	0.87 [0.75–0.98]	0.79 [0.69–0.89]	0.57 [0.50–0.65]

Table 1.Quality of recovery-15 scores (QoR-15) before and after surgery, and Levobupivacaine plasma concentrations in M-TAPA and OSTAPB groups.

No significant differences were observed between the groups in the QoR-15 values and the difference (M-TAPA-OSTAPB) at POD 1 and 2.

Although not statistically significant, the difference in QoR-15 at POD 1 was 11; notably, the minimal clinically important difference in QoR-15 is 8. Hence, compared with OSTAPB, M-TAPA may be

inferior for improving the quality of recovery at POD 1 after TLH. Changes in levobupivacaine plasma concentration levels showed a similar pattern in both groups.

Conclusion: M-TAPA may not be superior to OSTAPB in improving the quality of recovery after TLH.

03AP04-04
Choice of level of an effective erector spinae plane block does not affect the analgesic efficacy in an established enhanced recovery pathway for lumbar spine surgeries

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Background and Goal of Study: Erector Spinae Plane Block (ESPB) is a sound choice for Enhanced Recovery Pathways (ERP) but there are variations in the recommended level of block for lumbar spine surgeries, ranging from low thoracic to lumbar. It poses a dilemma for teams starting ERP protocols. We report single-center findings for ESPB level selection from an ERP protocol in Taiwan.

Materials and Methods: Bilateral ESPB as a part of ERP is performed with ropivacaine or bupivacaine with a total volume of 40~50mL. Level is selected by the anesthesiologist in charge.

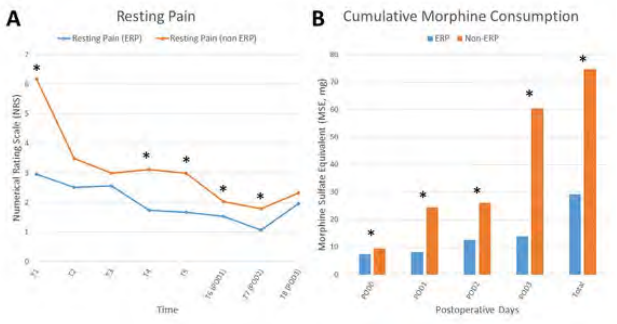
Patients are collected (IRB 2022-09-009BC) and grouped according to the number of segments between ESPB and the median Surgical level (ES segments).

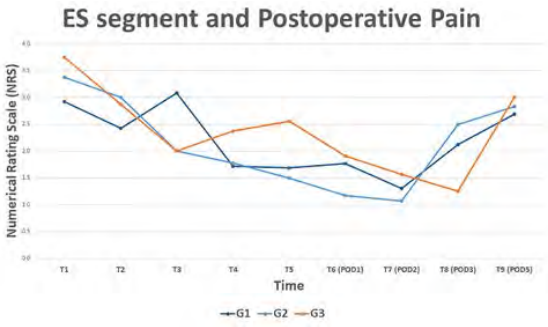
Three groups G1 (0~2 segments), G2 (2~3 segments) and G3(>3 segments) are sorted. Postoperative pain scores are compared using the numerical rating scale (NRS) at 0, 1, 2, 6, 12, 24, 48, 72 hours after surgery. Postoperative opioid consumptions are presented as morphine sulfate equivalents (MSE) in mg. ANOVA is used to evaluate the difference between the groups.

A separate set of non-ERP patients is compared with ERP for NRS and MSE.

Results and Discussion: There are 62 and 128 patients in the ERP and non-ERP patients respectively. The ERP group had lower MSE (29.3mg vs 74.8 mg) and NSR. Average surgical segments, ES segments and ESPB to final surgical level are 2.92, 2.77 and 4.7 segments respectively.

Within the ERP group, there are no statistically significant differences in NRS and MSE between G1, G2 and G3. The choice of ESPB level does not affect postoperative NRS and MSE.





Conclusion(s): ESPB as a part of the MMA bundle is effective for reducing postoperative pain. The choice of level for ESPB injection does not affect its analgesic efficacy. Thoracic region injections carry the risk of pneumothorax and should be avoided.

03AP04-05
A modified ultrasound-assisted approach for lumbar punctures in patients with scoliosis: a prospective observational study

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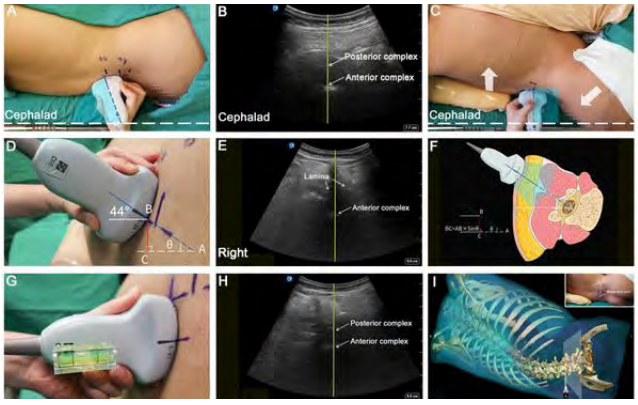
Background and Goal of Study: Lumbar punctures (LPs) are challenging for patients with scoliosis. Previous ultrasound-assisted techniques for LPs using the medial angle of the probe as the needle trajectory required more guesswork, leading to an increased number of needle manipulations. We designed a horizontal and straight needle trajectory approach with ultrasound assistance and assessed its feasibility and safety.

Materials and Methods: In 2022, 42 patients with spinal muscular atrophy and scoliosis were referred to the anaesthesia department for intrathecal nusinersen administration. The caudad or cranial angulation of the needle was eliminated by posture correction, as indicated by the probe's orientation (Fig. A-C). The angle (θ) of rotation of the vertebra relative to the horizontal plane was measured. The proposed needle entry point deviation from the "vertebral midline" was calculated using simple trigonometry (*Skin-dura sac distance* × *Sin θ)*, and verified using a spirit level attached to the probe. A spinal needle was inserted through the marked entry point to access the subarachnoid space horizontally and perpendicular to the edge of the bed. (Fig. D-I) Success rates, performance time and adverse events were recorded.



Results and Discussion: 71% (30/42) of patients presented with moderate or severe scoliosis. Success was achieved in all 174 LPs, with first-attempt and first-pass success rates of 85% (148/174) and 67% (116/174), respectively, both higher than previous studies that used the standard ultrasound-assisted approach in patients with mild scoliosis or even normal spine anatomy. The median [IQR] needling time was 1.5 [1.0, 2.4] min. Adverse events were infrequent and mild.

Conclusion(s): This novel technique is effective and safe for patients with complex spines. Given its simplicity, non-ionizing and safety profile, it could be considered the first choice for intrathecal medication delivery and neuraxial block in patients with complex spine anatomy and generalized to medical centres worldwide, particularly those with limited availability of skilful personnel for real-time ultrasound-guided technique.

03AP04-06
Can spinal anesthesia be a regular procedure for endoscopic lumbar spine surgery in the future?

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In recent years, spinal anesthesia (SA) has gained popularity in spinal surgery, due to its favorable recovery profile, reduced psychological burden on the patient and avoidance of the adverse effects of general anesthesia (GA). Despite its potential for improving outcomes, awake spine surgery is yet to be widely adopted as a reliable alternative to GA.

An observational retrospective study was conducted from March 2021 to September 2022 to compare the effects of SA with GA, in patients undergoing endoscopic spinal surgery (ESS), in terms of perioperative outcomes and cost effectiveness. Demographic data, anesthetic procedure, length of surgery, anesthesia and stay in the post-anesthesia care unit (PACU), nausea and vomiting (PONV) and analgesic requirements were recorded.

A total of 66 patients were enrolled: 49 assigned to GA and 17 to SA. Mean age was 47 years and 54.5% of patients were female. 58 patients were scored ASA II and 12.1% patients ASA III. There were no significant differences in demographic characteristics between the two groups. However, there was a significant association between ASA score and anesthetic technique (P=0.01). Duration of surgery was significantly shorter in the SA group (P=0.045) but anesthetic time (P=0.091) was similar in both. Intraoperative analgesia was significantly higher in the GA compared with SA group (P=0.014). Duration of stay in the PACU (P=0.512) and length of hospital (P=0.358) did not differ significantly between the two groups. 21 patients in the GA group requested analgesic medication postoperatively and 2 in the SA group (P=0.036). The percentage of patients with PONV was similar in both groups (P=1.0). SA was performed with bupivacaine 0.5% or levobupivacaine 0.5% ± sufentanyl in doses ranging from 6.25 to 15mg. In all cases, a dense block was achieved. Overall, the patients of the SA patient group and the surgeon expressed satisfaction with awake spine surgery.

The presented data shows that SA was associated with lower incidence of analgesic requirements. In contrast to the literature, duration of anesthesia was not significantly shorter in the SA group. However, the SA approach requires less positioning time and checking the patient responsiveness and airway control.

Additionally, SA has a lower cost of equipment and drugs, making it more cost-effective. In our study, SA was as effective as GA in patients undergoing ESS, making it a reliable alternative to consider in the future.

03AP04-07
Comparison of post-operative analgesia efficacy of Erector Spina Plane (ESP) block and Thoracic Epidural Analgesia (TEA) in patients undergoing lobectomy with thoracotomy incision

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Background and Goal of Study: ESP block provides good recovery and good analgesic activity in the first 24 hours post-operatively in minimally invasive thoracic surgery (1). Although studies demonstrate the efficacy of ESP block, further research is needed to compare it with the gold standard TEA (2).

Therefore, in this study, we aimed to compare the post-operative analgesic efficacy of ESP block and TEA, two different techniques routinely performed in patients undergoing lobectomy with thoracotomy incision.

Materials and Methods: Sixty patients undergoing lobectomy with thoracotomy ıncision were observed prospectively, post-operative analgesia efficacy of continious ESP block and continous TEA between February and December in 2022.

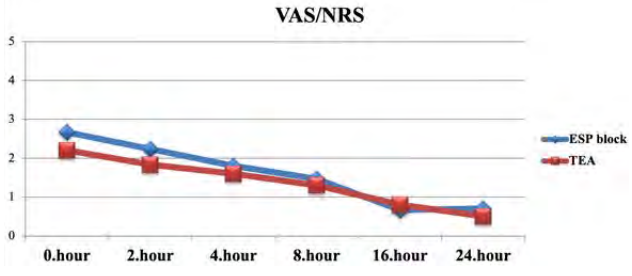
Primary outcome measures are visual analogue scale(VAS) and numerical rating scale(NRS) at 0, 2, 4, 8,16 and 24 hours.

Secondary outcome measures are post-operative hemodynamic values change, pulse oximetry change, postoperative nausea and vomiting, non-steroidal anti-inflammatory and opioid drug usage need.

Results and Discussion: There are thirty patietns in each group. There was no statistically significant difference in the mean of VAS/NRS of the groups in the follow-up (p=0.294 p=0.397 p=0.524 p=0.765 p=0.677 p=0.641). There was a statistically significant change in the VAS/NRS levels of the patients in the groups during the follow-up (p<0.001 for both).

In the study groups, coronary artery disaese rate of the ESP block group, which is one of the general characteristics, was statistically significantly higher than the TEA group(p<0.005). It was observed that the anesthesiologist preferred ESP block instead of TEA if the patient was using anticoagulants.

No statistically significant difference was found in the incidence of PONV, hemodynamic values change, nonsteroidal anti-inflammatory and opioid drug usage need in the follow-up groups.



Conclusion:The efficacy of ESP block in postoperative pain management in patients who underwent lobectomy with thoracotomy incision was similar when compared to TEA.

References:
1. DOI: 10.1016/j.bja.2020.06.020
2. DOI: 10.1016/j.jclinane.2020.110063

Acknowledgements:
Clinicaltrail.gov ID: NCT05402917

03AP04-08
Analgesic efficacy of ultrasound-guided thoracolumbar interfascial plane block in lumbar spine surgery: a systematic review and meta-analysis

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Background and Goal of Study: The classical thoracolumbar interfascial plane (cTLIP) block and modified TLIP (mTLIP) block have been used for perioperative analgesia in lumbar spine surgery. We aimed to evaluate whether TLIP block (cTLIP/mTLIP block) could provide adequate analgesia in lumbar surgery.

Materials and Methods: Adult patients undergoing lumbar spine surgery under general anesthesia were included for this systematic review and meta-analysis of randomized controlled trials. PubMed, Embase, Web of Science, Scopus, and KoreaMed were searched to identify eligible trials comparing TLIP block with control (no block/sham block) or other interventions (wound infiltration/epidural analgesia at closure/erector spinae plane block) in lumbar surgery. The primary outcome was opioid consumption in 24 h after surgery.

Results and Discussion: Twelve studies with 1011 patients were included. Compared with control, TLIP block significantly improved opioid consumption (morphine milligram equivalents) (-11.22 mg; 95% CI, -13.33 to -9.11; $P < 0.00001$) and postoperative pain scores at various time points (at rest or while active) during 24 h after surgery.

Furthermore, TLIP block decreased rescue analgesia demand (RR, 0.44; 95% CI, 0.31 to 0.61; $P < 0.0001$), increased the time to initial supplementary analgesia (6.60 h; 95% CI, 5.58 to 7.61; $P < 0.0001$), and ameliorated postoperative nausea and vomiting (PONV) (RR 0.58; 95% CI, 0.34 to 0.97; $P = 0.04$), compared to control.

Compared with other interventions, TLIP block reduced opioid consumption (-5.21 mg; 95% CI, -8.82 to -1.61; $P = 0.005$) and rescue analgesia requirement (RR, 0.49; 95% CI, 0.28 to 0.87; $P = 0.01$).

Conclusion(s): Compared with the control or other interventions, TLIP block provided effective postoperative analgesia for lumbar surgery. TLIP block relieved postoperative pain, reduced rescue analgesia, and alleviated PONV compared with the control. Current evidence supports that the TLIP block offers analgesic efficacy comparable to that of the erector spinae plane block. (PROSPERO registration number: CRD42022332161.)

Reference:
Ahiskalioglu A, Alici HA, Selvitopi K, Yayik AM. Ultrasonography-guided modified thoracolumbar interfascial plane block: a new approach. Can J Anaesth 2017;64:775-6. https://doi.org/10.1007/s12630-017-0851-y.

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03AP04-09
Dexmedetomidine in spinal anesthesia - worth it?

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Background and Goal of Study: Spinal anesthesia is a preferred method of anesthesia for lower limb surgery. Antinociceptive synergism between local anesthetics and opioids is well studied. Dexmedetomidine, selective alpha2-agonist, is relatively new as an intrathecal agent.

The main goal of this study was to compare dexmedetomidine with opioids as adjuvant to spinal anesthesia, in terms of its effect on postoperative analgesia, as well as its effect on hemodynamic stability in elderly patients.

Materials and Methods: Spinal anesthesia was performed on thirty ASA Grade II and III geriatric patients undergoing hip surgery. Before the procedure all patients received 500 mL of i.v. saline. Noninvasive blood pressure, heart rate and SpO2 were noted every 5 minutes. NRS(numeric rating scale) was assesed 2, 4, 6, 8, 10 and 12 hours after spinal block. Patients were randomly assigned into two groups: control group (n=15) received levobupivacaine by body height nomogram with 2.5 mcg (0.5 mL) of sufentanil, while subject group (n=15) received levobupivacaine by body height nomogram with 5 mcg of dexmedetomidine. Groups were compared by hemodynamic parameters(systolic pressure, pulse) and NRS score in early postoperative stage of recovery.

Results and Discussion: Baseline patients' characteristics were comparable in both groups. Analysis of hemodynamic data showed that incidence of hypotension, defined as systolic blood pressure lower than 90 mmHg, was not significantly different between groups.

When comparing analgesic effect, dexmedetomidine showed significantly better analgesic effect than opioids 10 and 12 hours after spinal block (p=0.03 and p<0.01), as shown in figure 1. Results are expressed as mean value with p value of 0.05 considered significant.

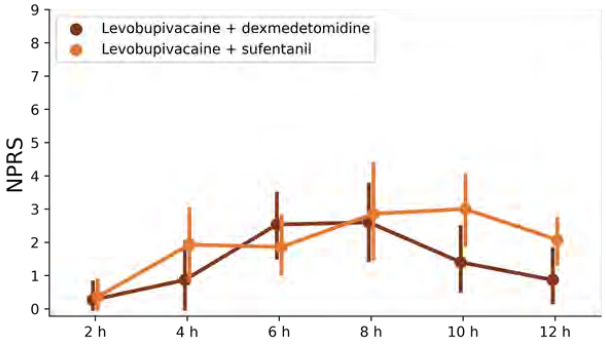

Figure 1.

Conclusion(s): Results of this study show that dexmedetomidine is a safe adjuvant to local anesthetics in elderly patients receiving spinal anesthesia. There is no significant difference between opioids and dexmedetomidine in hemodynamic stability. Dexmedetomidine showed significantly better analgesic effect in comparison to sufentanil in early postoperative period.

03AP04-10
Application of continual reassessment method to dose-finding study for estimation of optimal dose of 2-chloroprocaine of the first iterative reinjection during continuous spinal anesthesia for lower limb surgery: sensory block results

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Background and Goal of Study: Underused, Continuous Spinal Anaesthesia (CSA) has several advantages compared to single-shot spinal anaesthesia(1).
Short-acting local anaesthetic, 2-Chloroprocaine (2-Ch) has not been yet studied regarding optimal dose of CSA first reinjection. The use of sequential experimental methods is justified in anaesthesia dose study (DS). Continual Reassessment (Bayesian statistical study design) allows estimation of any percentile of the dose-response relationships.
Materials and Methods: An optimal DS was performed in 27 ASA I-II patients scheduled for lower limb surgery under CSA with 2-Ch. After intial bolus (IB=2-Ch 10mg.mL^{-1}, 4mL), first reinjection doses were randomly attributed: 7.5 or 10mg into an indwelling 25G catheter after 35min. We postulated the 90% efficacy probability as a sensory block (SB) ≥ T12.
Additionaly, 3 different scenarios of occurence of potential adverse events (AE) were used to calculate the 50% and 25% probability of AE (defined as SB >T10) and the 1% probability of obtaining a block ≥T6.
Results and Discussion: No CSA failure was recorded (all SB reach SB≥T12). For the 10mg dose, the average efficacy is 88% and the probability of obtaining 90% of efficacy is 41%. These results drop to 38.4% and 0.1% respectively for a 7.5mg dose. The average probability of AE is 28.2% and 5.9% for 10mg and 7.5mg respectively (Fig1&2).
Conclusion: The reinjection dose of 10mg is insufficient for 90% of patients to reach T12 level. However, the efficacy probability remains very close (88%). Finally, 28.2% of patients are at risk of exceeding T10 with 2-Ch 10mg.
The study shows an inability to achieve T12 block in 90% of patients by preserving from a Th6 level block, regardless of the dose of 2-Ch. Finally, a 1mL bolus may be recommended.
References: 1. Acta Anaesth Scand 2003;47:887-83

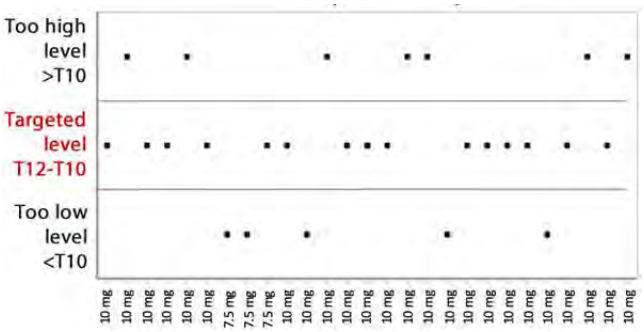

Figure 1. Upper level of sensory block of each patient after the first 2-chloroprocaine reinjection

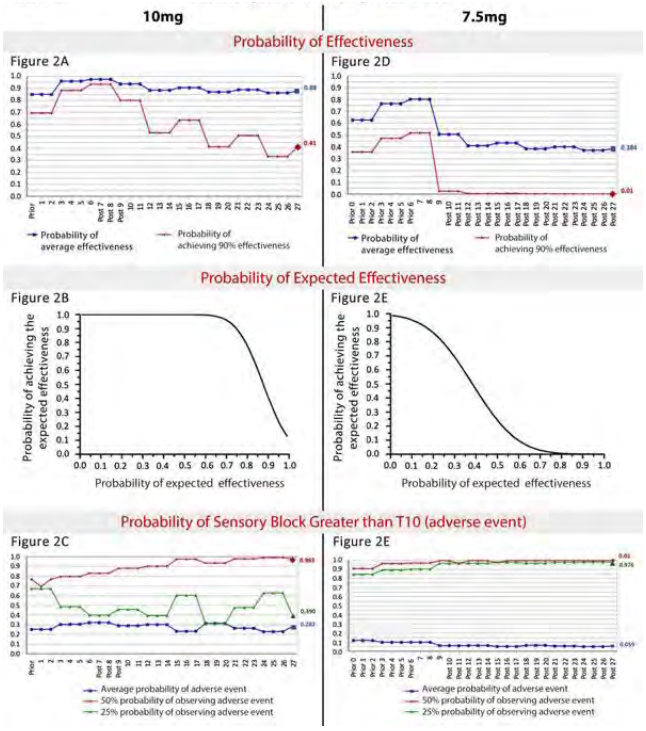

Figure 2. First reinjection of 2-chloroprocaine dose

03AP04-11
A modified paramedian approach in ultrasound-assisted mid-thoracic epidural placement: importance of patient stratification

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Background and Goal of Study: Although patients undergoing major surgery benefit from mid-thoracic epidural analgesia, technique difficulties often discourage its use. Previous research showed that preprocedural ultrasound scan did not improve the success rate of mid-thoracic epidural placement.
However, the universal needle entry point ignored the wide variability of the thoracic spine. Therefore, we designed a modified paramedian approach emphasizing patient stratification based on ultrasound scan.
We aimed to assess the viability of the technique and provide clinicians with an easier and more efficient technique.
Materials and Methods: A modified paramedian approach under ultrasound assistance was used in adult patients undergoing thoracic or upper abdominal surgery with a planned thoracic epidural catheter. A modified lateral position with a 10-15º anterior oblique angle was used to minimize the needle's inward angulation in the sagittal plane. The cephalad or caudad angulation of the probe was eliminated via posture correction to ensure the precise location of the interlaminar space.
Patients were stratified according to the visibility of the anterior complex via pre-procedural ultrasound examination, and the needle entry point (1 cm or 1.5 cm caudal shift to interlaminar space) and trajectory were chosen based on patient stratification and the depth of the lamina. Success rates, needling time, and procedure complications were recorded.

Results and Discussion: A total of 128 patients were included, with a mean (SD) age of 59 (18) years. The T5-6 and T6-7 levels were chosen for nearly half of the needle insertions. Success was achieved in 98% of patients. The first-pass success rate was 75% and the median [IQR] time to access the epidural space was 59 [47, 123] seconds, both higher than that of the recently reported ultrasound-assisted techniques.
Our method improved precision by tailoring the technique based on the anatomic information offered by ultrasound, accuracy of marking, and optimization of positioning. All patients reported appropriate dermatomal coverage and adequate analgesia. None experienced procedure-related complications.
Conclusion(s): The modified paramedian approach based on patient stratification facilitates the performance of mid-thoracic epidural placement and thus could be considered to be routinely utilized to simplify mid-thoracic epidural catheterizations.

03AP04-12
Quadratus lumborum block 1 (lateral) versus quadratus lumborum block transmuscular (anterior) for postoperative analgesia after total abdominal hysterectomy: a prospective cohort observational study

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Background and Goal of Study: Myofascial blockade techniques are widely implemented in the practice of perioperative analgesia in gynecology**.** The aim of our study was to assess two different types of the quadratus lumborum block for postoperative analgesia after total abdominal hysterectomy – Quadratus lumborum block 1 (QL 1) (lateral) or quadratus lumborum block transmuscular (QL transmuscular) (anterior).
The study hypothesis: no matter whether QL 1 or QL transmuscular block is performed to reduce postoperative pain after total abdominal hysterectomy.
Materials and Methods: We examined the data of 24 patients 40-55 years old with complicated symptomatic uterus fibroids, who needed total abdominal hysterectomy. Both groups underwent general anesthesia.
In addition, in I group after the surgery it was performed QL 1 block bilaterally via lateral access with ultrasound navigation; in II group – it was performed QL block transmuscular bilaterally via anterior access with ultrasound navigation. After surgery both groups of patients received multimodal analgesia with dexcetoprofen and paracetamol in a case of severe pain - morphine.
The stages of the study were 30 minutes (m_{30}), 6 hours (h_6), 12 hours (h_{12}), 24 hours (h_{24}), 48 hours (h_{48}) after surgery. We made the analysis of the pain level (with visual analogue scale - VAS), heart rate, mean arterial pressure, daily requirement of morphine.
Results and Discussion: It was found that the level of pain according to VAS in I group reached its maximum values on the stages m_{30} and h_6 and was 5.3 [3,6; 6.0] points and 4.0 [3.5; 6.4] points, while in II group - 5.2 [2,3; 5.8] points and 3.0 [2.6; 4.0] points, respectively ($p > 0.05$). We found no significant differences in heart rate and mean arterial pressure between groups. ($p > 0.05$). The daily requirement of morphine on h_{12} stage had the tendency ($p = 0.07$) to be lower in II group (5.5 ± 0.5 mg / day), compared with the I group I (7.5 ± 0.5 mg / day). The need for morphine use on h_{24} stage was slightly lower ($p < 0.05$) in II group (2.5 [1.2; 4.5] mg / day), compared with I group (3.5 [1.5; 5.5] mg / day).
Conclusion(s): QL block transmuscular is associated with a lower need in morphine and lower pain level according to the VAS compared to QL block 1 after total abdominal hysterectomy. No significant difference was found in heart rate and mean arterial pressure.

03AP04-13
Segmental spinal anaesthesia for breast cancer surgery: did the fear overshadow the beauty..!!!

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Background and Goal of Study: Traditionally, General Anaesthesia (GA) is used for breast surgeries that involves polypharmacy. In the presence of comorbidities this can be significant risk factors for perioperative morbidity and mortality. Subarachnoid block can decrease incidence of chronic pain syndromes (20-50%), recurrence, and a fast post-operative recovery. Lumbar subarachnoid block will require large amount of drug that may lead to greater hemodynamic instability. Highly selective segmental thoracic spinal (STS) block can mitigate the above risks while retaining the advantages of regional anaesthesia.
Hence, this study was planned to assess the efficacy of Segmental thoracic spinal (STS) in comparison to standard practice of General Anaesthesia in adult patients posted for elective modified radical mastectomy.
Materials and Methods: Following IEC approval, this prospective, randomized, open label, parallel design, non-inferiority study included fifty ASA I and II patients, between 18 and 60 years, scheduled for modified radical mastectomy (MRM) to either receive STS at T7-T8 level with 1 ml isobaric levobupivacaine 0.5% (5 mg)+ 25 mic fentanyl (Group S; n=25) or General Anaesthesia (Group G; n=25). They were assessed for Total 24 hours Analgesic Consumption in morphine milligram equivalent (mmeq), Time to first rescue analgesia, Time to T3 sensory block, Median NRS Score in first 24 hours, Hemodynamic affects and perioperative complications.
Results and Discussion: Total 24-hours Analgesic Consumption in morphine milligram equivalent (mmeq) was 16.6±7 and 29±8 mmeq ($p<0.05$) and in STS and GA respectively**.** Time to first rescue analgesia was 273±40 min in Group S versus 42±9 min in Group G ($p<0.05$). Mean time to T2 sensory block was 142±18 seconds. Median NRS Score in first 24 hours was 3.1 (IQR, 2.20-5.25) and 5.92 (IQR, 5.25-6.75), respectively ($p<0.05$).
No significant hemodynamic instability was observed in either group. Significantly decreased incidence of PONV, POUR, pruritus, and time to discharge were observed.
Conclusion(s): Segmental thoracic spinal with low dose isobaric levobupivacaine is an effective and safe alternative to general anaesthesia in Modified Radical Mastectomy. No significant intraoperative discomfort and complications were observed.

03AP05-01
Thoracic Epidural Anesthesia in the management of acute refractory ventricular electrical storm: a case report

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Background: Ventricular electrical storm (VES) is characterized by recurrent sustained ventricular arrhythmias in a short time. Develops in hearts with structural or electrophysiologic alterations after exposure to a trigger, like myocardial ischemia or sympathetic overstimulation (SO). SO creates a vicious circle and plays a relevant role in pathophysiologic of VES. When conventional therapies fails, TEA (Thoracic Epidural Anesthesia) is an excellent option that allows block cardiac sympathetic output.
Case report: 44-year-old man, ASA III, history of ischemic cardiomyopathy and schizophrenia, presented in emergency department with chest pain and palpitations. The electrocardiogram showed ventricular tachycardia with hemodynamic instability, so immediately cardioversion was done. He was transferred to intensive care unit. Although electrolytes correction, antiarrhythmics, cardioversion attempts, sedation, and introduction of overdrive pacing, refractory VES with cardiogenic shock was perpetuated. Due to clinical repercussions of VES, catheter ablation was no option.
A multidisciplinary approach decided to insert a TEA with the goal to modulate autonomic nervous system (ANS). After ASA standard monitoring, the patient was placed in left lateral decubitus. TEA was performed with 18-G Tuohy epidural needle at T3-T4 interspace, midline approach, loss of resistance technique. Epidural catheter was advanced 5 cm into the epidural space, negative aspiration for cerebrospinal fluid and blood was confirmed.
Were administered bolus of ropivacaine 0.25% and started continuous infusion of ropivacaine 0.20% 2-4 ml/h. VES control with progression to sinus rhythm and hemodynamically stabilization was achieved. Two months of follow-up: he integrates cardiovascular rehabilitation with progressive improve in functional capacity.
Discussion: VES is a medical emergency that can progress to heart failure and cardiopulmonary arrest with high incidence of adverse outcomes and mortality.
In this case we tried ANS modulation to prevent perpetuation of SO. With TEA we started infusion of ropivacaine, titrated according to rhythmic response. This strategy allowed progression to sinus rhythm and hemodynamically stabilization.
Learning Points: A multidisciplinary integration of Cardiology, Intensive Medicine, and Anesthesiology allows offering technical tools, clinical evaluation and health care that is crucial to increase the chance of successful treatment of life-threatening VES.

03AP05-02
Thoracic segmental spinal anesthesia as an alternative to general anesthesia, breast surgery, cases-series

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Background: Thoracic segmental spinal anesthesia is a technique of regional anesthesia that still needs to be explored to become popular or to be used as a routine.
We are trying to contribute by adding our humble experience, an attempt to clarify the doubts and hesitations to this technique of regional anesthesia, where we came up with 6 cases of breast surgery.
Cases Series: All patients were ASA III, submitted for radical mastectomies, after diagnoses for breast cancer. We proceeded with high thoracic segmental spinal anesthesia at a level of Th/5-Th/6, with Quincke needle 25G.
Drugs injected intrathecally: plain Bupivacaine 3-5mg, Fentanyl 20-25mcg, adjuvants Dexamethasone 4mg and Midazolam 1-2mg. Intraoperatively: dense, rapid, block of sensitive fibers, started within 3-4 min, from Th-8/10 to Th-1/2. Generally we noticed less hemodynamic fluctuations among patients, we witnessed hypotension in two cases, which where managed with 10-20mg Ephedrine.
One case showed transitory motor weakness grade 2-3. No case converted to general anesthesia. We noticed that its advantages are the quality of postoperative analgesia, lower incidence of nausea and vomiting, and shorter recovery time, with the consequent early hospital discharge.
Discussion: What makes THSSA feasible: in thoracic part, especially inTh-5/6 level the spinal cord is positioned anteriorly, leaving a significant amount of space between dura and spinal cord is Th2-4.7mm,Th5-6.4mm,Th10-5.1mm. Thoracic nerve roots are thin, favouring efficient blockade with low dose of drugs. Less bradycardia and hypotension due to sympathetic/lumbosacral sparing. Technical feasibility, not such difficult in hands of clinician with good learning curve. Economic feasibility: very economic. Utility for single shot THSSA, procedures 60 up to 90 min, practically for all thoracic wall procedures, radical breast surgery and some thoracoscopic procedures.
Learning Points: THSSA-thoracic segmental spinal anesthesia is a proper option, can be a preferred alternative to general anesthesia for radical breast surgery, especially among frail, older patients with comorbidities.

03AP05-03
Bilateral pesto-intercostal fascial block as a good analgesic alternative in pectus excavatum surgery

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Background: Surgical correction of Pectus excavatum (PE) is associated with significant postoperative pain. The pecto-intercostal fascial block (PIFB) constitutes an anteromedial block of the chest wall, consisting of the placement of local anesthetic in the interfascial plane between the pectoralis major and intercostal muscles, being an option for this surgery. The intercostal nerves here terminate in anterior cutaneous branches to supply superficial tissues of the parasternal region (1).
Case report: A 18-year-old male presents congenital deformity of PE. It is proposed for surgical correction.
After general anesthetic induction, prior to the start of surgery, an ultrasound-guided PIFB was performed at the bilateral parasternal level (Figure 1). After locating the interfascial plane, a single dose of 0.3% levobupivacaine was administered, a total of 20ml on each side.

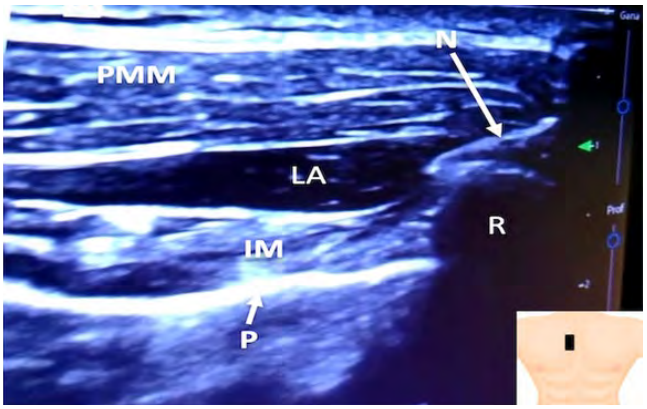

Figure 1. Intercostal pectus interfascial block anatomy. Parasagittal ultrasound section 2cm from the sternum.
PMM: Pectoralis major muscle. IM: Intercostal muscle. P: Pleura. R: Rib. LA: Local anesthetic. N: Needle.

In the intraoperative period we used fentanyl 100mcg at the start of surgery, Paracetamol and Dexketoprofen. There were no clinical signs of nociception during the intervention. After surgery, the patient presented good pain control (VAS 3/10).
In the first 48h, pain was controlled with prescribed analgesia without requiring opioid rescue.
Discussion: After reviewing the literature, we found series of clinical cases that propose the erector spinal block as an alternative technique with good results (2), but we have not found reports of this block for PE surgeries. The PIFB presents few complications and provides analgesia in the parasternal region.
In our experience, multimodal management with opioids and NSAIDs associated with a regional technique has shown good results
References:
1. K. J. Chin et al. Ultrasound-guided fascial plane blocks of the chest wall: a state-of-the-art review. Anaesthesia 2021, 76, 110–12
2. David R. et al. Continuous Erector Spinae Plane Blocks for Adult Pectus Excavatum Repair. Ann Thorac Surg 2019;108:e19–20
Learning Points: PE correction surgery presents significant rates of postoperative pain.
The PIFB can be a valid regional alternative with few complications.
More experience is needed to know the effectiveness of this type of block.

03AP05-04
Continuous spinal anaesthesia in the orthopedic elderly population – a case report

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Background: Continuous spinal anaesthesia (CSA), although underused, is a useful and reliable anaesthetic technique in lower extremity procedures in the fragile elderly patient with severe cardiopulmonary (CP) disease.
Case report: An 89-year-old woman was proposed for urgent hip fracture repair. Medical history included chronic anaemia, hypertension, type 2 diabetes mellitus, heart failure and previous breast cancer with radiation induced lung injury and chronic respiratory disease. She had respiratory failure needing supplemental oxygen therapy.
Physical examination revealed aholosystolic murmur IV/VI and bilateral rales. The chest image showed ribs horizontalization and a right pulmonary effusion. Due to the high cardiovascular risk and the unstable CP patient condition, we decided to perform the procedure under CSA and peripheral nerve blocks.
Firstly, an ultrasound-guided femoral and lateral cutaneous femoral nerve blocks were performed with a total of 20mL of 0.5% ropivacaine, followed by intrathecal catheter placement at L3-L4 level using a 18G Tuohy needle and 20G catheter. We administered 1ml of 0.25% of hyperbaric bupivacaine through the catheter and pushed forward with 2mL of 0.9%saline.
Approximately 10 minutes later, further 0.6mL of 0.25% bupivacaine was administered and surgical sensitive blockade level was achieved. The procedure lasted 1hour without any further anaesthetic requirements.
No adverse haemodynamic effects or cardiac events were noted and postoperative recovery was uneventful. The catheter was removed upon arrival at PACU and patient didn't complain of postdural puncture headache during the following days.
Discussion: CSA is a rarely-used technique in current practice. One of its greatest advantages is the possibility of slow titration of sensory level with small incremental boluses, allowing haemodynamic stability in the high-risk cardiovascular patient.
Additionally, the catheter allows block prolongation in case of a lengthy procedure where single shot spinal anaesthesia would prove insufficient.
Reference:
Fusco, P, et al (2021) Continuous spinal anesthesia and high anesthetic risk patient. Minerva Anestesiologica,87,1049–1050
Learning Points: The frail elderly patient, with multiple comorbidities, is a challenging everyday-case presenting for emergency surgery. Anaesthesiologists need to provide effective and safe intraoperative care and being familiar with CSA in everyday practice is a powerful anaesthetic skill.

03AP05-05
Continuous spinal technique: the ideal anaesthesia for aortic stenosis?

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Background: Severe aortic stenosis (AS) poses an anaesthetic challenge as it requires very tight hemodynamic control1. Severe hypotension associated with anaesthetic induction can further compromise an already diminished stroke volume and cardiac output1.
A continuous spinal block may be a good option to overcome the hypotensive response frequently associated with other anaesthesia techniques, as it may allow a slower titration of both the spread of anaesthesia and the degree of sympathetic blockade.
Case report: We present the case of an 84-year-old man, with a medical history of severe AS, ischemic heart disease, hypertension, dyslipidaemia, thrombophlebitis and glaucoma. He was schedule for hemiarthroplasty of the left hip after neck femur fracture. Preoperative Cardiology evaluation stated no absolute contraindication for surgery and that risk-benefit should be reflected.
It was decided to proceed with the surgery. A subarachnoid catheter (with an epidural catheter kit) was placed in a median lumbar approach, in right lateral decubitus. A total of 7.5 mg of 0.5% levobupivacaine was administered in fractional doses of 2.5 mg over 20 min, under invasive arterial pressure monitoring. We maintained a target of medium arterial pressure of 80 mmHg and heart rate of 75-80 with phenylephrine bolus, followed by phenylephrine infusion. In the end of the surgery the catheter was removed and the patient transferred to the post-anaesthetic care unit.
Discussion: A continuous spinal block allowed for adequate anaesthesia for accomplishing the surgical procedure and at the same time maintenance of the hemodynamic goals. Titrating the dose of local anaesthetic administered in the intrathecal space, with small increments and an overall reduced dose, is an unique advantage of this regional technique.
This technique avoids the marked hypotension that comes with the sympathetic blockade associated with a single-shot dose and allows extending of the duration of blockade, revealing to be an important tool in diminishing the mortality of patients with AS.
Reference:
1. Fontes, M.L. (2022). Anesthesia for noncardiac surgery in patients with aortic or mitral valve disease. In T.W. Post Hines R., Mark J.B. (Eds), UpToDate
Learning Points: Since patients with AS will not tolerate rapid onset of a sympathectomy and the consequent hypotension and critical reduction in coronary perfusion pressure, a continuous spinal anaesthetic may be very slowly titrated.

03AP05-06
Continuous spinal anesthesia for removal of osteosynthesis material in severe heart failure: case report

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Background: History of congestive heart failure (CHF) is associated with higher postoperative morbidity and mortality rates. Anesthetic techniques can cause myocardial depression and peripheral vasodilation, which are important cardiovascular events to control in CHF patients.[1]
Case report: Male, aged 76 years, ASA IV, proposed for femoral bone removal of osteosynthesis material. Relevant medical history included CHF NYHA III (due to ischemic dilated cardiomyopathy and under cardiac resynchronization therapy initiated 3 months prior surgery), diffuse coronary artery disease (with placement of 3 stents 6 months before), atrial fibrillation and arterial hypertension.
A preoperative echocardiogram revealed a left ventricle ejection fraction of 31%. With the patient positioned in left lateral decubitus, a Tuohy needle was inserted in the L3-L4 vertebral interspace.
After entering the dura layer, a pre-filled catheter with levobupivacaine was introduced 4 cm into the subarachnoid space and secured to the skin. The patient was repositioned supine and after aspiration of cerebrospinal fluid, 2.5 mg of levobupivacaine were administrated. The dose was readministered 3 times every 10 minutes until reaching T12 sensory block level, with stable hemodynamic conditions. The surgery lasted 30 minutes and was uneventful, without need for further doses of local anesthetic.
After recovery in the postanesthesia care unit, the patient was transferred to the general ward, leaving the hospital the following day. The patient was assessed daily for 5 days and no cardiovascular complications or post-dural puncture headache were registered.
Discussion: In CHF, the anesthetic approach must be planned with the goal of minimizing detrimental effects on cardiac output, considering careful preload and afterload management.[1]
Administration of high volumes of local anesthetics via spinal anesthesia decreases systemic vascular resistance and can compromise cardiac output.[2]
Continuous spinal anesthesia can be an option, allowing the titration of the necessary dose for the desired effect, reducing cardiovascular complications.[3]
References:
1. Br J Anaesth. 2004; 93: 74-85
2. Rev Bras Anestesiol. 2016; 66 (1): 82-85
3. Egypt J Anaesth. 2016; 32: 535-540
Learning points: Catheter-based neuraxial anesthesia with repeated small doses of local anesthetic can allow better hemodynamic control, which is important in patients with compromised ventricular function.

03AP05-07
An alternative anesthetic option for breast resection surgery – case report

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Background: Breast cancer is one of the most common neoplasms with highest mortality rate. Surgical resection is associated with improved outcome. Most breast surgeries are performed under general anesthesia, leaving regional anesthesia techniques for postoperative pain management, and not as the primary anesthesia.[1, 2]

Case report: We describe a case of a 85-year-old female patient ASA IV, scheduled for elective right upper third tumorectomy with sentinel node biopsy. She had atrial fibrillation (AF), diagnosed in the pre-operatory evaluation. She had chronic obstructive pulmonary disease GOLD D, with long-term oxygen therapy 1L/15h/day, NYHA class III cardiac failure, dyslipidemia, and cerebrovascular disease.

Anesthetic team decided to proceed with locoregional anesthesia, due to the risks inherent to general anesthesia in this patient. We administered 2 mg midazolam and 50 mcg fentanyl as pre-medication. Then we performed a pectoralis fascia block (PECS II) with 25 ml of ropivacaine 0,5% and a serratus anterior plane block with 15 ml of ropivacaine 0,5%, under ultrasound control.

Subsequently, dexmedetomidine was infused with a loading dose of 20 mcg for 5 minutes, followed by a maintenance dose of 0,6 mcg/kg/h, for patient comfort. Additionally, systemic multimodal analgesia was given. The surgical procedure was uneventful.

At 24 hours after surgery, the patient referred no pain at rest or with movement. During hospital stay, she had no need for opioid medications and was discharged home after 48h, under orientation of Immunohemotherapy.

Discussion: We showed that this approach can be a good alternative to general anesthesia, because this combination of regional anesthesia with dexmedetomidine has very few cardiovascular or pulmonary side-effects, as compared with general anesthesia.[2,3]

The regional anesthesia was also an effective technique in postoperative pain management, reducing the use of opioids, particularly important in COPD patient.[2,4]

References:

1. JAMA. 2009;302(18):1985-92.
2. Clin J Pain. 2021;37(12):925-39.
3. J Perianesth Nurs. 2021;36(2):179-86.
4. Reg Anesth Pain Med. 2015;40(1):68-74.

Learning points: Due to her comorbidities, we wanted to avoid a general anesthesia due to the associated risk of ventilatory and hemodynamic changes, increasing the risk of severe complications. This is a case of successful anesthetic management of breast surgery using regional anesthesia and sedation with dexmedetomidine.

03AP05-08
Clavicular surgery under clavipectoral fascial block and spontaneous ventilation in patient with recent pneumothorax

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Background: The clavipectoral fascial plane block (CPB), described by Valdés [1], is simple to execute, and has no risk of phrenic nerve block, unlike other locoregional techniques used for clavicular fracture surgery.

We describe the use of CPB in a patient with recent pneumothorax. Our approach allowed to keep the patient in spontaneous breathing, avoiding positive pressure ventilation, that could worsen his condition.

Case report: Male, 46 years old, ASA I, victim of thoracic trauma 8 days before, with fracture of 8 costal arches and clavicle on the right, associated with pneumothorax, drained with chest tube (already removed at time of surgery). Proposed for correction of the medial clavicle fracture, in “beach-chair” position.

Under ASA standard monitoring, anesthetic depth (BIS™, Medtronic©) and regional cerebral oxygen saturation (INVOS™, Medtronic©), we performed an ultrasound-guided CPB and superficial cervical plexus block (SCPB) with 0.5% Ropivacaine (25mL for CPB and 7mL for SCPB). Before and after the blockade, diaphragmatic excursion was evaluated with ultrasound.

For greater comfort, we induced balanced anesthesia. To avoid complications of mechanical ventilation, adequate pre-oxygenation was done without positive pressure. Induction with propofol for supraglottic device insertion, followed by apneic oxygenation until resumption of spontaneous breathing (80 seconds).

The procedure took place with adequate ventilation, hemodynamic stability, and cerebral perfusion. In the postoperative period the patient was comfortable (visual analogue scale <3) and satisfied.

Discussion: The clavicle has a complex innervation, from superficial cervical plexus and brachial plexus. The classic locoregional approach for clavicular fracture is an interscalene brachial plexus block (IBPB) usually combined with SCPB. The CBP, described in 2017, is a fascial block that is easy and has a lower complication risk (as frenic nerve block), compared with IBPB.

There are just a few cases described on literature of CPB as anesthesic block.

References: 1- Valdés-Vilches LF. Analgesia for Clavicular Surgery/Fractures: 36th Annual European Society of Regional Anaesthesia and Pain Therapy

Learning points: CPB is a viable and safe alternative to the IBPB for clavicle surgery.

03AP05-09
Clavipectoral Fascia Plane Block efficacy and safety for middle third clavicle osteosynthesis

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Background: The Clavipectoral Fascia Plane Block was described in 2017 by L. Valdés to provide perioperative analgesia in middle third clavicle fractures[1].
The present study aims to evaluate the efficacy and the appearance of complications derived from this technique, as single anesthetic method, in a 22 patients cohort.
Case report: A descriptive, observational study was carried out in 22 patients who underwent middle third clavicle osteosynthesis.
The initial anesthetic strategy was the Clavipectoral Fascia Plane Block associated with Supraclavicular Nerve infiltration, both under sonographic control.
Afterwards, the presence of pneumothorax and diaphragmatic dysfunction was evaluated by ultrasound exam.
Besides Clavipectoral Fascia Plane Block safety, the presence of motor block, reconversion to general anesthesia and analgesic rescue during admission in PACU were evaluated.
Discussion: Clavipectoral Fascia Plane Block associated with Supraclavicular Nerve Block, showed effective anesthesia in nineteen patients (86.4%), as well as optimal postoperative pain control during their stay in PACU (VNS <3). In the three remaining patients (13.6%), conversion to general anesthesia was necessary due to technique´s failure
In none of the evaluated patients was the presence of serious complications, such as pneumothorax or diaphragmatic paralysis, detected. Likewise, no motor block of the upper limb was observed.
References:
1. Valdés L. As part of the lecture: ‘‘Analgesia for Clavicular Surgery/Fractures. 36th annual ESRA Congress. 2017. Lugano, Switzerland.
2. Labandeyra, H., Valdés Vilches, L. F., & Valdés Vilches, L. F. (2021). Bloqueo del Plano de la fascia clavipectoral Guiada por ultrasonido. *Revista Chilena De Anestesia*, *50*(3), 498–501. https://doi.org/10.25237/revchilanestv50n03-10.
Learning points: Clavipectoral Fascia Plane Block seems to provide effective perioperative analgesia in middle-third clavicular osteosynthesis. As shown in literature[2] and in our findings, this technique would present fewer unwanted effects and a better safety profile compared to traditional brachial plexus approaches. In addition to being a simple regional technique[1].

03AP06-01
Horner’s syndrome: an underestimated complication

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Background: Horner’s syndrome (HS) results from a sympathetic nervous system dysfunction and is characterized by ptosis, miosis, facial anhidrosis, and conjunctival hyperemia on one side of the face. Our aim is to present a clinical case of a patient who developed HS secondary to two possible rare causes related to the anaesthetic approach.
Case Report: A 42-year-old female patient with periprosthetic joint infection was proposed for a complete resection of foreign material and placement of a cement spacer.
Combined epidural-general anesthesia was performed. An epidural catheter was placed at the L3-L4 interspace. After induction of anesthesia, it was performed an ultrasound-guided catheterization of the right IJV.
On postoperative day 1, the patient presented with ptosis, miosis, and conjunctival hyperemia of the right eye. Assuming the diagnosis of HS in the context of epidural analgesia, it was decided to remove the epidural catheter.
One week later, the patient still presented the same clinical condition. Neuro-ophalmology confirmed the diagnosis of right sided HS with pharmacological testing using apraclonidine eye drops. It was assumed that the HS was probably secondary to IJV catheterization and the catheter was replaced with a left subclavian venous catheter.
Discussion: HS results from an interruption of the sympathetic pathway that supplies the head and neck region[1] and can have numerous causes. In this case report, there were two possible iatrogenic and rare causes for the patient’s HS: epidural anesthesia[3] and IJV catheterization. HS remains a rare complication of IVJ catheterization[2].
According to most studies, the incidence in these contexts is 2-5%, but it seems to be underestimated Direct needle puncture of the cervical sympathetic fibers or compression of these structures by hematoma is the two most common mechanisms.
References:
1. Central venous catheters. Smith RN, Nolan JP. BMJ. 2013;347:0. Horner syndrome caused by internal jugular vein catheterization.
2. Zou ZY, Yao YT. J Cardiothorac Vasc Anesth. 2020;34:1636–1640.
3.Unusual case of persistent Horner’s syndrome following epidural anaesthesia and caesarean section. Goel S, Burkat CN. Indian J Ophthalmol. 2011;59:389–391.
Learning Points: The rapid recognition of the condition allowed us to consider different iatrogenic etiologies and their correction in order to limit the duration of symptoms and possible complications.

03AP06-02
Palliative surgical gastrostomy under ultrasound-guided bilateral rectus sheath block in a patient with difficult airway due to carcinoma of the oral cavity

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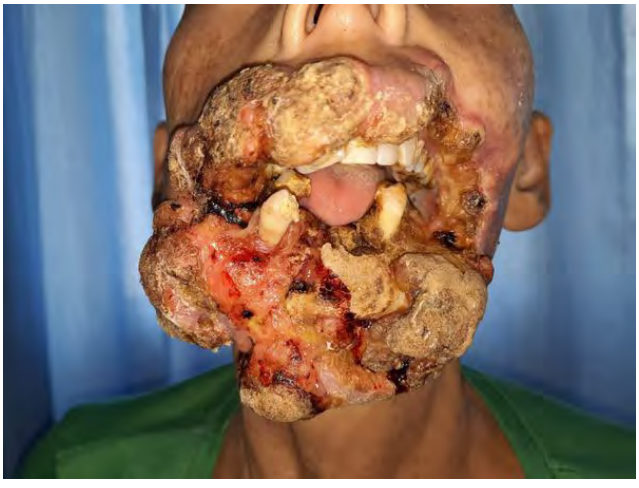
Background: We present the case of a 47 year old patient with an anticipated difficult airway due to squamous cell carcinoma of the lower lip who underwent a gastrostomy as palliative treatment. The surgery was performed under sedation with dexmedetomidine combined with an ultrasound-guided bilateral rectus sheath block.
Case report: A 47-year-old female, weighing 40 kg, with a known medical history of heart transplation, was scheduled for palliative surgical gastrostomy. In 2021 she underwent a surgery in which a R0 resection of cSCC of the lower lip was performed, but afterwars a recurrence occured.
The mass was so extended, rendering endotracheal intubation impossible.
Ultrasound-guided bilateral rectus sheath blocks was performed. An 50 mmm Ultraplex needle was inserted, using with the "in plane" technique. Ropivacaine 0.375% 20 ml was incrementally injected bilaterally. Intravenous dexmedetomidine was used for sedation, intraoperatively, with a bolus dose of 40mcg (1 mcg/kg) at the first 10 min and a continuous infusion dose of 0.5 mcg/kg/h.
The operation was successfully performed and the patient was soon transferred to the ward.
Discussion: End-stage oral cavity cancer patients face unique challenges in managing the airway, rendering endotracheal intubation, sometimes, impossible and in maintaining adequate nutrition, due to severe dysphagia(1). Gastrostomy tube placement is a treatment option which ensures enteral feeding and nourishment. The rectus sheath block seemed as the ideal option, because it provides somatic anesthesia to the abdominal wall structures superficial to the peritoneum.(2)



References:
1. Saima Rashid et al. Palliative surgical gastrostomy under ultrasound-guided bilateral rectus sheath blocks in a head and neck cancer patient. SaudiJAnaesth.2018Apr-Jun;12(2):371-373
2. Katrina Webster. Ultrasound guided rectus sheath block-analgesia for abdominal surgery. Update in anaestesia.

Learning points: Regional anesthesia can sometimes be the only feasible option in managing patients with difficult airway and severe comorbidities.

03AP06-03
Continuous ultrasound-guided adductor canal block for perioperative analgesia in a patient with Haemophilia A undergoing total knee replacement

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Background: Haemophilia A is an X-linked coagulopathy characterised by a deficit of factor VIII associated with an increased propensity to bleed into joints. Hemarthrosis, over time, can lead to chronic arthritis, particularly important in the knee joint as it can lead to very significant long-term disability.
Peripheral nerve blocks (PNB's) can be used safely for surgery of extremities in patients with severe haemophilia as long as safe Factor VIII activity levels are maintained throughout the perioperative period[1].
Case report: A 50 year old male with a known medical history of severe Haemophilia A presented for total knee replacement due to haemophilic arthropathy. Given the deficit of Factor VIII, it was decided to carry out factor VIII replacement before the surgery. Physical examination was normal except for pain in the left knee joint when walking.
After general anaesthesia induction, the patient was suitably positioned and the ultrasound-guided adductor canal block with catheter placement was performed.
Discussion: Many patients affected by Haemophilia A undergo orthopaedic surgery. The maintenance of an adequate level of Factor VIII is possible through the administration of Factor VIII concentrate, which is extremely important in the perioperative period. Although guidelines for regional anaesthesia in patients on anticoagulant therapy exist, there are no clear evidence-based guidelines on performing these techniques in patients with congenital coagulopathies.
As for PNB's, these enable adequate analgesia and can be safely performed in patients with congenital coagulopathies and corrected factor levels, thus reducing the use of opioids and avoiding the risks arising from the neuroaxial approach in these patients.
Reference:
1. Ripada R, Reyes J, Sun R. Peripheral nerve blocks for intraoperative management in patients with hemophilia. Journal of Clinical Anesthesia; Volume 21, Issue 2, March 2009, 120-123.
Learning points: Perioperative multimodal analgesia in patients with coagulopathies is a great challenge for the anaesthesiologist. Therefore, we consider that continuous adductor canal block as part of multimodal analgesia was a safe and effective method in a patient with Haemophilia A.
Additionally, it allowed us to use an opioid sparing analgesic strategy, reducing the side effects of these drugs and allowing early recovery and mobilisation.

03AP06-04
Local anaesthetic systemic toxicity (LAST) in a patient with portal hypertension: a case report

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Background: LAST is an infrequent but severe complication associated with administration of regional anaesthesia. A variety of risk factors have been reported and recommendations for prevention were issued but there is no single measure that can anticipate and avoid LAST. There is a wide spectrum of presentations that includes neurological and cardiovascular manifestations.
Case report: This is the case of a 69 year old woman with a history of cirrhosis and portal hypertension, scheduled for elective laparoscopic left hemicolectomy for treatment of adenocarcinoma. Eco guided bilateral *transversus abdominis* plane block was performed by the end of the surgery using 2.5 mg/kg of ropivacaine as local anaesthetic.
After a short stay in the post-anaesthesia care unit (PACU), the patient remained confused and disorientated and had a sudden episode of generalised tonic seizures followed by hypoxia and cardiac arrest. We started cardiopulmonary resuscitation manoeuvres and intubated the patient.
After considering and dismissing any other causes, LAST was considered by the medical team in the PACU and we started an infusion of MCT/LCT 20% (Lipofundin)[1].
After a single bolus of 100 ml, the patient recovered spontaneous circulation. She was successfully extubated and as she remained disorientated for the following hours, we performed a brain MRI. No pathological signs were found. The patient was transferred to the intensive care unit. She was discharged after 5 days without any remaining sequelae.
Discussion: This case suggests that portal hypertension with concomitant venous collateral circulation in the abdominal wall might constitute a potential risk factor for developing LAST. Previous studies or reports in the primary literature mention liver disease as a risk factor but it does not specify whether it is related to metabolic impairment or due to abdominal wall abnormalities[2].
Further studies are needed in order to evaluate the indications for adding epinephrine as a coadjuvant drug in the solution so as to rapidly recognise intravascular injection and generate local vasoconstriction.
References:
1. Reg Anesth Pain Med. 2018 Feb;43(2):113-123.
2. Drugs Aging. 2020 Jan;37(1):1-9.
Learning Points: Anatomical or functional abnormalities of the abdominal wall must be taken into account before performing abdominal interfacial blocks. The rapid recognition of the situation and the initiation of an adequate treatment are vital in the patient's prognosis.

03AP06-05
Regional Anesthesia in a patient with Myotonic dystrophy type 1 – a case report

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Background: Myotonic dystrophy type 1 (DM1) is considered a rare, genetic, progressive and multisystemic disorder that affects skeletal and smooth muscle as well as other organs[1].
Respiratory and cardiac involvement, *stigmata* of difficult airway, as well as a heightened sensitivity to sedative, anesthetic and neuromuscular blocking agents can also increase the risk of anesthesia related complications in DM1 patients[1,2].
Appropriate measures should be taken to reduce risk.
Case report: A 37-year-old female patient diagnosed with an adnexal mass was proposed for a laparoscopic unilateral salpingo-oophorectomy. Past medical history included DM1 with characteristic features: long and narrow face, high arched palate, distal muscle weakness and myotonia, dysarthria, first-degree atrioventricular block and a left anterior fascicular block.
Other known diagnosis included endometriosis and dyslipidemia. The patient was classified as ASA III and the case discussed in a multidisciplinary meeting, which resulted in a change of the surgical approach to a laparotomy and allowed for the use of regional anesthesia. An epidural block was performed at L3/L4 level, and an epidural catheter left in place for intraoperative anesthesia and postoperative analgesia.
Spontaneous ventilation was maintained throughout the procedure and the patient kept warm to prevent myotonic contractures. The procedure and recovery were successful and uneventful.
Discussion: There is limited literature available on the most appropriate anesthetic management for the DM1 patient. Careful consideration must be given to the selection of anesthetic technique and agents. Also of paramount importance is the communication between the anesthetic and surgical teams.
This case hopes to demonstrate a valid anesthetic approach in this type of patient and procedure as well as the importance of communication between teams.
References:
1. Vydra DG & Rayi A. Myotonic Dystrophy. In: StatPearls [Internet]. 2022. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557446/
2. Gupta, N., et al. Myotonic dystrophy: an anaesthetic dilemma. Indian Journal of Anaesthesia 2009; 53(6):688-691.
Learning points: Facing a rare disease with potentially serious anesthetic implications, we must be able to maintain a dynamic anesthetic and surgical approach based on the best scientific evidence available, while being familiar with the relevant pathophysiological features of the disease.

03AP06-06
Vocal cord palsy after neuraxial anesthesia - an unsolved mystery

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Background: Transient upper cranial neuropathy is a rare complication following spinal anesthesia (SA). However lower cranial neuropathies, including the vagus nerve, are seldom described and little is known about its etiology and recovery time.
Case report: This case reports a 77-year-old male with a medical history of hypertension and snoring. He was proposed for an open suprapubic prostatectomy. We performed a spinal anesthesia using a 25 gauge Quincke needle at level L3-4 with bupivacaine 0.5% and sufentanil. There was no airway or cervical vascular manipulation. The intraoperative period was uneventful.
During the transfer to the recovery room the patient developed acute respiratory insufficiency, stridor, loss of consciousness and eye retroversion that prompt orotracheal intubation. On the same day, the neurologic exam and cranial CT scan were normal, leading to extubation that was unsuccessful due to respiratory insufficiency. A flexible laryngoscopy revealed bilateral vocal cord palsy (BVCP).
On the fourth day the patient was submitted to tracheostomy and continued further evaluation. Cranial MRI revealed a recent ischemic event but without involvement of the vagus nerve nucleus. The patient was discharged home 50 days after surgery without etiological diagnosis and functional improvement.
Discussion: Cranial nerve palsy secondary to SA has been related to intracranial hypotension due to cerebrospinal fluid leakage following dural puncture. Despite being rare, vagal nerve neuropathy has been previously associated with SA. When considering the possible mechanisms of BVCP, SA was the only event that preceded the symptoms.
Additionally, all the acute etiologies were excluded. However, there were further investigations that could have supported the differential diagnosis. Facing the focal nature of clinical symptoms, laryngeal electromyography would be an important diagnostic tool as it could help differentiate vagus nerve injury or an isolated laryngeal recurrent nerve palsy, although it was not possible to perform it.
Learning points: Spinal anesthesia is rarely associated with cranial nerve neuropathy, which is usually transient and without permanent disability. Our case describes an idiopathic acute bilateral vocal cord palsy that immediately followed a spinal anesthesia, raising suspicions about the etiologic mechanism. We aim to raise awareness about this clinical entity and support the diagnostic investigation in further episodes.

03AP06-07
Case report: regional anesthesia in enzymtic debridement

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Background: Nowadays, the availability of non-surgical debridement techniques, for example, enzymatic debridement with Nexobrid®, force anesthetists to know analgesic techniques for their application. It is ve NexoBrid is a topically product used to remove scars that shed from healthy skin after a burn, applied in an intensive burnt care unit. This kind of debridement is so painful requiring deep sedation or other techniques.
Case report: We present a 34-year-old man with termal second-degree burns in upper and lower right limbs and sourrounding neck region, equivalent to 11% of his body area. Feeling was parcially afected in upper limb. Nexobrid was applied in his burns under ultrasound-guided axillary brachial plexus block with inyections of levobupivacaine 0,25% and mepivacaine 0,5%, 20 ml.
We did not consider supraclavicular or interescalene brachial block as an option because neck region was afected. Anesthesia and surgical procedure ocurred without complications. The pacient related an EVA of 3 when he was reevaluated 4 and 8 hours after the procedure. Just another aditional quirurgical debridement was needed to be done a month later. There was no infectious complication described.
Discussion: Nexobrid® has introduced a new concept in the treatment of burnt patients, minimizing their aggression, trying to reduce the risk of compartiment syndrome and surgical debridements afterwards. It is mandatory to use analgesia during its application. Intravenous sedation has been usually used. Regional anesthesia has rarely been described under these circumstances, however, is interesting to consider it because it provides analgesia for several hours in a less invasive way tan deep sedation.
Despite this, infection risks should be concerned. Studies comparing regional techniques against general anesthesia would be also interesting.
References:
Thompson EM, Andrews DD, Christ-Libertin C. Eficacia y seguridad de la sedación y analgesia de procedimiento para el cuidado de heridas por quemaduras. Res. de cuidado de quemaduras J. 2012;33(4):504-509.
GALEIRAS-VAZQUEZ, Rita et al. Sedoanalgesia para procedimientos de desbridamiento enzimático en pacientes con quemaduras en cara y cuello. Cir. plást. iberolatinoam., Madrid, v. 44, n. 3, p. 329-334 (2018)
Learning points: Regional anesthesia should be take into account as an option to provide analgesia in enzymatic debridement processes; regarding the risks that are involved.

03AP06-08
Intrathecal exacyl injection

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Background: Tranexamic acid (TA) is increasingly used in high-risk bleeding surgeries. Its new found success is the result of recent studies that have demonstrated a benefit in limiting blood loss. In parallel with its availability, intrathecal injection errors of TA are also increasing and are of concern to WHO. The purpose of this case report is to document the effects of a TA administration error during epidural anesthesia.

Case Report: 32 year old man, without any notable history, presented for a right internal saphenectomy. During spinal anesthesia, 300mg of TA was mistakenly injected instead of bupivacaine. Ten minutes after the injection, the patient experienced pain in the lower extremities that rapidly progressed to involuntary myoclonus.

Sedation and then intubation were initiated, and the patient was transferred to intensive care. The seizures were then treated with hypnotics, muscle relaxants, and anticonvulsants. Arterial blood gases showed metabolic acidosis with increasing hyperlactatemia.

The cerebral scan returned normal, and the sedated electroencephalogram (EEG) showed dysrhythmias with slow delta and diffuse theta waves. The patient was transferred to another hospital in the area for continuous EEG monitoring.

Discussion: As demonstrated in this clinical case, ampoule confusion resulting in intrathecal injection of TA induces very deleterious effects. A recent review identified more than 20 cases worldwide of accidental TA injections. The mortality rate was as high as 50% and neurological morbidity was severe among the survivors.

The main clinical symptoms and signs were severe back pain, generalized myoclonus, severe hypertension, tachycardia, and arrhythmias.

Another 2019 study reported an increase in cases since 1980 with a clear incidence in the last 2 decades. They also suggested strengthening preventive measures to limit these errors such as double-checking ampoules or separating them, either in a different cart or by requiring firms to change the physical similarities of the ampoules.

Early therapeutic measures such as saline lavage of cerebrospinal fluid (CSF) have been shown to limit the effect of TA on the spinal cord and to result in earlier revalidation.

Learning Points: In view of the increase in TA injection errors in recent decades, preventive solution plans should be protocolized, focusing mainly on physical differentiation of ampoules, specific placement of local anesthetics and washing of CSF as soon as possible.

03AP06-09
Local anesthetics systemic toxicity in orthopedic surgery: a case report

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Background: Local anesthetics systemic toxicity (LAST) is a rare but potentially fatal complication of regional anesthesia. Major risk factors include local anesthetic (LA) and patient-related factors.[1]

Case Report: 47–year-old woman, 80kg, presented for shoulder arthroscopy and left humerus plating. Medical history included obesity and nephrolithiasis. Ultrasound-guided left interscalene block was performed, with 20mL of 0.75% ropivacaine after negative aspiration.

The patient was placed in the beach chair position and sedated with a 2mg/kg/h propofol infusion. Subcutaneous infiltration of the posterior arthroscopic port with 5mL of 2% lidocaine was administered and, without informing the anesthetic team, 15mL of 2% lidocaine was injected intraarticularly by the orthopedic team.

30 minutes after the block and 15 minutes after lidocaine infiltration, the patient became tachycardic (155bpm) and hypertensive (190/110 mmHg) and right arm myoclonic movements were noticed. Thirty seconds later, a tonic-clonic seizure occurred.

LAST diagnosis was assumed and 20% lipid emulsion therapy was initiated (100mL bolus followed by 250mL infusion). For seizure control, midazolam 5mg, diazepam 6mg, and propofol 30mg were given. Endotracheal intubation was performed after induction with fentanyl 100μg and propofol 100mg. A central venous access and an arterial line were placed.

45 minutes later the patient was stable and was transferred to the PACU. Tonic-clonic seizures recurred after 15 minutes, which resolved after administration of 100mL of lipid emulsion. She was then transferred to the intensive care unit.

There was no recurrence of symptoms nor neurological sequelae reported and the patient was discharged after 6 days.

Discussion: The major contributing factor to LAST in this case was LA overdosage due to a lack of communication between the surgical and anesthetic teams. Close monitoring of the patient after the initial treatment was crucial for the timely management of the recurring symptoms.

Reference:

Dun-Chi Lin, et al (2017). Two for One. *A & A Case Reports*, *8*(9), 235–237.

Learning Points: Clear communication between the surgical and anesthetic teams is fundamental. Due to increasing use of LA by non-anesthesiologists there is a need to raise awareness regarding LA pharmacology and associated risks, as well as proper LAST management. Prolonged monitoring after initial treatment of LAST is required due to the risk of recurring symptoms.

03AP07-01
Effects of combine dexmedetomidine and regional analgesia vs propofol on posttraumatic stress disorder after Combat Trauma

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Objective: Posttraumatic stress disorder (PTSD) is a frequent and disabling consequence of traumatic events. A previous study found that early use of propofol was a potential risk factor for PTSD. This prospective study aimed to investigate the effect of propofol and Combine Dexmedetomidine and Regional Analgesia on PTSD after emergency surgery in trauma patients.
Methods: A total of 94 combat trauma patients undergoing emergency surgery were randomly divided into two groups and anesthetized with propofol and/or Combine Dexmedetomidine and regional analgesia (DMM+RA). Perioperative clinical data were collected. The incidence of PTSD was evaluated with the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) in the two groups 3 months after the operation.
The relevance of the injury time and CAPS-5 scores was assessed by Spearman correlation analysis. Logistic regression analysis was used to analyze the risk factors for PTSD.
Results: The incidence of PTSD in the propofol group was higher than that in the DMM+RA group 3 month postoperatively (27.4 vs. 14.3%, $P = 0.012$). The injury time was negatively correlated with the CAPS-5 score in the propofol group (r=-0.217, $P < 0.001$). In the logistic regression analysis, the utilization of propofol was an independent risk factor for PTSD ($P = 0.014$).
Conclusion: Early use of DMM+RA in surgery for combat trauma patients may decrease the risk of PTSD.
References:
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03AP07-02
Enhanced recovery after surgery (ERAS) with sedation and thoracic paravertebral block improve post-operative pain control and reduce side effect in breast cancer patients

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Background and Goal of Study: Enhanced recovery after surgery (ERAS) has gained popularity in recent years in breast surgery. We have provided non-intubated intravenous sedation and regional anesthesia with thoracic paravertebral block (TPVB) as ERAS protocol, which has been used since 2018 in Taipei Veteran General Hospital, Taiwan.
This study aims to compare general anesthesia (GA) to ERAS group in breast surgery, with the primary outcome being total post-operative analgesics dosage. Secondary outcomes were post-operative numerical rating scale (NRS) pain score, and incidence of post- operative nausea and vomiting (PONV).
Materials and Methods: 30 female patients whom underwent unilateral elective breast tumor wide excision, mastectomy with or without sentinel lymph node biopsy (SLNB) under ERAS protocol were identified as ERAS group. For the GA group, 30 patients who received general anesthesia were selected to match ERAS group with sex, age, BMI and type of surgery. Charts were reviewed for post-operative analgesic use.
Morphine, pethidine and tramadol were converted into intravenous morphine equivalents and compared with t-test. NRS were also reviewed and compared with t-test. Incidence of PONV were compared with chi-square test.
Results: The results showed patients in ERAS group had significant decrease in NRS (ERAS 3.0±2.4, GA 5.4±1.6,$p<0.01$) and post-operative analgesic dose at post-operative unit (ERAS 1.67±2.6mg, GA 3.9±2mg, $p<0.01$) compared to GA group.
However, patient in the ERAS group showed no significant difference (6.7% in GA group vs 10% in ERAS group) to GA group in PONV due to 23% (n=7) of patients in GA group had been given PONV prevention such as dexamethasone or 5HT-3 antagonist.
There were no conversion to GA in the ERAS group and no complications such as pneumothorax, hypotension or excessive movement during operation.
Conclusion(s): Compared to GA group, patients in ERAS group have lower NRS score and post-operative analgesics consumptions. PONV prevention ability is equivalent to intravenous PONV prevention medications such as dexamethasone and 5HT3 antagonist.

03AP07-03
Haemodynamic changes after the application of dexmedetomidine as adjuvant in fascia iliaca compartment block: a retrospective database analysis

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Background and Goal of Study: Adequate pain management in patients with hip fracture is challenging. A fascia iliaca compartment block (FICB) is one of the possible anesthetic options. To increase block duration, the use of dexmedetomidine (DEX) was shown to be highly effective. However, DEX may lead to significant cardiovascular compromise.
There is little evidence on the effect of perineural DEX on intraoperative blood pressure in patients undergoing surgery for hip fracture compared to patients treated with FICB without DEX.
Materials and Methods: All adult patients suffering from hip fracture undergoing surgery between 1.1.2014 and 31.3.2022 at an academic center were included. Data were extracted from the routine anesthesia documentation via SQL. Data processing and calculations were done using Python.
Incomplete datasets were excluded.
Intraoperative time with a mean arterial pressure (MAP) under 65mmHg (MAP65) in patients receiving FICB with DEX compared

to FICB without DEX (NODEX) was the primary outcome parameter. MAP65 was calculated as the longest time in minutes with a MAP continuously below 65 mmHg.

Descriptive statics were calculated, a t-test was used to compare MAP65 between DEX and NODEX. A multivariable regression was modelled including vasopressor doses (Atropine, Epinephrine, Glycopyrroniumbromide, Norepinephrine, Phenylephrine, ASA status and the usage of spinal anesthesia). For this regression model, DEX dose was calculated relative to weight to show a dose dependent association.

Results and Discussion: Data was available for 338 patients (109 DEX, 229 NODEX) with a mean dose of 110mcg (1.6mcg/kg) of DEX used.

The overall mean MAP65 was 10.7 minutes (SD: 19.0). There was no significant difference between the two groups (DEX: 13.5 (SD: 24.0) vs. NODEX: 9.4 (SD: 15.9) min, t-test, p = 0.07). In the multivariate regression, DEX dose per kilo was significantly associated with longer MAP65 (OR: 30.0, CI: 2.4-368).

This shows that there is a dose dependent association between perineural DEX and intraoperative blood pressure.

Conclusion: Perineural DEX influences time with a MAP below 65mmHg in a dose dependent way.

03AP07-04
Comparison of opioid requirements in patients with surgical versus ultrasound-guided rectus sheath catheters following laparotomies using audit data

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Background and Goal of Study: Rectus sheath catheters (RSCs), used increasingly for post-laparotomy analgesia, can be inserted surgically under direct vision or with ultrasound (US) guidance. In our hospital, patients with RSCs are routinely prescribed intravenous morphine, delivered by patient-controlled analgesia (PCA), in the initial postoperative period. PCAs deliver a bolus upon patient request, termed a 'good demand', followed by a 5-minute lockout, where further requests may be made but no morphine will be delivered.

Following PCA termination, patients experiencing ongoing pain not managed by RSC alone are started on long-acting opioids. No study has directly compared the analgesic effect based on the RSC insertion method.

Thus, routine data collected during an audit on RSC use (audit number: FV2021/14.1) was used to compare the analgesic effects of surgical and US-guided RSCs through the evaluation of postoperative opioid use.

Materials and Methods: Data on PCA and subsequent long-acting opioid use on 37 patients (surgical: n=23; US-guided: n=14) undergoing elective and emergency laparotomies between July to November 2021 was obtained through examination of medical records.

Results and Discussion: Duration of RSC use was similar between the surgical and US-guided groups (Table 1). Comparison of PCA use showed no significant difference in the average (i) duration of use, (ii) dose of morphine consumed, (iii) total number of demands, which was a sum of the 'good' demands and requests made in the lockout period, or (iv) the ratio of good: total demands (Table 1). There was also no significant difference in the rate of long-acting opioid initiation following PCA termination (Table 1).

	Surgical (n=23)	US-guided (n=14)	P-value (statistical test)
Duration (days) of RSC use (mean (95% confidence interval (CI))	3.7 (3.1 – 4.2)	3.2 (2.3 – 4.1)	0.36 (unpaired Student's T-test)
Duration (days) of PCA use (median (interquartile range (IQR)))	1.6 (0.9 – 2.2)	1.0 (0.7 – 1.7)	0.36 (unpaired Student's T-test)
Dose (mg/day) of morphine consumed through PCA (mean (95% CI))	38.0 (26.2 – 49.7)	28.0 (20.0 – 36.1)	0.22 (unpaired Student's T-test)
Total number of PCA demands per day (median (IQR))	44.8 (19.9 – 64.9)	28.5 (21.0 – 49.7)	0.46 (Mann-Whitney test)
Ratio of good: total PCA demands (median (IQR))	0.9 (0.6 – 0.9)	0.8 (0.7 – 1.0)	0.72 (Mann-Whitney test)
Number of patients started on a long-acting opioid following PCA termination (number (%))	5 (22%)	2 (14%)	0.68 (Fisher's exact test)

Table 1. Results

Conclusion(s): The similar postoperative opioid use in patients with surgically-inserted and US-guided RSCs suggests similar analgesic effectiveness between these methods. This finding increases the potential accessibility of RSCs, and thus eases the integration of its usage into existing analgesic regimes.

03AP07-05
Dosing of intrathecal morphine for analgesia in total hip arthroplasty

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Background and Goal of Study: Joint replacement surgery is one of the most painful surgical procedures. The key factor for post-operative length of stay and rapid recovery is perioperative analgesia. Spinal anaesthesia incorporating intrathecal morphine has been used as a systemic opioid-sparing technique.

The advantage of intrathecal morphine is due to its delivery into the subarachnoid space while clinical duration of action can be as long as 20 hours. The most frequently investigated dose was 100μg.

Materials and Methods: Difference between the use of standard analgesic methods and the administration of intrathecal morphine after total hip arthroplasty has been examined. 100 patients were included. Patients who met the research criteria were grouped into two groups.

One group of patients received a systemic combination of opioid and non-opioid analgesics as part of postoperative analgesia. The test group received morphine intrathecally, and it was divided in two subgroups (200 mcg and 250 mcg of intrathecal morphine). The application of morphine was part of procedure that applies spinal anaesthesia, only morphine was added to the local anaesthetic.

Results and Discussion: VAS score was measured 10 times in first 24 postoperative hours. The results have shown that average VAS score per patient per hour in group who have received 200 mcg morphine was 1,09 and other group was 250 mcg was 0,64. VAS

score in control group was 2,39. The results suggest that the least pain felt patients in the group who have received 250 mcg. The p-value in 250 mcg group was 0.001 compared to control group. Meta-analysis published in 2022 included 29 trials concluded that dose of 100 mcg is 'ceiling 'dose for analgesia and a threshold dose for increased rate of postoperative nausea and vomiting.
In this study, doses between 200 mcg and 250 mcg were administered because lower doses have shown to have less analgesic effect. Respiratory depression or any similar hypoventilation problems were not encountered, and PONV was noted in 13% of patients who have received dose 200mcg or above.
Conclusion(s): Patients who have received intrathecal morphine of 200 mcg or 250 mcg had lower pain scores compared with morphine dose of 100 mcg. Also, patients who were administered intrathecal morphine had VAS scale lower than in those in test group. Nevertheless, this topic required further randomised control trials to prove the efficacy of intrathecal morphine in different dosing regimens.

03AP07-06
Effects of levobupivacaine and ropivacaine on transmural dispersion of repolarization. Study in a porcine experimental model

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Background and Goal of Study: Ropivacaine (R) and levobupivacaine (L) are considered to have a wider margin of cardiovascular safety than other local anesthetics (LAs) such as bupivacaine. However, there are several reports of arrhythmias and cardiac arrest related to the unintentional administration of these anesthetics.
Abnormal cardiac repolarization increases the risk of arrhythmias and ventricular repolarization markers (corrected QT, QT-dispersion, corrected Tpeak-Tend and Tpeak-Tend dispersion) are useful to in predicting the risk of malignant arrhythmias.
We aim to compare the effects of R and L on the transmural dispersion of repolarization in an experimental model of a non-lethal local anesthetic intoxication.
Materials and Methods: Miniature pigs were anesthetized and instrumentalized. Three quadripolar catheters were placed in the high right atrium, right ventricular apex, and in the His bundle recording area. Simultaneous 12-lead electrocardiogram (ECG) recording was performed, and the data were continuously recorded with a polygraph monitor. Pigs were randomized into two groups that received a non-lethal dose of R (5 mg/kg) or L (4 mg/kg).
Ventricular repolarization was recorded by a 12-lead ECG and analyzed manually at baseline and at 1, 5, 15 and 30 min after drug administration. Arterial blood samples were taken at 0, 1, 5, 10, 15 and 30 and R and L were measured.
Results and Discussion: 14 pigs were included in the study. One animal in L group died from a severe hemodynamic collapse. Each LA induced significant changes in ventricular repolarization: QTc interval increased significantly in both groups ($\triangle$=12 ± 8% in the L group; p=0.046) vs. ($\triangle$=6 ± 10% in the R group; p=0.01), with no difference between groups. QTD increased by 123 ± 69% in the L group and 34 ± 32% in the R group (p=0.005 between groups).
Corrected Tpeak-Tend interval increased by 108 ± 69% in the L group (p=0.028) vs. 53 ± 32% in the R group (p=0.01), with no difference between groups. Tpeak-Tend dispersion increased by 145 ± 53% in the L group vs. 60 ± 43% in the R group (p=0.04). The AUC of plasma concentrations of LAs was higher in the R group, p=0.02.
Conclusions: L and R induced significant changes in ventricular repolarization parameters. These alterations were more intense in the L group. The results observed in our experimental model suggest a superior arrhythmogenic potential of L compared to R.

03AP07-07
Peng block in perisurgical pain management of intracapsular femoral fractures

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Background and Goal of Study: Hip fractures are very common in elderly patients and are associated with significant morbidity and mortality. Different regional techniques have been described to improve perioperative analgesia, allowing a lower consumption of opioids and reducing postoperative delirium. The anterior capsule of the hip joint contains the largest number of sensory and mechanoreceptor fibers and is innervated by the femoral nerve, the obturator nerve and the obturator accessory nerve. Pericapsular Nerve Group (PENG) block is a pure sensory block and its target corresponds precisely with the described innervation. We believe is likely to be more effective because of its high selectivity in intracapsular fractures.
For this reason, we have decided to follow up a serie of cases to evaluate the effectiveness of PENG block in these fractures.
Materials and Methods: Forty patients with intracapsular femoral fractures who could undergo PENG block and spinal anesthesia were included. We excluded patients with cognitive impairment. 15mL of ropivacaine 0.2% were used for the PENG echoguided block. Spinal anesthesia was performed with 10mg of bupivacaine 0,5% plus 10mcg of fentanyl.
Moreover, conventional analgesia was administered. In case of visual numeric scale (VNS) >3 tramadol 1mg/kg and morphine chloride 2mg were prescribed. VNS after the reversion of the spinal blockage, VNS at 24 hours after surgery and the need of analgesic rescues during this period were evaluated.
Results and Discussion: The average age of our population was 80 years. 95% of patients were ASA II-III. The fractures were mainly subcapital (80%) and hip replacement was
performed in 72,5% while the rest were treated with ostheosintesis. After the reversal of the spinal block, 75% had VNS 0 and 25% reported VNS 1-2. 24 hours after surgery, 92% of our population reported no pain or mild pain. Merely 15% of the patients needed analgesic rescue with tramadol, no one needed morphine.
Conclusion(s): PENG block targets the innervation of the anterior capsule of the femur. That's why we believe that its high selectivity makes it more effective for intracapsular femoral fractures.
In our study population, most of the patients either reported no pain or mild pain after reversal of intradural anesthesia and 24 hours later. Also, a minority required analgesic rescue. So, we can conclude that PENG block is an effective approach for peri-surgical pain control in intracapsular femoral fractures.

03AP07-08
Artificial intelligence for femoral nerve visualization in ultrasound images

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Background and Goal of Study: The number of hip fractures per year is estimated to reach 6 million worldwide by the year 2050. The most central intervention in emergency care for patients with hip fracture is pain relief. Despite many advantages of regional blockades when managing pain from such a fracture, these are used to a lesser extent than general analgesia.
One reason is that the opportunities for training and obtaining clinical experience in applying nerve blocks can be a challenge. Ultrasound image guidance based on Artificial Intelligence (AI) may be one way to increase nerve block success rate.
We propose an approach using AI to identify the femoral nerve in ultrasound images.
Materials and Methods: In order to obtain sufficient data to train a model, 1410 ultrasound images of the femoral nerve were collected from 48 patients and were annotated by a clinical professional. The image set was divided into train-, validation-, and test-sets with a 70/20/10 percent split.
The segmentation model architecture of choice for this project was U-net as presented by Ronneberger et al [1]. Intersect over Union (IoU) was used as the primary metric. The intersect represents the overlap between the manually annotated image mask and the predicted mask. The union is the combined area of the two masks, hence, the quota between the two expresses the percentage of overlap of the two total areas.
Results and Discussion: After training the model we achieved a Mean IoU of 69%. In order to further validate the result a 10-fold crossvalidation was performed and this resulted in a Mean IoU of 74%. Figure 1 shows an image with an IoU of 57%.

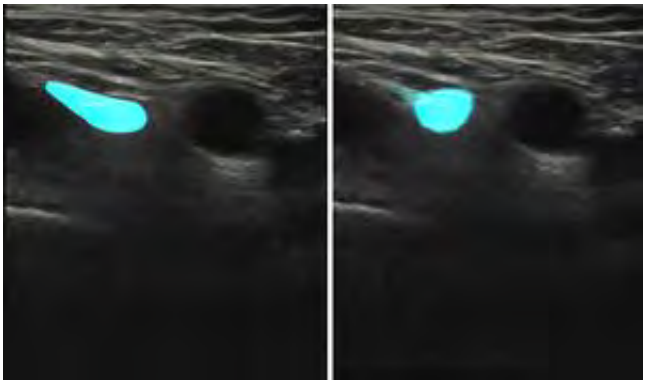

Figure 1. Left: Expert's manual annotation of the femoral nerve. Right: Trained U-net segmentation of the femoral nerve.

Conclusion(s): The results indicate that the technique shows potential for assisting the inexperienced user when performing nerve blocks. In further studies we aim to evaluate what performance is needed for this to be used as a clinical tool and at which experience level the tool can provide the most benefit.
Reference:
1. Ronneberger et al. U-net: Convolutional Networks for Biomedical Image Segmentation.

03AP07-09
The postoperative analgesic effect of liposomal bupivacaine on gynecological and obstetric surgery: a systematic review and meta-analysis

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Background and Goal of Study: Effective measures should be taken to reduce postoperative pain in female patients undergoing gynecological and obstetric surgery. The nerve block is an important component of perioperative multimodal analgesic methods, but it may not be effective in controlling postoperative pain for long periods due to the limited duration of action of current local anesthetics. Liposomal bupivacaine is a local anesthetic with a sustained slow release that lasts 72 hours. However, the effect of this drug in paients undergoing gynecological and obstetric surgery is unclear.
Therefore, the aim of this meta-analysis was to investigate the effect of liposomal bupivacaine on postoperative pain in this population.
Materials and Methods: This meta-analysis was conducted in line with the Preferred Reporting Items for Systematic Reviews and Meta-analyses. The database, including PubMed, Web of Science, Embase via Ovid, and the Cochrane Central Register of Controlled Trials, were searched by two searchers independently to gain relevant research from inception to 09, November 2022.
In addition, the relevant pieces of literature have been handsearched. The randomized controlled trials (RCTs) concerning the effect of liposomal bupivacaine on postoperative pain, meeting the inclusion criterion, were brought into this meta-analysis.
Results and Discussion: A total of 25 full-texts were screened and a final number of 12 studies were included. Of these studies, eight studies evaluated the effect of liposomal bupivacaine on total opioid consumption at 72h postoperatively, and there was no statistical significance between the liposomal bupivacaine and control groups (Standardized mean difference 0.08, 95% Confidence interval -0.24 to 0.41, $P=0.61$).
Eight studies evaluated the effect of this local anesthetic on pain score at 72h postoperatively, and the difference was also no statistically significant (Standardized mean difference -0.24, 95% Confidence interval -0.53 to 0.04, $P=0.10$).
Conclusion(s): This systematic review and meta-analysis suggested that the liposomal bupivacaine could not reduce opioid consumption and pain intensity at 72h postoperatively.
Therefore, in this population, more studies were needed to further investigate the effect of liposomal bupivacaine on postoperative pain and analgesics.
Acknowledgements: We are much grateful that the studies included in this meta-analysis.

03AP07-11
Effectiveness of different doses of prophylactic dexamethasone in post-spinal anesthesia hypotension mitigation, in elective abdominal surgery elderly patients

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Background and Goal of Study: Spinal anesthesia is used for surgery in elderly, being preferred for its efficacy, minimal impact on mental status and protection against thromboembolic disease. However, it comes with an increased risk of potentially harmful hemodynamic disturbances. Post-spinal anesthesia hypotension in elderly is challenging. Fluids and vasoactive agents that are used to treat this condition prone the patient to the risk of hypervolemia and myocardial ischemia.
This randomized, double-blind, placebo-controlled study evaluates the effect of 2 doses of prophylactic dexamethasone (4 and 8mg) vs placebo, on the hemodynamics during elective surgery under spinal anesthesia in elderly.
Materials and Methods: 108 patients (ASA I-III), aged >65 years, scheduled for abdominal elective surgery under spinal anesthesia, were included. They were randomly assigned to 3 groups, each with 36 patients. They received 1h preoperatively 4, respectively 8mg of intravenous dexamethasone for groups D4 and D8, while group P was given normal saline.
The primary outcome was the incidence of hypotension assessed every 10min, during first 30min after spinal anesthesia.
The secondary outcome measures the requirement of ephedrine for the same interval. The incidence of nausea/vomiting, bradycardia, pruritus and shivering were recorded, too. Collected data were analyzed using Student's t-test and Fisher's test, $p<0.05$ being considered as statistically significant.
Results and Discussion: The incidence of spinal anesthesia induced hypotension was significantly lower in groups D8 ($p<0.01$) and D4 ($p<0.05$) vs placebo, for all time intervals. Group D8 had an advantage in terms of hemodynamic stability against D4, without statistical value. The epinephrine consumption was significantly less in dexamethasone patients vs placebo ($p<0.05$). Nausea/vomiting was less experienced in dexamethasone groups vs placebo ($p<0.05$).
No difference was mentioned among groups concerning bradycardia. Pruritus and shivering were detected with a statistically lower incidence in D8 vs D4 ($p<0.05$), respectively in D4 vs placebo ($p<0.01$).
Conclusion: Our data suggest that prophylactic dexamethasone could be efficient in reducing the incidence of spinal anesthesia-induced hypotension and of vasopresor request, without significant differences between doses, in elderly undergoing abdominal elective surgery. A favourable impact on other spinal anesthesia associated adverse events should be considered, too.

03AP07-12
Perineural dexamethasone inhibits neuronal excitability and exerts a neuroprotective effect in human nociceptive dorsal root ganglion neurons

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Background and Goal of Study: Dexamethasone is often used as a perineural additive to prolong the duration of analgesia of regional anaesthesia. However, controversy remains over the existence of a peripheral mechanism of action, and dexamethasone's potential neurotoxicity.
We hypothesize that dexamethasone inhibits peripheral electrical activity, and study this effect and its neurotoxicity in a human induced pluripotent stem cell (iPSC)-derived nociceptive dorsal root ganglion (DRG) neuron model.
Materials and Methods: Nociceptive DRG neurons were obtained from Human iPSC-Derived Sensory Neuron Progenitors (Axol Bioscience) by lineage-based differentiation. Differentiation was confirmed 21 days post-seeding using brightfield microscopy and immunostaining for markers of the peripheral nociceptive nervous system (e.g. BRN3A, TRPV1 and Na_v 1.7). Microelectrode array was used to study the effect of dexamethasone on electrical network activity or spikes.
Neurotoxicity of dexamethasone was assessed using luminescent ATP, LDH, and caspase enzyme activation assays. (Un)paired T-tests were used to compare the effect of dexamethasone on spikes to untreated control, and baseline and recovery measurements. Toxicity data is presented descriptively.
Results and Discussion: Cells showed typical DRG neuron morphology and expressed the expected (nociceptive) markers. Dexamethasone 1 mM (a concentration found using a dose-response trial) produced a reversible inhibition of electrical activity (Fig. 1A), compared to untreated controls ($P<0.001$), baseline ($p=0.02$) and recovery ($p=0.026$) measurements.

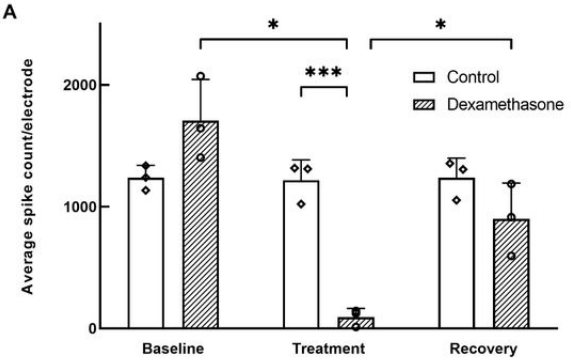

Fig. 1A. Dexamethasone 1 mM reversibly inhibits electrical network activity (or spikes)

Protective effects of dexamethasone 1 mM were found for LDH release and caspase 3-7 activation after 24 h incubation, while intracellular ATP was decreased (Fig. 1B).

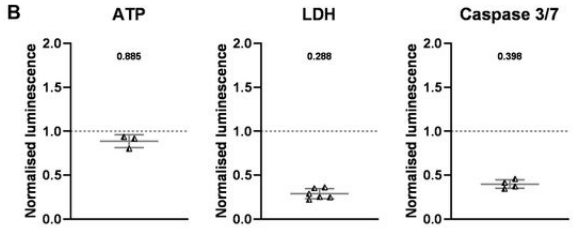

Fig. 1B. Dexamethasone 1 mM reversibly inhibits electrical network activity while exerting a predominantly neuroprotective effect.

Conclusion: Perineural dexamethasone was shown to inhibit electrical network activity of nociceptive DRG neurons, while exerting a predominantly neuroprotective effect. Future research should study the mechanism underlying the demonstrated effect on electrical activity.

03AP07-13
Total knee arthroplasty and total hip arthroplasty: perioperative analgesia strategies and pain control

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Background and Goal of Study: Total knee arthroplasty (TKA) and total hip arthroplasty (THA) are major orthopedic procedures associated with intense early postoperative pain. Pain management is crucial and determines the outcome of the recovery process after surgery. The main aim of this study was to characterize perioperative anesthesia and analgesia strategies applied to patients submitted to TKA and THA and identify perioperative factors affecting pain control (NRS <=3) in the recovery room, 24 hours (h) and 48h postoperatively.

Materials and Methods: A prospective study was conducted in a tertiary hospital, evaluating patients who underwent elective TKA and THA, between January 2020 and May 2021.

The exclusion criteria were inability to provide informed consent; age <18 years, ASA >3; history of allergy to local anesthetics or ≥2 analgesics; contraindication for locoregional anesthesia (LRA) and chronic pain unrelated to the surgical site.

Mann-Whitney U, Chi-square and Fisher's exact tests and logistic regression were used for statistical analysis. Approval by the local ethics committee and informed consent from all patients were obtained.

Results and Discussion: A total of 110 patients (58 TKA/ 52 THA) were included, 62.7% females, with a median age of 68. Intraoperative anesthesia technique comprised 81.8% LRA, 10.0% general anesthesia (GA) and 8.2% combined (GA + LRA).

At the recovery room, 14.5% patients presented uncontrolled pain at admission and 3.6% at discharge. At 24h and 48h postoperatively, 16.2% and 5.4% presented uncontrolled pain at rest, 61.3% and 48.6% at movement, respectively.

Both TKA (vs THA) - OR 4.96 (1.01-24.39, p=0.049) and LRA (vs GA) - OR 0.02 (0.0-0.17, p<0.001), were independently associated with uncontrolled pain in the recovery room.

Combined postoperative analgesia OR 0.36 (0.14-0.93, p=0.035) and uncontrolled pain at movement at 24h OR 2.9 (1.2-6.9; p=0.016) were associated with uncontrolled pain at movement at 48h postoperatively.

Conclusion(s): Anesthesia and analgesia strategy are key determinants of perioperative pain control. Both the choice of LRA and a combined postoperative analgesic protocol are the best choice to reduce immediate and 48h postoperative pain control, respectively. Also, TKA and uncontrolled pain at movement at 24h were found to be risk factors to uncontrolled pain in the recovery room and uncontrolled pain at movement at 48h postoperatively, respectively.

Since ineffective pain control results in postoperative complications and hinders successful recovery, establishing a common understanding of what constitutes the practice when it comes to pain management after TKA and THA, is crucial.

Obstetric Anaesthesiology

04AP01-01
The role of noradrenaline in maintenance of haemodynamic stability during spinal anaesthesia for caesarean section - randomized single-blinded controlled study

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Background and Goal of Study: Maternal hypotension during spinal anaesthesia for caesarean section can provoke deleterious effects on mother and child's well-being. The effect of noradrenaline boluses on maternal mean arterial pressure (MAP) was examined in comparison with equivalent doses of ephedrine and phenylephrine. The incidence of nausea and/or dizziness and bradycardia as secondary outcome was recorded.

Materials and Methods: 27 healthy parturients were randomly assigned in noradrenaline (N) or control group (C). Co-loading with 500 ml of intravenous saline was received in both groups. Upon neuraxial procedure, bolus of 8 mcg of noradrenaline was given. In control group, equivalent doses of phenylephrine or ephedrine were administered. In case of HR less than 100/min ephedrine was given, otherwise phenylephrine was the vasopressor of choice. MAP and HR were recorded before spinal (MAP_1 -time zero) and then every 3 minutes from intrathecal drug administration until delivery (MAP_2-MAP_6). Hypotension was defined as a drop of MAP below 65 mmHg or as decrease of systolic blood pressure by more than 20% of baseline value and was treated accordingly. In case of bradycardia, atropin 0.5 mg was given.

Results and Discussion: Demographic characteristics were comparable. There was no significant difference between groups regarding MAP (Table 1, Figure 1). Similar findings exist regarding the incidence of nausea/dizziness (p=0.999).

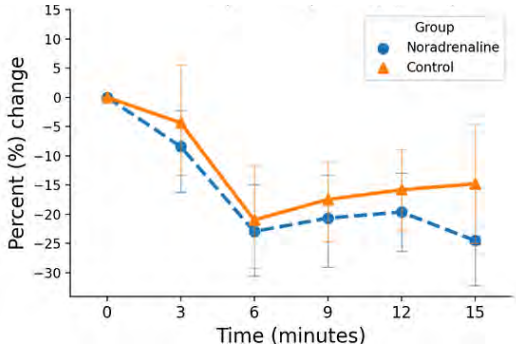

Figure 1. Mean arterial pressure - percent (%) change

Variables	N group (n=14)	C group (n=13)	p
MAP_1	96.3 (7.3)	89.3 (14.5)	0.118
MAP_2	88.0 (13.5)	84.6 (17.3)	0.574
MAP_3	73.8 (14.4)	70.4 (18.4)	0.591
MAP_4	76.2 (15.2)	73.8 (16.3)	0.693
MAP_5	76.9 (10.5)	74.3 (11.2)	0.532
MAP_6	73.3 (11.6)	73.2 (14.5)	0.999
Hypotension	10 (71.4)	8 (61.5)	0.990
Bradycardia (HR<60/min)	3 (21.4)	1 (7.7)	0.908

Values are expressed as mean (SD) or n(%). MAP is expressed in mmHg.

Table 1. Maternal haemodynamic data

Conclusion: Noradrenaline is not superior to combination of phenylephrine and ephedrine boluses. However, it can be a valuable tool in management of spinal hypotension in obstetrics.

04AP01-02
The relationship between peripartum pain and maternal bonding

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Background and Goal of Study: Mother-infant bonding is a woman's early maternal emotions and connectedness to her offspring. Impaired bonding can lead to devastating consequences. There are peripartum risk factors for impaired mother-infant bonding but the influence of peripartum pain on bonding has not been studied. Therefore, we designed this study to investigate whether peripartum pain influenced postpartum bonding.

Materials and Methods: After institutional review board approval and signed informed consent, women were recruited on first postpartum labor. All women with live healthy offspring not admitted to the NICU were included. Women were asked about BMI, gravity, parity, type of delivery, type of analgesia or, type of rooming in (partial or full rooming in), breastfeeding (yes, no) as well as postpartum depression (PPD, Edinburgh Postpartum depression scale).

Then they were asked to quantify average and maximal pain during labor and in the first 24 hours postpartum (Verbal Numeric Score (0-10). Maternalinfant bonding was assessed using the Post- Partum Bonding Questionnaire, a validated questionnaire consisting of 25-item scale assessing the mother's feelings and attitudes towards her baby.

We conducted a univariable regression analysis with average and maximum intrapartum and postpartum pain as the independent variables and PBQ as the dependent variable. The multivariable regression model included age, BMI, gravidity, parity, type of delivery, type of analgesia/anesthesia, rooming in status, breastfeeding (yes, no), postpartum depression (PPD), higher education (yes/no), salary status (above or below average) as well as intrapartum and postpartum pain (0-10) as independent variables and the PBQ as the dependent variable.

Results and Discussion: A total of 750 women were recruited. 559 (74.5%)underwent normal vaginal, 21 (2.8%) underwent instrumental vaginal, 112 (14.9%) underwent elective CS, and 58 (7.7%) underwent emergency CS. In the univariable and multivariable regression analysis, we found no influence of either average or maximal pain either intrapartum or postpartum on postpartum bonding. However, in the multivariable regression, PPD was independently associated with a higher PBQ score, beta-coefficient 2.63 (95% Confidence Interval, 1.1 – 4.6, p = 0.002).

Conclusion(s): We were unable to show any relationship between peripartum pain and maternal bonding. However, there was a strong relationship between bonding and mood.

04AP01-03
The relationship between peripartum pain and depressed mood

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Background and Goal of Study: Depressed mood immediately postpartumis a predictor for development of postpartum depression (PPD). There is controversy whether peripartum pain influences postpartum depression. One of the reasons for this controversy is that PPD is multifactorial and previous studies investigating this relationship did not control for other factors.
Therefore we decided to investigate the relationship between peripartum pain and depressed mood after controlling for other factors.
Materials and Methods: After IRB approval and signed informed consent, Women with live healthy offspring not admitted to the NICU were recruited on first postpartum day. Women were asked about BMI, gravity, parity, type of delivery, personal or family history of depression, marital and economic status. Women were asked to rank average and maximal pain both intrapartum and in the 24 hours postpartum. They were then asked to fill out the Edinburgh Postnatal Depression Scale (EPDS), a 10-item validated questionnaire; higher scores indicating worse mood.
We performed univariable linear regression by including average/maximum intrapartum or postpartum pain as independent variables and EPDS score 24 hours after delivery as the independent variable. We then did a multivariable linear regression analysis including age, BMI, gravidity, parity, type of delivery, breastfeeding (yes/no), rooming-in (yes/no), education level (college/no), marital status (married/not) as well as salary (above/below average) as well as average/maximal intrapartum/postpartum pain as independent variables and EPDS score 24 hours after delivery as the dependent variable. We report beta-coefficients of the linear regression model as well as 95% Confidence Intervals(CIs).
Results and Discussion: In the univariable regression analysis, we found that neither average nor maximum intrapartum pain were associated with higher EPDS scores. However, we found that higher maximum pain after labor (beta-coefficient 0.20 [95%CI; 0.08 – 0.31],p = 0.001) as well as higher average pain after labor (beta-coefficient 0.23 [95%CI; 0.11 – 0.35], p < 0.001) predict higher EPDS scores.
In the multivariable regression model, we found that maximum pain postpartum (beta-coefficient 0.17 [95%CI; 0.04 – 0.29], p = 0.009) as well as average pain postpartum beta-coefficient 0.21 [95%CI; 0.09 – 0.34], p < 0.001 were still predictive of higher EPDS.
Conclusion(s): Treatment of postpartum pain is crucial as it may influence mood disorders.

04AP01-04
Birth expectations, psychological distress and their relationship with labour epidurals - a Swedish birth cohort study

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Background and Goal of Study: The determinants of why women choose labor epidural analgesia (LEA) for childbirth vary greatly. The aim of our study is to analyze the association between birth expectations, antenatal psychological distress and and use of LEA.
Methods: Data were retrieved from BASIC project (2009-2017), a population based longitudinal study of pregnant women carried out at Uppsala, Sweden. Regional ethical review board (Dnr 2009/171). Women with singleton vaginal deliveries and a normal progress under labour were included and the outcome was use of LEA. Resilience was measured using the Swedish version of sense of coherence scale (SOC-29). Antenatal depressive symptoms and self-harm thoughts were accessed with the Edinburgh postnatal depression scale (EPDS) completed at week 32. Information on clinical parameters were retrieved from medical records.
Results: Of the 1367 women included in this study, 294 (21.5%) reported use of LEA and 1073 (78.5%) did not. Table 1 shows the demographic, perinatal and clinical characteristics of study participants (n= 1367) with or without use LEA, reported as numbers (n) and percentages (%). P value is calculated by Fischers exact test.
Discussion and conclusions: The use of LEA was higher in nulliparous women, having low resilience, with previous history of depression, PMS, delivery fear, negative delivery expectations and antenatal psychological distress. LEA was not associated with negative delivery experience in our study. Antenatal management by a multidisciplinary team might help reduce the negative expectations and improve the quality of the delivery experience.

Variables	No LEA n= 1073 (78.5)	LEA n= 294 (21.5)	P value
Age > 35 years	719 (67)	212 (72)	0.09
BMI ≥ 30 kg/m^2	219 (23)	81 (31)	*0.01*
History of depression	524 (56)	164 (63)	*0.04*
History of premenstrual syndrome	91 (10)	39 (15)	*0.01*
Low resilience (SOC-29)	72 (7.0)	30 (10)	*0.04*
Nulliparity	308 (29)	133 (45)	*<0.001*
Negative delivery expectations	129 (14)	63 (25)	*<0.001*
Fear of childbirth	179 (19)	68 (27)	*0.01*
Antenatal self-harm thoughts	37 (4.1)	13 (5.0)	*0.01*
Antenatal depression (EPDS)	67 (7.2)	28 (11)	*0.04*
Negative delivery experience	19 (2.1)	11 (4.3)	0.05

Table 1:

04AP01-06
Melatonin reduces blood loss during scheduled cesarean section under spinal anesthesia

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Background: Cesarean section rate is increasing worldwide despite WHO recommendations of 10-15%. Bleeding during c-section is one of the major concerns and uterine atony is the main cause of post-partum hemorrhage. Several therapies are used to prevent bleeding during surgery.
Melatonin has been implicated in the induction of labor by initiating uterine contractions and increasing their intensity.
The aim of the study was to evaluate the efficacy of melatonin as a premedication to reduce blood loss during a scheduled c-section under spinal anesthesia.
Materials and Methods: A prospective randomized double-blind study was conducted over a period of 2 months in a tertiary maternity center. After oral and written informed consent, ASA I and II parturients, with singleton pregnancies, proposed for a scheduled c-section under spinal anesthesia were included.
Twenty minutes before c-section, parturients received either melatonin 6 mg (group M) or placebo (group P) sublingually. Spinal anesthesia was performed with hyperbaric bupivacaine 10 mg + sufentanil 2.5 μg + morphine 100 μg for a T4 sensitive block.
After fetal extraction, 05 UI of oxytocin were administered as an IV bolus followed by 10 UI over a period of 30 minutes. Additional boluses of 05UI of oxytocin were added at the surgeon's request to achieve good uterine tone.
We noted parturients hemodynamic status (HR and MAP) and anxiety level (simple verbal scale 0-10), intraoperative bleeding (weight of gauzes used during surgery) and total oxytocin dose received.
Our primary endpoint was the measured blood loss.
The secondary endpoint was the total dose of oxytocin consumed.
A p value<0.05 was considered statistically significant.
Results: Our study population included 60 parturients in each group. No significant differences in demographic or obstetric characteristics were noted between the two groups. The mean blood loss was 187.21±27.01 ml in group M and 245.3±33.28 ml in group P (p<0,001). The median oxytocin dose was 15 [15-20] UI and 20 [20-25] UI in group M and group P respectively (p< 0.001). In the operating room, parturients in group M had significantly lower MAP, HR and anxiety score.
Conclusion(s): Melatonin has an anxiolytic effect and potentiates the action of oxytocin in the myometrium. In our study, premedication with melatonin allowed us to note a reduction in intraoperative blood loss and oxytocin consumption. Our findings need to be confirmed by other studies.

04AP01-08
Post ceasarean pain management with Transversus Abdominis Plane Block (TAP Block)

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Background and Objectives: The post-ceasarean administration of effective analgesia decreases maternal convalescence, promotes early ambulation, optimizing the affective relationship with the newborn, being the Transverse Abdominal Plane Block (TAP-Block) a technique to achieve this.
The general objective was to verify whether post-ceasarean analgesia with TAP-Block is associated with a decrease in values obtained in the Visual Analogue pain Scale (VAS) and in opioid requirements, during the first 36 post-surgical hours.
The secondary objectives were to determine if TAP-Block favors early ambulation, and if it decreases the need for rescue analgesia and the presence of adverse effects.
Methods: An observational, longitudinal, prospective, randomized case-control study was carried out at the *Ramón Sardá* Maternal and Child Hospital in Buenos Aires, between May and August 2019. The population consisted of 44 pregnant volunteers, ASA I and II, hemodynamically stable, who had ceasarean delivery, with Pfannestiel incision, randomly distributed into two groups: study group, which underwent US guided TAP-Block with 1.5 mg/kg of ropivacaine after ceasarian section, and a control group that did not.
In both groups, IV Ketorolac 1 mg/kg/day was administered, and IV Paracetamol 1 gram in a continuous infusion, switching to oral administration upon recovery, and Tramadol 1 mg/kg as a rescue. Patients were visited every 2 hours during the postoperative period, recording the presence of pain and its VAS score, the need for rescue with opioids and its side effects.

Variable: VAS scale Pain	TAP-BLOCK GROUP: 22 patients											
	0= Null		Score 1= VAS 1-3: Mild		Score 2: VAS 4-5 Moderate		Score 3: VAS 6 - 7 Severe		Score 4: EVA 8-9 very severe		Score 5: VAS 10 Maximum pain	
HOURS	AF	RF	AF	RF	AF	RF	AF	RF	AF	RF	AF	RF
2	6	28%	16	72%								
4	6	28%	16	72%								
6	7	32,2 5%	13	58,75%	2	9%						
8	5	22,7 5%	16	72,75%	1	4,5%						
12	2	9%	17	77,50%	1	4,5%	2	9%				
24	9	41%	11	50%	1	4,5%	1	4,5%				
36	11	50%	11	50%								

Variable: Adverse effects	AF	RF
None	16	72,75%
Pruritus	3	14%
Nausea and Vomiting	1	4,5%
Sedation	1	4,5%
Respiratory Depression	-	
Combination of 2 or more adverse effects	1	4,5%
Others	-	-

Variable: Analgesic rescue	AF	RF
Puntaje 0: NO	18	82%
Puntaje 1: YES	4	18%

Variable: Movement and ambulation	AF	RF
Score 0: less than 6 hours	17	77,5%
Score 1: Between 6 and 12 hours	4	18%
Score 2: more than 12 hours	1	4,5%

Results and Discussion: The highest level of pain in the control group was recorded at 6 hours, while in the study group it was recorded between 8 and 12 hours. In the control group, 86% received rescue between 6 and 12 hours presenting adverse effects, achieving mobility and ambulation in more than six hours or the day after the procedure.

In the study group, 82% did not need rescue, nor presented side effects, registering ambulation in less than six hours, presenting a significant difference with the control group.
Conclusion: The TAP block is an effective analgesic technique for post-cesarean pain management.

04AP01-09
Retrospective observational study on individual factors influencing postcesarean delivery pain

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Background and Goal of Study: Pain after caesarean delivery (CD) has been associated with adverse events such as chronic pain, prolonged hospital stay, impaired maternal-fetal bond and postpartum depression. Multimodal analgesia is the most recommended strategy. However, little is known about individual risk factors predicting severe postoperative pain or low response to mainstay therapy.
Aims of this study were to assess pain control after CD in our center and to explore the role of different factors to identify patients at higher risk of poorly controlled pain.
Patients and Methods: A retrospective observational study was conducted in a single Spanish hospital. Patients undergoing CD of all Lucas classification deliveries under spinal anaesthesia were recruited.
Data collected: demographic, medical and obstetric, body mass index (BMI), previous surgeries, chronic pain treatment (CPT), type and dose of opioid. Numeric Pain Rating Scale (NPRS) at 6h and 12h and adverse events in the first 24h were also recorded. Data were analysed using Stata vs15.
Results and Discussion: 113 patients were recruited between June 2021 and July 2022. Mean age was 35,2 (SD 5,4) years old and mean gestational age was 38,3 (SD 5,5) weeks. 45,1% of patients had a previous CD and 54,9% had a previous abdominal surgery. 7,1% of patients were under CPT.
All patients received spinal fentanyl (mean dose 11,7 μg); 78,8% also received spinal morphine (mean doses 48,6 μg). Patients with spinal morphine had lower NPRS at 6h, both at rest (2,5 [IC95% 2,2–2,9] vs 3,7 [IC 3,1–4,4]) and at movement (3,7 [IC95% 3,3–4,0] vs 4,9 [IC 3,9–5,8]), but there was not a statistically significant difference at 12h.
There was an increased number of urine retention in patients who received morphine (p = 0,05), but a longer hospital stay was not required. This difference was not observed regarding pruritus (p = 0,60) nor nausea and vomiting (p = 0,49). NPRS was not modified by BMI, previous CD, previous abdominal surgery or CPT when adjusting by the use of morphine, neither at 6h or at 12h, nor at rest nor at movement. Time to discharge was not modified by these factors.
Conclusions: Concording to literature, low doses of spinal morphine reduced postoperative pain without severe adverse events. Individual factors such as BMI, previous surgeries or CPT seem to not play a role into postoperative pain management in these patients.
Reference:
Best Pract Res Clin Anaesthesiol. 2017 Mar;31(1):69-79.

04AP01-10
Mothercare: listening to cries for help

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Background and Goal of Study: The Scottish Intensive Care Society Audit Group (SICSAG) published a document entitled 'Minimum Care and Quality Indicators for Critical Care in Scotland'[1].
This outlines that all critical care units should conduct regular patient experience surveys on an annual or more frequent basis. We undertook a patient survey in the obstetric high dependency unit (OHDU) at Princess Royal Maternity (PRM) to ascertain the patients' experience of their admission, and understand the follow up needs of this patient group.
Materials and Methods: A short telephone questionnaire was designed and conducted at least 6 weeks post discharge from OHDU. Patient data and consent for follow up survey was obtained during the patients hospital admission and recorded on Ward Watcher. Patients completed a telephone interview about their care in OHDU.
Results and Discussion: 15 patients completed the follow up survey. The mean length of OHDU stay was 2.52 (1-4) days. 100%(n=15) of patients surveyed were aware that they had received a higher level of care than usual, and knew why this was. 53% (n=8) patients said their OHDU stay had affected them emotionally or psychologically, and 6% (n=1) physically. 20% (n=3) had unanswered questions about their OHDU stay, and 40% (n=6) of patients said routine follow up after their OHDU admission would have been helpful. 53% (n=8) of patients said their OHDU stay made them feel anxious about having future children. A poster and patient leaflet were subsequently designed and distributed to OHDU patients. This allows access to patient initiated follow up.
Conclusion(s): More than half of the patients in our survey were experiencing emotional or psychological effects of their OHDU stay and many patients expressed a wish for follow up. Our patient information leaflet and poster will improve access to patient initiated follow up, and we plan to monitor the impact of this on our patients and services in the coming months.
Reference:
1. Scottish Intensive Care Society Audit Group. (2015). *Minimum Standards and Quality Indicators for Critical Care in Scotland https://www.sicsag.scot.nhs.uk/quality/20151215-Quality-Indicators-Booklet-V3-0.pdf*

04AP02-01
Expect the best, prepare for the worst: amniotic fluid embolism (AFE) + atypical haemolytic uremic syndrome (aHUS) in a cascade mode. Anything else to treat?

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Background: AFE and aHUS are two entities related to pregnancy with high fetal-maternal morbimortality unless early diagnosis and treatment is set. AFE is caused by abnormal activation of immunologic mechanisms following entry of fetal antigens into maternal circulation. aHUS is a disorder defined by microangiopathic hemolytic

anemia and thrombocytopenia which affects the kidneys with anuria and renal failure (RF). We present a case of a patient with these two entities in the immediate puerperium and the ICU management.

Case report: A 39-year-old woman, no previous clinical records. G3A2.After forceps delivery, the patient presented poor general condition, headache, hypothermia and intense piloerection. She was tachycardic, tachypneic and hypotensive and there was evidence of obstetric hemorrhage with DIC (Hb 8.1gr/l, 60,000 platelets, INR 2,APTT 65.9,fibrinogen 163)requiring transfusion and placement of a Bakri balloon.

Since leaving the OR, anuria was evident not responding to diuretics with impaired renal function (Creatinine 1.34, GF 51, K+ 5.7 and Na 135). The nephrology department was notified that postpartum aHUS with secondary anuric FR was suspected,requiring extrarenal purification.

A complement genetic study was requested, which showed that she was a carrier of heterozygous aHUS risk polymorphisms and treatment with eculizumab was started. A progressive improvement of renal function was observed but did not return to normal levels at discharge.

Discussion: Although infrequent we must not stop thinking about AFE since the clinical picture can vary from cardiopulmonary collapse to non-specific symptoms. 70% of cases present as atonic hemorrhage. Early diagnosis and treatment are essential: cardiovascular support, coagulopathy and hemorrhage management. C1-esterase inhibitors may be potential therapeutic options.

Fetal and amniotic fluid antigens from the AFE can stimulate complement activation, which is what most likely occurred in our case and was the cause of the aHUS, damaging the microvascular endothelium.

This entity can mimic other pathologies (preeclampsia or HELLP). Genetic analysis together with anti-CFH antibodies confirm the diagnosis, but the absence of mutations does not exclude it. The treatment of choice is cardiovascular support with plasmapheresis and eculizumab.

Learning Points: Although infrequent, these entities require close management, early diagnosis and treatment by a multidisciplinary team to avoid fetal-maternal morbimortality.

04AP02-02
Spinal bupivacaine in a pregnant Brugada patient with SARS-COV-2 infection: an unnecessary or a calculated risk?

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Background: Brugada Syndrome (BrS) is a rare channelopathy caused by several mutations, the most common is on the SCN5A gene which encodes the cardiac sodium channel. Patients with BrS are at risk of developing ventricular arrhythmias and sudden cardiac death.[1] Arrhythmic events during the peri-operatory period are rare, so most recommendations are theoretical and based on pharmacodynamics and physiopathology.

Case report: We report the case of a 35-year-old full-term pregnant female patient that presented to the Emergency Room in labor. The patient had an incidental diagnosis of Type I BrS and had an ICD (Implantable Cardioverter Defibrillator). The pregnancy was complicated with gestational diabetes, hypothyroidism, and gestational hypertension.

On admission, the patient was diagnosed with asymptomatic SARS-COV2 infection. The cardiotocography showed signs of fetal distress and an urgent C-section was required. The choice of anesthetic technique was complex. Spinal anesthesia with bupivacaine had risks because this drug is not recommended in BrS Patients.[2]

On the other hand, general anesthesia was also ill-advised. Due to the urgency of the procedure, all options were quickly reviewed with the patient, and spinal anesthesia was performed with 2ml of hyperbaric bupivacaine 0,5% and 2,5 μg of sufentanil with lower limb motor block and T4 sensory level block.

Because no eletrosurgery device was used, the ICD was not disabled for surgery, though a magnet was readily available if needed. Later, an epidural catheter was placed for postoperative analgesia with epidural opioids. The surgery and recovery were uneventful. The patient was discharged 3 days later.

Discussion: Bupivacaine is a local anesthetic with a distinct affinity for cardiac sodium channels that is thought to potentiate arrhythmias in BrS patients, although there are no studies that undoubtedly demonstrate the risk, particularly in spinal anesthesia.[2] Because of conflicting evidence on the matter, this case aims to report the uneventful use of spinal bupivacaine in a patient with BrS.

References:

1. Brugada, J., et al. 2018. Present Status of Brugada Syndrome: JACC State-of-the-Art Review. *J Am Coll Cardiol.* 2018, pp. 72(9):1046-1059.

2. BrugadaDrugs.org. [Online] [Cited: 11 20, 2022.] https://www.brugadadrugs.org/.

Learning points: Although Bupivacaine is not recommended in patients with BrS, its safety, particularly in spinal anesthesia, should be studied.

04AP02-03
Postpartum congestive heart failure following cesarean delivery for a pregnant woman with Fontan circulation: a case report

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Background: Perinatal hemodynamics and management for parturients with Fontan circulation (FC) have yet to be established. The most commonly reported cardiovascular complications for pregnant patients with FC are arrhythmia and heart failure 1).

However, few cases with pathophysiological or clinical backgrounds in such complications are reported or discussed.

Case report: A 28-year-old woman, who had undergone total cavopulmonary connection for congenitally corrected transposition of the great arteries (ccTGA) without anatomic repair, was planned for cesarean section due to worsened congestive heart failure at 33 weeks gestation. Her NYHA was III, and anatomical right ventricle (aRV) ejection fraction, which was 58% before pregnancy, decreased to 38%.

She was induced and maintained with combined spinal and epidural anesthesia for the surgery. Her ABP, CVP, and ScvO2 were 147/76 mmHg, 16 mmHg, and 51%, respectively, before the surgery, and those scores did not change intraoperatively. In-out was -1440 ml during the surgery. CVP increased gradually up to 20 mmHg with worsened edema in her limbs and face after 5 hours since the

admission to the ICU. Her chest X-ray showed cardiomegaly and pulmonary edema. Furosemide was infused, and CVP decreased to 12 mmHg according to the increase of urinary volume. X-ray showed improved pulmonary vascular shadows on postoperative day (POD)2. So, she was discharged from the ICU on POD3.

Discussion: Prepartum hemodynamic changes could worsen heart failure for patients with FC due to sinus hypofunction and insufficient cardiac output increase. In the postpartum period, fluid shifts occur as the uterus contracts, which could result in fluid overload.

In addition, FC with right ventricular morphology, including FC with aRV in ccTGA, had less endurance for preload increase 2). Preoperative dilution of heart function and postoperative volume overload with her cardiac morphological character resulted in postoperative congestive heart failure in this case. Perioperative fluid restriction or inotropic agents might have been preventive for heart failure exacerbation in this case.

References:

1. Garcia Ropero A et al. Circ Cardiovasc Qual Outcomes. 2018; 11(5):e004575

2. Erikssen G et al. Open Heart 2018;5:e000902

Learning Points: Perinatal management for a patient with FC should be adjusted considering with not only FC but also prepartum condition and cardiac morphology such as which ventricle is responsible to systemic circulation.

04AP02-04
Anesthesic management of severe thrombocytopenia secondary to HELLP syndrome diagnosed during labor

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Background: HELLP syndrome is a severe form of pre-eclampsia presenting haemolysis (H), elevated liver enzymes (EL) and low platelets (LP) in a pregnant or puerperal patient. It diagnose could be a challenge because patient could present hypertension, proteinuria, epigastric pain, nausea, vomiting, headache and malaise or only unexplained thrombocytopenia.

Case report: A 42 year old female 40 + 2 weeks pregnant was admitted for labor induction. Pregnancy was uneventful without laboratory disturbances or pre-eclampsia. After 12 hours of admission she presented epistaxis but blood pressure was normal. Patient was transfer to delivery room and she requested epidural analgesia. Anesthesia team requested a new laboratory test to rule out hematological disturbances because epistaxis was unexplained until that time and very rare. A very low count of platelets (15000) and high levels of liver enzymes were noted but blood pressure was normal. An urgent cesarean section was indicated because HELLP syndrome. Patient and her husband were informed for obstetrician and anesthesia team about contraindications of neuroaxial anesthesia and risks of general anesthesia in pregnant woman and massive hemorrhage possibility. Transfusion of 4 platelets pool, tranexamic acid (1 g) and fibrinogen (2g) were administered intraoperatively based on anesthesia team decision. Intraoperative and postoperative course was uneventful without hemorrhagic or thrombotic complications and patient with her child were discharged to home at 4 days.

Discussion: This case describes HELLP syndrome presenting with severe thrombocytopenia during induction labor in a patient with prior uneventful pregnancy and normal laboratory tests without hypertension making diagnosis more difficult than usual. Unexplained epistaxis makes that anesthesia team decided to request a new laboratory test to rule out abnormalities and probably avoided serious complications of epidural analgesia. This case is very interesting because clinical course, severe thrombocytopenia of our patient requiring a cesarean section and the lack of hemorrhagic complications were not described previously for evidence as far as we know.

Learning Points: This case underscore the importance of clinical and laboratory evaluation of pregnant woman with unexplained hemorrhagic symptoms to rule out serious complications like HELLP syndrome related to higher morbidity and mortality.

04AP02-05
Vasovagal syncope with asystolic pauses during labor in a previously healthy obstetric patient

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Background: Arrhythmias during labor are not infrequent but rarely cause major clinical effects in both mother and child. Although tachycardia is expected to be the most common hemodynamic response to labor, the incidence of bradycardia is surprisingly high (1).

Case report: A 36-year-old, primiparous, healthy woman was admitted to ER for presyncope/syncope concerning labor contractions at full term. The ECG showed progressive bradycardia that evolved to complete AV block with asystolic pauses of up to 8 seconds with each contraction. Fetal monitoring showed bradycardias as a result of the maternal condition. The patient received a transitory pacemaker and had an emergency C-section. After intradural anesthesia, episodes of bradycardia/asystolia ceased. The patient gave birth to a healthy baby and 4 hours later the pacemaker was removed without further complications.

Discussion: Although during pregnancy, deep cardiovascular changes occur and labor is a state with a lot of pain and anxiety, there are few studies about arrhythmias during this period, especially in healthy patients (1,2).

These studies found benign changes in rhythm in more than half of their subjects. The patients frequently presented supraventricular extrasystoles without clinical significance. In this case report, the patient had a neuromediated syncope with a predominance of cardioinhibitory reflex.

The correlation between pain and bradycardia was clear since the beginning. The pacemaker ensured the patient's hemodynamical stability, counteracting the possible side effects of intradural anesthesia and c-section. The patient was asymptomatic after birth and no more episodes were recorded during hospitalization.

References:

1. **Incidence and characteristics of maternal cardiac arrhythmias during labor** Ayal Romem, MD, MHA, Yitzhak Romem, MD, Miriam Katz, MD, and Alexander Battler, MD Am J Cardiol. 2004 Apr 1;93(7):931-3.

2. **Maternal arrhythmias of normal labor and delivery**. Berlinerblau R, Yessian A, Lichstein E, Haberman S, Oruci E, Jewelewicz R. Gynecol Obstet Invest. 2001;52(2):128-31.

Learning points: This case illustrates the importance of early diagnose of arrhythmias in obstetric patients along with a multidisciplinary management.
In rare cases invasive procedures, like a temporary pacemaker, can be needed prior to any intervention or anesthetic technique to avoid maternal-fetal complications.

04AP02-06
Anaesthetic management of patient with low stature and cardiopathy for caesarean delivery: how much spinal dose should I use? Case report

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Background: Parturients with low stature and high BMI scheduled for cesarean delivery (CD) are challenging from an anaesthetic point of view due to the absence of recommended spinal doses for a height < 140 cm. This optimum dose allows to avoid the risk of insufficient extension and difficult airway if it were insufficient, or to a high or total spinal block in case it would be excessive.
We report the case of a patient with very low stature, high BMI + structural cardiopaty who was scheduled for CD under neuraxial block, using a low dose of local anaesthetic.
Presentation of the Case: This 30-year-old pregnant women was scheduled for CD at 38+4 weeks of gestation. Her medical records showed an extremely low stature, with a BMI of 49 kg/m2 (high 131 cm and weight 85 kg). She suffered from a double rheumatic mitral injury associated with a mild cardiac failure from the 30th week of gestation which had required medical treatment with diuretics and Beta blockers.
At her arrival at the operating room her cardiac condition was stable. A CSE was perform using 5 mg of 0.5% heavy bupivacaine plus 20mcg fentanyl. Prophylaxis of hypotension was ensured using a continuous infusion of 5mcg/mL norepinephrine, with no further complications.
Five minutes after the intrathecal injection, a sensitive T4 level was achieved, and allowed the obstetricians to deliver a healthy newborn. The intervention lasted 70 minutes unventfully. The patient didn't requiere any additional bolus through the epidural catheter and accomplished a complete motor recovery at 110 minutes after delivery. The patient was discharged home on day 5 after surgery without any complication.
Discussion and Learning Points: Our main objective in this report was to achieve an appropiate anesthetic level, with minimum risk of cardiac failure secondary to maternal hypotension, and taking into account the risk of intrapartum failed blcok. The determination of the optimum dose in a low stature patient was especially challenging, given that all recommendations conceeeern patients taller than 140 cm.
Hypotension associated with spinal anaesthesia was efficiently treated with a continuous inufsion of noradrenaline. A lower incidence of reflex bradycardia and a slight beta agonist action might not be necessarily beneficial in case of mitral insufficiency.
Reference:
1: Harten, Anaesthesia, 2005; 2: Danelli, Minerva Anestesiologica, 2001

04AP02-07
Epidural blood patch for post dural puncture headache in a parturient with active coronavirus disease 2019 in early postpartum

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Background: The safety of epidural blood patch (EBP) in patients with Coronavirus disease 2019 (COVID-19) is unknown. A primary concern of using EBP in these patients is the possibility of seeding the virus into the central nervous system.
Case report: We are presenting a case of 26 year-old G2P0 parturient who underwent vaginal delivery under epidural analgesia, complicated by accidental dural puncture. Her medical history was remarkable for anemia, and she was found to be COVID-19 positive on admission.
The patient was experiencing mild upper-respiratory symptoms, and had never received immunization against COVID-19. Her laboratory results were remarkable for mild leukocytosis and hypocalcemia. Approximately 24 hours after an uncomplicated vaginal delivery, the patient began to experience typical signs and symptoms of post-dural puncture headache (PDPH).
The headache was initially treated with conservative methods, including bedrest, oral hydration and Butalbital/ Acetaminophen/ caffeine, without significant improvement. The risks of performing EBP were discussed with the patient during informed consent, including limited data on performing EBP during active COVID-19 infection, and the possibility of viral spread into cerebrospinal fluid.
Since the patient accepted the risk, was afebrile, and had no major laboratory abnormalities, we decided to proceed with EBP. After the procedure the patient reported significant improvement of symptoms several hours afterward. She did not experienced any complications, and was discharged home the next day.
The patient had frequent follow-ups for 10 weeks and did not report any complications.
Discussion: To our knowledge, there are two reported cases of performing EBP in COVID-19 positive patients. (1, 2)
References:
1. Norris MC et al. Epidural Blood Patch for Post Dural Puncture Headache in Patient with Coronavirus Disease 2019: A case report. A&A Pract. 2020
2. M. Ibrachim et al, Epidural Blood Patch for a Post-DURAL Puncture Headache in COVID-19 Positive Patient following Labor Analgesia, International Journal of Obstetric Anesthesia 2021
Learning Points: In summary, we presented a single case report of an EBP in patient with mild COVID-19 disease. We cannot comment on the safety of performing EBP in patient with severe symptoms. Based on limited data, clinicians should weigh risk versus benefits of performing EBP, as PDPH may significantly interfere with postpartum recovery.

04AP02-08
Vaginal vs caesarean delivery for GUCH; when one's logistical capabilities dictate the anaesthesia and mode of delivery

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Background: Women GUCH (Grown-Up Congenital Heart Disease) require careful planning and management during pregnancy and delivery. The risk of complications depend on the underlying cardiac diagnosis, ventricular and valvular function, presence of cyanosis, pulmonary artery pressure and comorbidities.
Case report: 25-y.o primigravida, with a Fontan repair at 3-y.o due to a congenital single ventricle with a large non-restrictive VSD, transposition of the great arteries, valvular and subvalvular pulmonary stenosis and a small anterior outflow tract to the aorta. Basal SatO2 91 % with no increasing hypoxia on exertion, she could play football regularly. The patient wished to deliver vaginally.
The multidisciplinary team focused on mode of delivery and anaesthesia. As she was considered WHO class III with good function, vaginal delivery was a viable option, but logistically not possible as the delivery ward lack invasive monitoring and was far away from thorax.
The alternative plan was for the first stage of labour to proceed in the thoracic-ICU and for the second stage in the thoracic operating theatre. A midwife would be present, as well as an obstetric anaesthetist, who would provide epidural analgesia and identify and treat complications.
Despite being a tertiary university hospital, with all resources, it was decided that it would not be feasible to try this plan for the first time in such a high-risk patient. She was scheduled for a caesarean section in the thoracic operating theatre. She received arterial and central lines. An epidural was placed at level L3-L4 and topped-up with ropivacaine 7.5mg/ml (titrated to Th4 level, with a total dose of 21ml given over 45 min).
After fetal extraction two 0.5U doses of iv oxytocin were administered. Fluids given were 1200 ml of plasmalyte and 200 ml of 20% albumin, bleeding was 300 ml. She was stable throughout and was transferred to the thoracic PACU. Discharged home at day 3.
Discussion: For hospitals treating high risk cardiac patients, protocols need to be in place in order to handle vaginal and caesarean deliveries according to patient wishes. We have since implemented a protocol to be able to provide vaginal delivery for this group of patients.
Reference:
Circulation 2017;8:50-87, EHJ 2018;39,3165–3241
Learning Points: Multidisciplinary teams are vital in the deliveries of high-risk patients. Protocols should be in place to offer patients a choice of delivery method based on patient preference.

04AP02-09
Rotational thromboelastometry (ROTEM®)-guided management of a parturient with amniotic fluid embolism after caesarean section: a case report

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Background: Amniotic fluid embolism (AFE) is a rare (1:20000 deliveries), but often lethal complication that can occur during the peripartum period. Mortality may exceed 50% in the first hour.
Case Report: A 36-year-old parturient (G2P1), at 40 weeks' gestation, was admitted for scheduled inducing labor. Past medical history included hypothyroidism and gestational diabetes. Nine hours after induction, she became unresponsive, developed hypoxemia and the cardiotocography showed fetal bradycardia.
Emergency c-section, under general anaesthesia, was decided and carried out immediately. The patient had cardiorespiratory instability intraoperatively. Oxytocin infusion was commenced right after the delivery, tranexamic acid (TXA) 1g was administered after the initial estimated blood loss of 1000ml and while pending the first ROTEM® results, which were indicative of severe coagulapathy with absence of thrombus formation.
Fibrinogen concentrate (FC) 2g, TXA 1g, 2 units FFP and 1 unit pRBC were given instantly. Subsequent ROTEM® results revealed significant hypofibrinogenemia and deficit in the extrinsic pathway coagulation factors; viz $A5_{EXTEM}$ 5mm, $A5_{FIBTEM}$ 0mm, CT_{EXTEM} 503sec, so further FC 4g, prothrombin complex concentrate 1000 units and 1 unit pRBC were administered.
At the end of the c-section the patient was haemodynamically unstable, requiring a norepinephrine infusion 0.02mcg/kg/min. A CT scan displayed findings presuming AFE and brain lesions suggesting posterior reversible encephalopathy syndrome.
Finally, the patient was transferred to the Intensive Care Unit (ICU), where other FC 5g, 5 units PLTs and 1 unit pRBC were transfused, under the ROTEM® guidance. The patient was discharged from the ICU the following day, with no complications.
Discussion: AFE is characterised by cardiopulmonary collapse, coagulopathy and severe bleeding. Treatment is mainly supportive, with aggressive resuscitation and point-of-care ROTEM®-guided management being the cornerstones of an optimal outcome. In our case, ROTEM® was performed whenever it was deemed necessary and coagulation factors were transfused according to published PPH A5 ROTEM algorithm (Görlinger K, et al., 2019).
Learning Points: This rare case of AFE highlights the advantages of viscoelastic point-of-care coagulation testing, both in terms of rapid and targeted blood component therapy, in such challenging conditions.

04AP02-10
Anesthetic management for cesarean section in a pregnant woman with severe thrombocytopenia: a case report

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Background: Thrombocytopenia is a common finding in pregnancy and constitutes a diagnostic and management challenge.[1] The multidisciplinary approach during the peripartum period aims to minimize maternal and neonatal bleeding.[1,2]

Case Report: A 29-year-old female gravida 1, para 0 was referred to our hospital for thrombocytopenia management during pregnancy. She had a history of thrombocytopenia detected 5 years earlier. Genetic testing hadn't been able to confirm or exclude the monoallelic form of Bernard-Soulier syndrome.

During the third trimester, for suspicion of immune thrombocytopenia and platelet counts inferior to 50×10^9/L, the patient was started on prednisolone. Due to poor response, it was decided to start the patient on intravenous immunoglobulin and dexamethasone.

At 37 weeks and 1 day of gestation, following premature rupture of membranes and considering breech presentation of the fetus, it was decided to proceed to Cesarean Section. The platelet count was 19×10^9/L so we opted for general anesthesia.

During the procedure, after consultation with Hematology, she received dexamethasone 40mg, hydrocortisone 100mg, 2 units of platelets and tranexamic acid 1g. According to the institutional protocol, a bolus of 10 units oxytocin was administered and 10 units in a slow infusion, as well as additional misoprostol 800mcg rectally.

A good surgical hemostasis was guaranteed by the surgical team and so the estimated blood loss was of 600mL.

There were no complications for mother or newborn.

Discussion: Management of thrombocytopenia in pregnancy remains a challenge and a multidisciplinary approach is key. Prior to delivery, the platelet count should be raised to at least 50×10^9/L, to decrease the bleeding risk.[1,2]

If Cesarean Section is planned, complications associated with the anesthetic technique must be considered, as regional anesthesia entails a risk of neuraxial hematoma and general anesthesia an increased risk of difficult airway access and mortality.[2]

References:

1. https://doi: 10.1111/j.1365-2141.2012.09135;
2. https://doi: 10.4236/ojanes.2022.121005;
3. https://doi: 10.2450/2019.0245-18.

Learning Points: Management of thrombocytopenia in pregnancy aims to minimize maternal and neonatal bleeding. When considering Cesarean Section, the risks of regional anesthesia must be balanced against the risks of general anesthesia.

04AP03-01
Does managing inadvertent dural puncture affect the incidence of post-dural puncture headache and the need for an epidural blood patch?

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Background and Goal of Study: Inadvertent dural puncture (IDP) leads to post-dural puncture headache (PDPH), associated with severe neurological sequelae. Threading the catheter intrathecally (ITC) after IDP may mitigate PDPH, but data was inconclusive as there was variation in the duration of ITC and whether intrathecal saline (ITS) was injected.

Therefore, we investigated the effect of leaving an ITC, its duration, and ITS use on the incidence of PDPH and the need for an epidural blood patch (EPB).

Materials and Methods: This was a retrospective study from 2 tertiary referral hospitals using data from manual and electronic logs. IDP was managed either via repeating epidural or inserting ITC according to discretion.

In the case of ITCs, anesthesiologists choose to remove it immediately after delivery or o keep it for 24 hours, and whether to inject 10 mL of ITS. The outcomes were the incidence of PDPH and the need for EPB.

Multivariable logistic regression was conducted, including BMI, gravidity, mode of delivery, multiple attempts, and epidural technique as independent variables. Adjusted odds ratios (aORs) along with 95% Confidence Intervals were computed.

After assessing for normal distribution, a t-test or Mann-Whitney test was used for continuous variables. Fisher's exact test was used for categorical variables. A p-value < 0.05 was considered statistically significant.

Results and Discussion: We included 550 women who had an IDP. 322 (58.5%) women developed a PDPH, of which 215 (66.8%) required an EBP, and 15(4.7%) required a second EBP. Using ITC versus repeating epidural did not decrease the odds of PDPH, aORs 0.91 (0.81, 1.01), $p = 0.08$.

However, in patients that received an ITC, ITS injection decreased the odds of PDPH by 15%, aORs 0.85 (0.73, 0.99), $p = 0.04$.

Furthermore, we found a positive interaction between ITC and ITS injection, aORs 0.85 (0.73, 0.99), $p = 0.045$. We found no difference in the incidence of PDPH whether the ITC was left in for 24 hours or less, aORs 1.28 (1.06, 1.54), $p = 0.009$.

The use of ITC rather than repeating epidural decreased the odds of the need for EBP by 18%, aORs 0.82 (0.73, 0.91), $p < 0.001$. ITS injection led to lower odds of needing EBP, aORs 0.75 (0.64, 0.87), $p < 0.001$.

We found no difference between ITCs left for 24 hours or a shorter period, aORs 1.04 (0.87, 1.23), $p = 0.69$.

Conclusions: There does seem to be a beneficial effect of leaving an ITC catheter in preventing an EBP, especially if ITS is injected.

04AP03-03
Assessment of peripartum haemorrhagic risk in pregnant women: retrospective evaluation of the diagnostic performance of the HEMSTOP standardised questionnaire

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Background and Goal of Study: Current recommendations regarding the assessment of bleeding risk advise to carry out a personal and family history of haemorrhagic diathesis[1]. We used the standardized HEMSTOP questionnaire[2] in pregnant women to assess its ability to detect any haemostasis disorder and to predict the haemorrhagic risk associated with delivery.

Materials and Methods: The HEMSTOP standardized questionnaire of all pregnant women who gave birth at the Brugmann University Hospital in 2020 and 2021 was retrospectively analysed.

The HEMSTOP questionnaire of each parturient was correlated with primary haemostasis tests performed during the prepartum anaesthetic consultation, and with postpartum blood loss. Abnormal haemostasis assessment was defined as any abnormal coagulation test (PT, aPTT) or low platelet count (< 75.000 G/L). Abnormal postpartum bleeding was defined as a blood loss greater than 1000mL. Categorical variables were analysed with Chi square.

Results and Discussion: A total of 3588 patients were included in the study. There was a significant relationship between the HEMSTOP questionnaire and the presence of an abnormal haemostasis or an abnormal bleeding (Table).

	HEMSTOP (-)	HEMSTOP (+)	
Normal haemostasis (N, %)	3418 (99.6)	147 (94)	P<0.001
Abnormal haemostasis (N, %)	14 (0.4)	9 (6)	
Normal bleeding (N, %)	2926 (89)	122 (79)	P<0.001
Abnormal bleeding (N, %)	355 (11)	32 (21)	

The specificity and sensitivity of the HEMSTOP questionnaire to predict abnormal haemostasis in pregnant women were respectively 96% (95%CI:0.95 to 0.97) and 39% (95%CI:0.20 to 0.61). The specificity and sensitivity of the HEMSTOP questionnaire to predict postpartum bleeding risk were respectively 96% (95%CI:0.95 to 0.97) and 8% (95% CI:0.06 to 0.11).

Conclusion: The HEMSTOP questionnaire has a very high negative predictive value, indicating that pregnant women patients with a negative questionnaire (score < 2), have a very low risk of having abnormal coagulation tests and or abnormal postpartum bleeding. These results confirm the recommendation against the systematic prescription of laboratory tests in patients with no history of bleeding diathesis.

References:

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2. Bonhomme F et al. Can J Anesth 2016;63:1007-15.

04AP03-04
Perioperative management of placenta accreta spectrum: case series

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Background and Goal of Study: Placenta accreta incidence is around 1/1000 deliveries[1]. It has increased due to the rising number of cesarean sections (CS) and is associated with postpartum hemorrhage (PPH), being the leading cause of emergency hysterectomy. Prior diagnosis is imperative for a multidisciplinary approach. Our review aims to assess the management and outcomes of these patients.

Materials and Methods: After obtaining approval of the Ethics Committee, the following data was collected: demographic and obstetric data, anaesthetic and surgical plan, the use of intraarterial balloons (IA), rate of transfusion, and perioperative complications.

Result: Between 2012 and 2022, 7 patients with accretism were seen at our center. Table 1 shows demographic data and accretism characteristics.

	Age	Previous CS or curettage	Type of accretism	Diagnosis
Case 1	25	3 CS	extensive accreta + total occlusive placenta previa	Prior ultrasound and magnetic resonance
Case 2	38	2 curettages	extensive accreta + total occlusive placenta previa	Prior ultrasound
Case 3	36	1 CS	extensive accreta + total occlusive placenta previa	Prior ultrasound and magnetic resonance
Case 4	37	Bicornuate uterus, 2 CS	focal accreta	Prior ultrasound and magnetic resonance
Case 5	39	-	extensive accreta + total oclusive placenta previa	No prior diagnosis
Case 6	41	1 curettage	extensive accreta + total occlusive placenta previa	Prior ultrasound and magnetic resonance
Case 7	37	2 CS	extensive accreta + total occlusive placenta previa	Prior ultrasound and magnetic resonance

Table 1.

In all cases of extended accretism general anesthesia with invasive monitoring, large-caliber IV lines and blood reserve was performed. In case 4 (focal accretism) and case 5 (unexpected accretism) CS was performed iniatially under regional anaesthesia. Table 2 shows perioperative management and complications.

	Hysterec-tomy	IA balloon	IA balloon expansion	PPH estimate and/or management	Transfusion	Complications
Case 1	Elective	Hypogastric	prophylactic	Not recorded	Not required	-
Case 2	Elective	Iliac	therapeutic	1500ml	2 PRBC (packed red blood cells)	Bladder injury with bilateral ureteral section
Case 3	Elective	Hypogastric	therapeutic	Severe hemorrha-gic shock	18 PRBC, 2L FFP (fresh frozen plasma), 1 platelet pool, 8g fibrinogen, 1g TA (tranex-amic acid)	Ureteral injury Bilateral pulmonary thromboembolism (postoperative inferior vena cava filter) ICU admission
Case 4	Emergent	Deemed unnecesary	-	Not recorded / Bakri balloon placement	5 PRBC, 1L FFP, 2g TA	-
Case 5	Emergent	-	-	2000ml / ovarian and uterine artery embolization	8 PRBC	Hemoperitoneum, abdominal hema-toma requiring embolizations
Case 6	Elective	Iliac	prophylactic	1400ml	3 PRBC, 1g TA	Postoperative hemorrhage requiring surgery and ICU stay
Case 7	Elective	Hypogastric	prophylactic	2000ml	750mg TA	Grade 3 bladder injury Paralytic ileus

Table 2.

Conclusions:

- Surgical and anaesthetic resources should be assessed and prepared.
- Insertion and expansion of IA balloons, and specific checklist verification; allow for better hemorrhagic control, with better surgical performance and patient stability.
- Prophylactic expanson of IA balloons, rather than therapeutic, seems to relate to a more controlled surgical site.
- The involvement of various specialities is crucial for reducing the risk of bleeding, rate of transfusion, and perioperative complications.

Reference:

1. Clin Obstet Gynecol. 2018 Dec;61(4):733-742

04AP03-05
Establishment of an *in vitro* human blood-placental barrier model and verification of remimazolam permeability

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Background: Because of the anatomical structure of the placenta differs among animal species, there are limitations to application of experimental results for drug transfer in the placenta in animals to humans. Recently, *in vitro* studies for examining drug permeability at the blood-organ barrier have been carried out by culturing different cells on both sides of a porous cell culture membrane. We conducted a dextran impermeability test and used the model to verify remimazolam permeability across the blood-placental barrier.

Materials and Methods: Human trophoblast cells (BeWo cells) were used as maternal placental syncytial trophoblast cells, human umbilical vein endothelial cells (HUVECs) as fetal vascular endothelial cells, a porous polymeric membrane as a basement to partition the wells. The model consisted of a three-layered structure in the same well.

We tested for permeability under confluent conditions, near concentration of dextran with 400 Dalton and remimazolam with 438 Dalton were administered to the medium of BeWo cell side.

At 3 hours after drug administration, the concentrations of the two agents of the medium on the HUVEC side were measured by fluorescence spectrophotometry and high-performance liquid chromatography tandem analysis, respectively.

One-way analysis of variance followed by unpaired t-test with Bonferroni correction for multiple comparisons was used as the statistical test, and p value and adjusted p value <0.05 were considered as statistically significant difference.

Results and Discussion: The rate of dextran permeability across the blood-placental barrier was 3.28±0.62% in the BeWo group, 16.87±0.51% in the HUVEC group, and 0.31±0.43% in the co-culture group, showing a significant difference among the three groups ($p<0.001$, Figure).

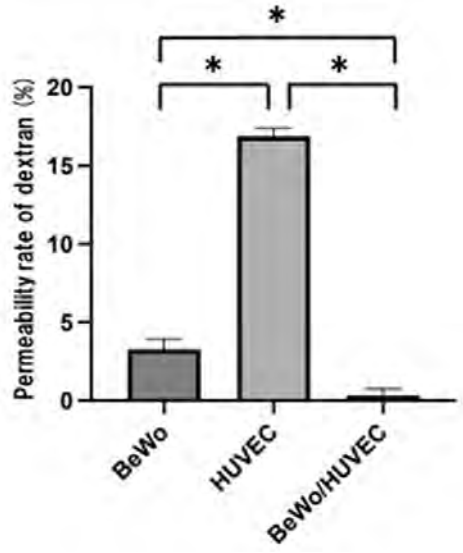

Figure. Differences in dextran permeability. (: p<0.001)*

The rate of remimazolam permeability in the co-culture group was 26.68±1.82%.The rates of permeability of dextran and remimazolam differed significantly despite of having similar molecular weights, indicating the possibility of a mechanism transporting to the fetal side.

Conclusion: The permeability of dextran were depended on cell type and conditions. We verified the permeability of remimazolam.

04AP03-06
Prophylactic vasopressor and non-invasive cardiac output monitoring to prevent hypotension following spinal anesthesia for cesarean section: a randomized clinical trial

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Background and Goal of Study: Hypotension following spinal anesthesia during cesarean section is common and could negatively affect the mother and child. This study aimed to assess whether spinal anesthesia-induced hypotension could be prevented using non-invasive cardiac output monitoring and as needed prophylactic vasopressor therapy.

Materials and Methods: This prospective randomized study was approved by the Institutional Review Board of Kyushu University, Fukuoka, Japan (IRB No. 20192028), and registered in the UMIN-CTR Clinical Trial Database (ID: UMIN000040066; https://upload.umin.ac.jp/cgi-open-bin/ctr_e/ctr_view.cgi?recptno=R000045678) on April 15, 2020.

Two hundred patients undergoing elective cesarean delivery under spinal anesthesia between May 2020 and May 2022 were enrolled. Blood pressure (BP) was measured at 2.5-minute intervals following an intrathecal injection of 10 mg hyperbaric bupivacaine.

When the systolic blood pressure (SBP) was under 100 mmHg and the mean BP was under 65 mmHg, or when the patient complained of nausea, a bolus of 100 μg phenylephrine was administered. Patients in the intervention group received 100 μg phenylephrine when the estimated continuous cardiac output (esCCO) decreased by over 10% since the last measurement.

The primary outcome was the proportion of patients with hypotension (SBP under 100 mmHg and mean BP under 65 mmHg) between spinal anesthesia induction and delivery.

The secondary outcomes were nausea and vomiting, reactive hypertension, and umbilical arterial blood pH. Fisher's exact test and Student's t-test were used for analysis.

Results and Discussion: Four of the 200 patients assessed for eligibility declined participation in this study, so 105 randomized to the esCCO group and 91 to the control group. Hemodynamic data for the primary outcome analysis were available from 102 subjects in the esCCO group and 89 in the control group. The incidence of hypotension was 44/89 (49%) in the control group and 20/102 (19%) in the intervention group ($P<0.01$). The incidences of nausea and vomiting, reactive hypertension, and umbilical arterial blood pH did not differ between the groups.

Conclusion(s): Estimated continuous cardiac output-guided prophylactic vasopressor therapy effectively prevented hypotension following spinal anesthesia for cesarean section.

04AP03-07
Role of overactive bladder diagnosis in predicting the risk of post-spinal hypotension during elective cesarean section operations

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Background and Goal of Study: Post-spinal hypotension occurs in 55-90% of cesarean section cases with maternal and fetal complications and its prediction facilitates decision-making and early intervention. Overactive bladder (OAB) is caused by impaired coordination and imbalance between sympathetic and parasympathetic nervous systems which play a central role in maintaining hemodynamics as well. Up to date, OAB has not been used to predict risk of post-spinal hypotension in cesarean section operations.

The goal of this study is to determine if OAB could predict post-spinal hypotension in women undergoing elective cesarean section. We hypothesized that, OAB would not be a predictive factor for post-spinal hypotension.

Materials and Methods: This randomised prospective, triple-blind study was carried out on primigravida women planned for elective cesarean section under spinal-epidural anaesthesia in Atatürk University Research Hospital. Although urodynamic tests provide certain diagnosis of OAB, they are invasive and not cost-effective[1], therefore OAB was diagnosed using the OAB-V8 scoring form in Turkish. Noninvasive uroflowmeter was used to exclude patients with urinary obstructions. Patients with overactive bladder were included in Group 1, and the others in Group 2.

Following Power Analysis by PAS software, 143 patients were included. Statistical analysis was completed by IBM SPSS 20 software. Continuous variables of normal distribution were analysed with Shapiro Wilk-W and Kolmogorov Simirnov tests.

Independent Samples t-test was used comparing two independent groups with normal distribution, and Mann Whitney u test was used in case of skewed distribution. Comparing cathegorical parameters, Pearson Chi-square test, Chi-Square Yates test and Fisher's Exact test were used. $p<0,05$ was considered as statistically significant.

Results and Discussion: There was no statistically significant difference between groups in terms of demographic values ($p>0,05$). Hypotension was observed in 39,9% of patients in the study group. In Group I, hypotension occured statistically higher than Group II ($p=0.041$).

OAB diagnosis with scoring test was found to have 68% of sensitivity and 49% of specifity for predicting risk of hypotension.

Conclusion(s): Risk of post-spinal hypotension is higher in patients diagnosed with OAB, and scoring for diagnosis can be a practical predictor for post-spinal hypotension.

Reference:

1. Lightner DJ, Gomelsky A, Souter L et al: Diagnosis and treatment of overactive bladder (non-neurogenic) in adults: AUA/SUFU Guideline amendment 2019. J Urol 2019; 202: 558.

04AP03-08
The influence of epidural analgesia on systolic blood pressure, obstetrical and neonatal outcomes of pregnant women with cardiovascular disease

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Background and Goal of Study: The frequency of cardiac disease in pregnancy varies from 1% to 4%, and the number is increasing in the western world. More women delay childbearing age to later reproductive years when ischemic cardiac disease and cardiovascular risk factors are more prevalent. Therefore, the administration of epidural analgesia in hemodynamically compromised parturient is frequent in the daily practice of an anesthesiologist.
Our objective was to evaluate the effect of epidural analgesia on systolic blood pressure, obstetrical and neonatal outcomes during delivery of women with cardiovascular disease (CVD).
Materials and Methods: A retrospective study of 112 women with CVD that gave birth at the Hospital of Lithuanian University of Health Sciences Kaunas Clinics from 2017 to 2020 was performed. The following data were analyzed: age, gestational age, CVD, first recorded systolic blood pressure (sBP), the maximal recorded sBP, obstetrical outcomes (spontaneous vaginal delivery rate, blood loss), neonatal outcomes (Apgar score and pH of umbilical cord). Patients were divided into two groups: epidural group (E) and no-epidural group (NE).
Quantitative variables were described as mean±standard deviation or median (interquartile range). Differences between the groups were analyzed using $\chi 2$ test of independence, Student's t and Mann Whitney's U tests and considered statistically significant when $p<0.05$.
Results and Discussion: The mean age was 28.6±5.5 years old and gestational age 39 (2) weeks. The most common CVD was valvular heart disease n=54 (48.2%). There were 50 (44.6%) cases in the E group and 62 (55.4%) in the NE group.
There was no significant difference in the first recorded sBP between E and NE group (123.5 (15.25) mmHg and 123.5 (13) mmHg respectively; p=0.35).
The maximal sBP was significantly lower in the E group compared with NE group (124.56±12.58 mmHg and 129.87±12.22 mmHg respectively; p=0.026). Maternal blood loss and spontaneous vaginal birth rate did not differ between groups, $\chi 2=2.573$, p=0.276 and $\chi 2=1.033$, p=0.309, respectively.
Apgar's score at 1 min did not differ between the E and NE group (9 (1) and 9 (1) score respectively, p=0.619). The pH was not significantly different in the E (n=19) and NE (n=15) group (7.29 (0.139) and 7.24 (0.197) respectively; p=0.52).
Conclusion(s): The maximal sBP during labour was lower in the E group. There were no other significant differences between obstetrical or neonatal outcomes.

04AP03-09
Impressions of the NRFit spinal and epidural needles after introduction at a medium sized district general hospital

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Background and Goal of Study: In April 2021, the NRFit epidural and spinal needles were introduced at a 750 bedded DGH, for use primarily in the delivery suite. Following introduction of the new equipment, a qualitative survey regarding the needles and kits they were presented in was carried out to gather the initial impression of the new equipment among the anaesthetic department.
After the first survey, a second survey was taken a year following to gauge sentiment regarding the quality of the NRFit needles.
Materials and Methods: An online survey was created consisting of 16 questions asking about the grade of clinician, the use of the needles, and the quality of the needles and kits they were presented in. The questions consisted of closed questions or statements requiring clinicians to tick a box agreeing or disagreeing with the statement/question; additionally, dialogue boxes provided an opportunity for clinicians to use free text to describe any issues or praise of the needles and kits.
Results and Discussion: Notably, between the first and second survey, the overall satisfaction and ease of use appeared to improve. With initial comments mentioning that there was difficulty in discerning tissue layers when penetrating with the spinal needle, and similar comments made regarding the epidural needle. However, in the second survey, there were no mentions of this at all.
Comments that run through both surveys, appear to be problems with the rest of the spinal/epidural kits, such as catheter mounts not being included and difficulty threating the catheter into the filter.
Conclusion(s): It appears that through experience of use of new equipment and the training of junior staff, that overall impressions of the NRFit needles improved. With familiarity of the equipment and the ingenuity to work with the kits, the overall satisfaction of the quality of the components improved over time.

04AP04-01
Perioperative management of caesarean delivery in a parturient with mitochondrial myopathy

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Background: Mitochondrial myopathies comprise of a group of neuromuscular disorders induced by dysfunctional mitochondrial respiratory chain that disrupts energy production. Incidence of known pathogenic mitochondrial DNA mutations is 1 in 500.[1]
We report a case with mitochondrial myopathy presenting for emergency caesarean delivery and discuss anaesthetic implications**.** Our case was atypical because she was 5th gravida with previous normal pregnancies.
Case report: A 27-year-old, multigravida, 37-week gestation presented to casualty in labour with complaints of fatigue and weakness in lower limbs. Patient gave history of similar complaints in the

past and investigated to reveal raised CPK-NAC levels and muscle biopsy suggestive of mitochondrial myopathy. She took multivitamins, coenzyme Q10. Had 2 uneventful normal vaginal deliveries and 2 stillbirths. Patient was unable to maintain lithotomy position and was planned for caesarean. Patient had muscle power of 3/5 in lower limbs with haemoglobin of 8.9 gm% and serum lactate 3.6 mmol/L. Spinal anaesthesia was administered with ropivacaine. Warm intravenous fluids and electrical heating blanket was used to prevent hypothermia. Patient was shifted to postoperative ward and carefully monitored for signs of respiratory distress/ muscle weakness progression and was discharged after 3 days.

Discussion: A parturient with mitochondrial disease presents a challenge for anaesthesiologists because little is known about the relationship between them. There are case reports of women who developed worsening of symptoms during pregnancy; and concluded that pregnancy can aggravate mitochondrial disease.[2]

Another study described a case who, after cesarean developed severe postpartum haemorrhage.[3]

The diagnosis can be considered even if the patient had previous uneventful pregnancies, as seen in our patient. The optimal anaesthetic technique for these patients is unknown. We decided to administer spinal anaesthesia as it ameliorates metabolic stress and pain. General anaesthetics were avoided as can cause postoperative residual muscle blockade and respiratory compromise.

Reference:

1. RE Say et al 2.Kovilam et al 3. Dessole et al

Learning points: Mitochondrial disease are likely to experience a variable clinical course before, during and after pregnancy and multidisciplinary care is indicated. Anaesthesiologists should be aware of the disease, varied presentation and anaesthetic implications.

04AP04-02
Case report of Arnold Chiari malformation with syringomyelia and the anesthetic management for delivery

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Background: The Chiari malformation (CM) is described as the pathological ectopy of the cerebellar tonsils below the foramen magnum. Syringomyelia is a cyst in which cerebrospinal fluid is retained in spinal cord. The anesthetic management of these patients has to be planned, especially in pregnant women.

Case report: A 31-year-old primiparous woman, ASA II, IMC 23kg/m^2 without difficult airway stigmas was proposed for elective cesarean section. She had a CM type 1 with syringomyelia diagnosed during pregnancy due to occipital headache, paresthesia and thermoalgic sensitivity alterations of the 2nd to 4th fingers on both hands. She was taking folic acid. In the operating room, she was hemodynamically stable and eupneic on room air.

General anesthesia was proposed and accepted. For the induction, we used propofol, lidocaine and rocuronium, ensuring orotracheal intubation under direct laryngoscopy. Sevoflurane and remifentanil infusion were used for anesthetic maintenance.

After birth, paracetamol, parecoxib and tramadol were administered intravenously and a bilateral ultrasound-guided tranversus abdominis plane block was performed. Neuromuscular blockade was reversed with sugammadex.

The postoperative course was uneventful, with no neurological deterioration. The patient was discharged on the second postoperative day.

Discussion: The decision between general and regional anesthesia in patients with MC is still not consensual. Neuraxial anesthesia has the theoretical risk of herniation. The low rate of dura perforation in these patients does not guarantee the safety of the technique. General anesthesia requires airway management and careful choice of drugs. In vaginal delivery, the Valsalva maneuver can increase intracranial pressure.

If symptoms got worse during pregnancy or surgical correction was not done, scheduled cesarean section is the safest option. In a retrospective review, no difference was identified in clinical severity with vaginal delivery or cesarean section, as well as no difference was identified between general and regional anesthesia in terms of evolution of symptoms or functional deterioration.

In this clinical case, we present a safe and effective anesthetic possibility, associated with a successful postoperative pain control with multimodal analgesia.

Points of Interest: More studies are needed to understand whether neuraxial techniques in patients with CM are safe. Thus far, general anesthesia remains the safer option.

04AP04-03
General anesthesia in pregnant woman with Arnold Chiari malformation type I. A case report

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Background: The cesarean section can be carried out under general or neuraxial anesthesia. General anesthesia has been relegated but, there are situations in which its use is highly recommended.

Arnold-Chiari malformation is characterized by prolapse of the cerebellum below the foramen magnum, it causes increased pressure in the head and decreased pressure in the medullary canal. Type I is frequently diagnosed in adults[1 2].

Case report: 38-year-old pregnant woman scheduled for cesarean section. The woman suffered from a type I Arnold Chiari malformation. After being evaluated by a multidisciplinary team formed with neurosurgeons, anesthesiologists, obstetricians and pediatricians, it was decided to finish her pregnancy at week 39 and carried out in cesarean section under general anesthesia.

The patient arrived in the operating room, she was monitored and pre-oxygenated. Cefazolin and metoclopramide were administered. A rapid sequence induction was executed with propofol (3 mg/kg) and rocuronium (1.2 mg/kg). After cord clamping, carbetocin (100 mcg) and fentanyl (2 mcg/kg), dexketoprofen, acetaminophen and morphine were administered.

At the end of the intervention, an abdominal wall block was performed and neuromuscular block was reversed with sugammadex. The child had an APGAR score of 7 at first minute and an APGAR score of 8 at fifth minute.

Discussion: There are no firm recommendations about the Arnold Chiari malformation best anesthetic technique in pregnant women. A complete neurologic evaluation, including MRI, should be performed. The goal of anesthesia and peripartum care is to prevent increased intracranial pressure.

References:
1. Sicuranza G.B., Steinberg P., Figueroa R.: Arnold-Chiari malformation in a pregnant woman. Obstet Gynecol 2003; 102: pp. 1191-1194
2. Penney D.J., Smallman J.M.: Arnold-Chiari malformation and pregnancy. Int J Obstet Anesth 2001; 10: pp. 139-141
3. Paéz L., Navarro V.J.R. Anestesia regional vs general para la intervención de cesárea. Revista Colombiana de Anestesiología 2012; 40 (3): pp. 203-206
Learning points: Although neuraxial anesthesia seems more and more widespread to carry out urgent caesarean sections, the indication of general anesthesia is necessary in some cases [3].
Arnold Chiari malformation is a rare disease with potential morbidity. Decision-making must be multidisciplinary and include a specialist in maternal-fetal medicine, a neurosurgeon, and an anesthetist.

04AP04-04
When David meets Goliath: obstetric anaesthesia in the presence of a SOL

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Background: The anesthetic approach of the pregnant woman with SOL requires a modification of the neuroanesthesia and obstetric anesthesia practices, whose clinical principles are sometimes conflicting.
Furthermore, there is no evidence-based consensus, which means that the decision-making process of such challenging patients relies on a limited compendium of case reports.
Case report: A 35-year-old, 35-week gestational age woman, ASA II, presented with a SOL with a midline left shift of 8 mm, suspicious of meningioma. A multidisciplinary team planned a preterm caesarean delivery. We opted for TIVA under standard ASA and invasive blood pressure monitoring. RSI was adapted to include Lidocaine, Esmolol and Rocuronium and the airway was secured after videolaryngoscopy. Levetiracetam was administered as seizure prophylaxis and Dexametasona was used to prevent cerebral edema.
At the end of the surgery, an ultrasound-guided TAP block was performed. Haemodynamic stability was maintained during the caesarean and extubation was uneventful. Two days after, the patient underwent embolization and exeresis of the intracranial mass.
Discussion: Given the rarity of cerebral neoplasms in pregnancy, case reports represent a valuable source of knowledge and experience. Meningioma is the most common intracranial primary malignancy and its growth is faster in pregnancy due to the presence of estrogen and progesterone receptors. Acute neurologic deterioration mandates resection; it is preferred to postpone to the postpartum period in order to enable tumoral retraction.
Even though there are well-established strategies for maintenance of a normal-range intracranial pressure in the general population, that is not true in pregnancy. Meticulous haemodynamic control and avoidance of drug-induced disrupted cerebral compliance are to be prioritized. No deleterious manifestations were observed from the direct effect of uterotonic drugs.
References:
Wang LP, Paech MJ. Neuroanesthesia for the pregnant woman. Anesth Analg. 2008 Jul;107(1):193-200. doi: 10.1213/ane.0b013e31816c8888. Smith IF, Skelton V. An unusual intracranial tumour presenting in pregnancy. Int J Obstet Anesth. 2007 Jan;16(1):82-5. doi: 10.1016/j.ijoa.2006.04.016.
Learning points: We add to the literature a successful report on the approach to the parturient with SOL. The presence of intracranial hypertension or obstruction to the LCR outflow contraindicates neuraxial techniques.

04AP04-05
Cesarean section of a chiari malformation parturient

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Background: The safest mode of delivery and anesthetic management for parturients with Arnold Chiari malformation (ACM) remains controversial. ACM are anomalies associated with herniation of cerebellum.
Contractions during labor are associated with increases in cerebrospinal fluid (CSF) pressure, which in turn can be exacerbated by pain. Neuraxial anesthesia (NA) was concerned to be a possible cause of neurologic deterioration from tonsillar herniation.[1]
Case report: A 39-year-old primiparous woman, ASA III (obesity BMI 37kg/m^2 and ACM type II), 39 weeks of gestation, was admitted for an elective cesarean section due to maternal disease. In anesthetic evaluation there was no increased ICP or signs of difficult airway. Consent to general anesthesia (GA) was obtained.
Following adequate ASA monitoring with TOF, BIS™ and urine output, and a period of pre-oxygenation, a rapid sequence induction was performed for GA. It was administered 2mg/kg propofol and 1,2mg/kg rocuronium. Airway was carefully secured through direct laryngoscopy and endotracheal intubation occurred with no difficulties.
Maintenance of anesthesia was followed by sevoflurane. Cesarean section proceeded uneventfully. Intravenous multimodal analgesia was initiated intraoperatively and follow-up was continued by Acute Pain Service. Emergence of anesthesia occurred smoothly with prudent care during extubation.
Discussion: An unintentional dural puncture or perhaps even an uncomplicated spinal anesthetic might produce a CSF pressure gradient between brain and spinal cord with resultant cerebral herniation. In the other hand, general anesthesia with laryngoscopy and tracheal intubation may also increase ICP or the CSF pressure gradient.
Studies suggest that anesthetic complications occur infrequently in patients with ACM regardless of the anesthetic management.[1]
Therefore, NA is a viable anesthetic option except parturients with hydrocephalus and papilledema who have high risk for both vaginal delivery and NA.[1]
Although institutional preference in anesthetic and obstetric care appears to drive patient management, the findings advocate that an individualized approach has favorable outcomes in this population.
Reference:
1. Waters, et.al. Management of Anesthesia and Delivery in Women With Chiari I Malformations. Obstetrics & Gynecology: 11/2018 - Volume 132 - Issue 5
Learning points: GA involves a specific management for parturients with ACM, yet no absolute contraindication is attributed to NA.

04AP04-06
Spinal anesthesia for fetal tracheal occlusion by fetoscopic approach. Case Report

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Background: Congenital diaphragmatic hernia (CDH) occurs in 1–5/10,000 live births. Fetal tracheal occlusion (FETO), positioning a latex balloon endoscopically, increases airway pressure, stimulates pulmonary proliferation, alveolar airspace and promotes pulmonary vascular development, increasing postnatal survival. Best anesthesia techniques for FETO procedures are not yet defined for the mother and fetus.
Case report: 31 y/o woman, ASA II, 70 kg, BMI 27.33, gravid seventh with four first-trimester spontaneous abortions, a healthy 3 y/o son, another neonatal death with prenatal diagnosis of CDH, and a current 28 weeks pregnancy complicated with left CDH.
Fetal ultrasound showed a severe left CDH, O/E LHR 25%, with stomach, bowel and liver in the thorax. MRI reported a total fetal lung volume of 21%. Indomethacin was administered 12 hs before FETO.
After premedication with intravenous clonidine (75 mcg), spinal anesthesia was performed with hyperbaric bupivacaine (7.5mg) and fentanyl (15mcg) using 26G pencil point needle.
Continuous intravenous infusion of phenylephrine was started (0.5mcg/kg/min). Fetal anesthesia and immobilization were performed by administration of fentanyl, atropine and vecuronium to the fetus. FETO was performed without maternal or fetal complications.

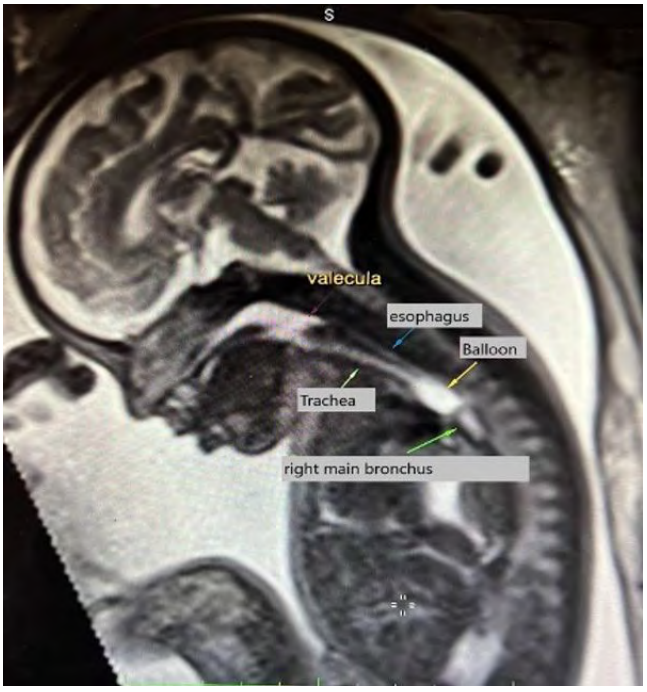

Figure.

Discussion: Although FETO can be safely performed with local anesthesia and fetus anesthesia, many centers prefer regional techniques.[1]
Procedures performed under maternal anesthesia were more effective than maternal-fetal anesthesia, showing a higher rate of fetal death and premature rupture of membranes.[2]
Fetal immobilization could be achieved when remifentanil is administered for mild maternal sedation, due to placental crossing. This should be further explored.
References:
1. Van De Velde, M. et al. Fetal Anaesthesia: is this necessary for fetoscopic therapy?
2. Duci, M. et al. Anesthesia for fetal operative procedures: A systematic review. Front Pain Res (Lausanne) 3, 935427 (2022).
Learning points: Spinal anesthesia combined with fetus immobilization for FETO procedures showed to be an effective choice. Epidural or combined spinal-epidural techniques should also be considered.

04AP04-07
High spinal block in cesarean section after incomplete spinal block with epidural

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Background: Neuraxial block is the pain relief technique of choice in vaginal delivery and cesarean section. Epidural block is highly accepted, but has an error rate that varies between 1.5-20% depending on the physician experience.
Case Report: We present a 25-year-old pregnant woman with factor V Leiden disease who attended the hospital for labor. Epidural catheter was placed at L2-L3. Failure in analgesia after 6 hours because of catheter coming out led to a second epidural puncture. The patient reported pain relief, but after 4 hours pain started on the right side without improving after withdrawing the catheter 1 cm. A third epidural puncture was performed at L3-L4.
Two hours later, bilateral pain appeared. A total of 5 bolus of 50 mg of 1% lidocaine and 2 bolus of 12.5 mg of 0.25% levobupivacaine were administered.
After 24 hours of dilation and incomplete epidural block, a cesarean section was performed due to non-progressive labor. Intradural puncture with hyperbaric bupivacaine 0.5% (8 mg) + sufentanil (0.5 mcg) was performed.
After a few minutes, she reported drowsiness, tingling in the hands and difficulty speaking and breathing.
Despite not presenting desaturation or hypotension, rapid sequence intubation was done. During the surgical procedure, she maintained heart rates of 100-120 bpm, sinus rhythm and normal blood pressure. The patient recovered spontaneous breathing in the operating room after reversing neuromuscular blockade and was extubated without incidents.
She mobilized all extremities and answered questions coherently. She was transferred to the intensive care unit for close monitoring and discharged the next day.
Discussion: Spinal block is a rare but serious complication of neuraxial anesthesia. The reason could be the reduction in the subarachnoid space due to high anesthetic volume in the epidural space.
Thus, epidural bolus 30 min before dural puncture is not recommended.
Lower dose of intrathecal anesthetics should be used when a high dose of epidural anesthetic has been administered and place the patient in the anti-Trendelenburg position(1).

Reference:
1. P. Dadarkar et al. Spinal anesthesia for cesarean section following inadequate labor epidural analgesia: a retrospective audit, International Journal of Obstetric Anesthesia, Volume 13, Issue 4, 2004
Learning Points: The rate of serious complications with neuraxial anesthesia is low, but we must know those complications that imply a risk to the lives of our patients.

04AP04-08
Anesthesia for emergent cesarean in pregnant woman with acute liver failure

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Background: Liver failure during pregnancy can affect both the mother and the fetus negatively. It ranges from minimal symptoms in the mother to death. The morbidity usually presents with coagulopathy, hypoglycemia, renal insufficiency and encephalopathy in patients without pre-existing liver disease.
Case Report: A 33 years-old 32 weeks pregnant was admitted in the obstetric emergency room with episodes of nausea and vomiting for one week and jaundiced sclera since the previous day. She denied choluria and acholia. The patient had been taking amoxicillin with clavulanic acid for acute otitis for a week. The blood analysis showed a pattern of cytocholestasis and coagulopathy.
The patient was admitted with hepatitis with unknown etiology and fluidotherapy and dexamethasone for fetal pulmonary maturation was initiated. Serologies came positive for IgM Hepatitis A antibody. Complete coagulation study showed hypofibrinogenemia and deficit of factors VII, IX, X and XISix days after she started to become prostrated with worsening of the coagulopathy and liver function, so cesarean section was decided.
Thirty minutes before surgery were administered 10 milligrams (mg) of phytomenadione, 2 grams (g) of fibrinogen and 500 units of prothrombin complex. A general balanced anesthesia was made with 140mg of propofol and 80mg of succinylcholine during induction. Maintenance was made with sevoflurane 1%, 0.2mg of fentanyl and 25mg of atracurium. Reversion of neuromuscular blockade was made with neostigmine 1mg and 0,5mg of atropine.
Post-operative analgesia was performed with fentanyl patient-controlled analgesia. No complications were registered, and the patient was admitted in a PACU for 2 hours before admission in an intermediate care unit.
Discussion and Learning Points: Concerns with coagulopathy, hemodynamic instability and hepatic failure should be taken into consideration. Regional anesthesia is contraindicated due to the inherent coagulopathy associated with liver failure. The hepatic metabolism of drugs may be altered whereby choice of drugs for anesthesia and post-operative analgesia should be cautious. A multidisciplinary approach between anesthesia, obstetrics and immunotherapy services is fundamental.
References:
Pandey CK, et al. Acute liver failure in pregnancy: Challenges and management. Indian J Anaesth. 2015
Casey LC, et al. Acute Liver Failure Study Group. Acute Liver Failure (ALF) in Pregnancy: How Much Is Pregnancy Related? Hepatology. 2020

04AP04-09
Preeclampsia & HELLP syndrome in a Jehovah's witness twin pregnancy: a true combination of anaesthesiologic risk factors

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Background: Preeclampsia is a progressive multisystemic disorder characterized by a vascular endothelial malfunction with hypertension and proteinuria or hypertension and organ failure. HELLP syndrome (haemolysis, elevated liver enzymes, low platelet levels) represents a life-threatening condition in which haemolysis, high liver enzymes and thrombocytopenia are predominant main features. Jehovah's witness religion is well-know for their refusal to receive blood transfusions.[1,2]
Case report: The patient is a 32-year-old primigravida with twin pregnancy at 36 weeks of gestation. Pathological antecedents of moderate aortic stenosis and hypertension ASA IV. Important personal background information is the fact the patient is a Jehovah´s witness.
Admitted with a severe case of preeclampsia / HELLP syndrome for an emergency caesarean delivery under general anaesthesia. A standard ASA monitorization was applied with invasive arterial blood pressure control prior to anaesthesia induction, maintained with a remifentanil and labetalol perfusion. The surgical procedure underwent without immediate complications.
Patient was shifted to post-anaesthesia care unit (PACU). In this unit the patient starts with postpartum haemorrhage due to uterine atony. A sulprostone perfusion is initiated, 2gr of tranexamic acid IV and intravaginal misoprostol are given and an intra-uterine balloon tamponade performed. The haemorrhage is successfully controlled and patient discharged.
Discussion: Severe preeclampsia and HELLP syndrome present high levels of morbidity and mortality. This case report cause anaesthesiologists to leave their comfort zone in terms of the best approach for obstetrical emergencies. In relation to preeclampsia a hemodynamical optimized control of the patient is necessary.
In this case a uterine atony in a Jehovah's witness with blood transfusion refusal a quick and effective approach is necessary to decrease blood loss.
Remifentanil is an effective available drug for intra-operatory blood pressure control with minimal adverse effects for the foetus and good hemodynamical control in pregnancies with preeclampsia/ HELLP syndrome under general surgery.
References:
1. Scott H, Bateman C, Price M.Anaesthesia. 1998 Jul;53(7):695-7. doi: 10.1046/j.1365-2044.1998.490-az0564.x.
2. Van de Velde M.Curr Opin Anaesthesiol. 2016 Jun;29(3):257-60. doi: 10.1097/ACO.0000000000000334.
Learning points: Preeclampsia , Jehovah´s witness

04AP04-10
Thoughts on past medical history of spontaneous spinal epidural hematoma and C-section: general anaesthesia for life?

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Background: Spontaneous spinal epidural hematoma (SSEH) is a rare pathologic entity, with only scattered case reports and associated reviews. A predisposition to bleeding and minor trauma are two of the poorly understood risk factors. Its clinical features can go from MRI findings to signs of spinal cord compression (1).
In this work we report the anesthetic management of a pregnant woman with past medical history (PMH) of SSEH submitted to a c-section.
Case Report: A 31 year old woman 37 weeks pregnant woman was proposed for an urgent c-section due to fetal stress and PMH of SSEH. Five years before, during her first pregnancy, she developed SSEH, manifested as sudden paraplegia. She underwent prompt surgical decompression with almost complete functional recovery, developing neurogenic bladder afterwards. To her first child labour, not only was vaginal delivery contraindicated due to risk of rupture of a potential arteriovenous malformation with Valsalva maneuvers, but also neuraxial anaesthesia (NA) due to risk of accidental injury to blood vessels. An uneventful elective c-section was performed under general anaesthesia (GA). Afterwards, she was studied for possible hemorrhagic disorders, vascular malformation or previous history of trauma, with no causal factor identified.
For the present delivery, although there were no clinical findings, we performed a GA with rapid sequence induction and maintenance with sevoflurane. Analgesia was ensured with ropivacaine wound infiltration, iv fentanyl, paracetamol and ketorolac. The procedure was uneventful.
Discussion: NA is the technique of choice for cesarean delivery. However, one should balance risks and benefits of NA versus GA. There is a potentially small risk of developing spinal hematoma after NA, but will it outweight the disadvantages of performing GA in the obstetric population?
More research is needed in order to understand if NA increases the risk of SSEH relapse. Under the absence of evidence based practices, we agreed upon GA for this case anesthetic management.
Reference:
1. Vastani, Amisha et al. "Risk Factor Analysis and Surgical Outcomes of Acute Spontaneous Spinal Subdural Hematoma. An Institutional Experience of Four Cases and Literature Review." World neurosurgery vol. 146 (2021): e384-e397.
Learning Points: We add to the literature a report of woman with a rare PMH of SSEH submitted to a c-section. We draw attention to the need of research in order to take evidence based decisions.

04AP05-02
'Walking epidural': comparison of the analgesic efficacy of levobupivacaine 0.0625% + fentanyl 2mcg/mL versus ropivacaine 0.075% + fentanyl 2mcg/mL in laboring patients, a prospective observational study

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Background: Epidural infusion with low local anesthetic concentrations with opiates decrease the severity of the motor blockade associated [1].
The present study aims to compare the analgesic efficacy and the motor blockade between two local anesthetic epidural infusions: levobupivacaine 0.0625% + fentanyl 2mcg/mL versus ropivacaine 0.075% + fentanyl 2mcg/mL.
Materials and Methods: In a simple blind cohort study, 60 laboring patients were included: 30 received epidural levobupivacaine 0.0625% + fentanyl 2mcg/mL and 30 of them received ropivacaine 0.075% + fentanyl 2mcg/mL (Table 1). Analgesic, motor blockade and satisfaction records were collected as well as maternal and neonate adverse events.

	Ropivacaine group	Levobupivacaine group	P-value
Patients (n)	30	30	-
Age (years)	30 [32-37]	30 [31-38]	*P* = 0.48
Tall (cm)	166.3	164.3	*P* = 0.38
Weight (kg)	69.1	68.8	*P* = 0.83
Cervix dilation at epidural administration (cm)	3 [2-3]	3 [3-3]	*P* = 0.23
Primiparous (%)	45	58	*P* = 0.37
Sensory level 30 mins after epidural administration	T10 [T9 – T10]	T10 [T9-T10]	*P* = 0.71
Deambulation time (mins)	63 [34 – 92]	66 [26 - 102]	*P* = 0.88

Table 1. Basal characteristics of the patient included in the present study.

Results and Discussion: After 2 hours, patients who received levobupivacaine showed a mean VAS of 3.2 [1.8 to 4.6] versus 1.8 [1.2 to 2.5] (P = 0.05) in patients who received ropivacaine. Patients who received levobupivacaine showed a punctuation in Bromage scale of 1.0 [0.0 to 1.0] versus 0.0 [0.0 to 0.0] (P = 0.01) in patients who received ropivacaine. Levobupivacaine group required a mean ratio of rescue bolus of 0.6 bolus per hour [0.3 - 1] versus 0.3 bolus per hour [0.2 to 0.4] (P = 0.05) in the ropivacaine group. Levobupivacaine group scored a mean satisfaction index of 8.1 [7.3 to 8.9] versus 9.3 [8.7 to 9.8] (P = 0.02) in those who received ropivacaine. We did not register maternal nor neonate adverse events.
Conclusion(s): Both infusions (levobupivacaine 0.0625% + fentanyl 2mcg/mL and ropivacaine 0.075% + fentanyl 2mcg/mL) are safe and effective for labor analgesia.
However, ropivacaine would present a better pharmacodynamic profile with less motor blockade and decreased need for analgesic rescue hence improving patient's satisfaction.

Reference:
1. Lee BB, et al. Epidural infusions for labor analgesia: a comparison of 0.2% ropivacaine, 0.1% ropivacaine, and 0.1% ropivacaine with fentanyl. Reg Anesth Pain Med. 2002; J27(1): 31-6.

04AP05-03
Comparing patients' experience of post-operative pain following Caesarean section, according to the choice of intrathecal opioid: change in local anaesthetic practice due to diamorphine supply shortage

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Background and Goal of Study: Caesarean section (C-section) is associated with moderate-severe postoperative pain. It is often under-treated and impacts recovery and maternal bonding. The PROSPECT guideline recommends intrathecal morphine or diamorphine and to start regular simple analgesia from delivery. Diamorphine is advised in the UK but there have been national supply shortages. This forced a change in practice at our hospital to preserve supply for emergency cases.
The **goal of the study** was to asses if the choice of intrathecal opioid - diamorphine vs morphine plus fentanyl - affected severity and onset of postoperative pain following any category C-section.
Secondary aims were to observe planned and breakthrough analgesia given in these two groups, postoperative prescribing of analgesia and its successful delivery to women in the first 24 hours.
Materials and Methods: A survey was completed for 53 consecutive patients at two time points:
1. In theatre and;
2. During their routine 24-hour follow-up, to assess pain.
Pain scores were adapted from the Brief Pain Inventory (Short Form) on a scale of 1-10. Prescriptions and anaesthetic charts were reviewed. A two-sample t-test was used to analyse pain scores and other results compared.
Results and Discussion: There was no significant difference in the mean worst, least and average pain scores between the diamorphine (n=28) and fentanyl+morphine (n=25) groups, nor time to onset of pain postoperatively. Pain scores were significant in both.

Indicator	Diamorphine (95% CI)	Fentanyl + Morphine (95% CI)	Difference in mean *(95% CI)*	P-value
Worst pain	**6.53** *(5.69 – 7.38)*	**6.56** *(5.77 – 7.34)*	0.024 *(-1.10 –1.15)*	**0.97**
Average pain	**4.86** *(4.01 – 5.70)*	**5.32** *(4.51 – 6.13)*	0.463 (-0.687 – 1.61)	**0.42**
Least pain	**3.43** *(2.61 – 4.25)*	**3.64** *(2.80 – 4.48)*	0.211 *(-0.938 – 1.36)*	**0.71**
Time to onset of pain after surgical closure (hours)	**6.91** (4.90 – 8.93)	**8.72** (6.30 – 11.13)	1.81 (-1.23 – 4.84)	**0.23**

Intraoperative breakthrough analgesia (11% vs 8%) and planned analgesia decisions were similar. Postoperative regular (≥1 dose) paracetamol and dihydrocodeine was prescribed and given to >90% patients, but less for NSAIDs (79% prescribed, of those 60% given).

Conclusion: These results give confidence to use of intrathecal morphine plus fentanyl. Importantly, the majority of women surveyed had significant postoperative pain and merits vigilance in giving multimodal analgesia.

04AP05-04
Controlled infusion of profilactic oxytocin dose during ceasarean section

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Background and Goal of Study: Postpartum haemorrhage (PPH) is the top cause of maternal mortality, accounting for nearly a quarter of parturient deaths worldwide. The main reason for PPH is uterine atony, therefore increasing the routine use of uterotonic agents for all women during delivery should help to reduce the PPH- determining morbidity and mortality. The administration of exogenous oxytocin is the most typical method because it is thought that additional oxytocin further stimulates uterine contractility.
This study investigates if there is a difference between oxytocin injection routes during caesarean section. Our hypothesis is that oxytocin delivered via an automatic injection pump (AIS) is the more accurate way and even smaller doses can be more effective.
Materials and Methods: The local ethics committee approved this prospective controlled trial. AKL infused with 500 ml of crystalloids (n=10) and others received 5 units of oxytocin through an automatic injection pump (AIS) per 10 minutes (n=10). Data were analyzed with SPSS. P level< 0.05 was considered significant.
Results and Discussion: The total dose of oxytocin was 2.5 times lower in the AIS group (15 ± 5.7 IU and 6 ± 2.1 IU respectively, p<0.001). The need for additional oxytocin dose was higher in the infusion group (n = 8 respectively n = 2, p = 0.023,).
The more significant amount of blood loss (1280 ± 181.353 and 460 ± 54.64 respectively, p<0.001) and need for intravenous fluid (2300 ± 258.19 and 2000 ± 0 respectively, p <0.023) were observed in the infusion group.
There were no differences in heart rate or peripheral oxygen saturation between the groups, but changes in systolic and diastolic blood pressure are more affected by oxytocin infusion. It is easier to know the injected dose when AIS is used, and the even infusion of the uterotonic drug may be a key to more accurate uterine tonus control.
Conclusion(s): The initial prophylactic dose of oxytocin is lower when it is delivered by an automatic syringe pump.

04AP05-05
Influential factors of ropivacaine consumption in patient-controlled epidural analgesia for labor

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Background and Goal of Study: The analgesic requirement of patient-controlled epidural analgesia (PCEA) for labor pain varies substantially between individuals.
This study sought to evaluate potential influential factors for ropivacaine consumption of PCEA in labor.
Materials and Methods: Women receiving PCEA for their first delivery at a tertiary center from January 2020 to November 2022 were included. The exclusion criteria were age <18 years, missing data, ineffective PCEA, and no continuous epidural infusion.
The primary outcome was total ropivacaine dosage of PCEA during labor. Logarithmic transformation was used to decrease the skewness of total ropivacaine dosage.
Stepwise multivariable linear regression models were used to calculate the regression coefficient (beta) and 95% confidence interval (CI) for independent factors of the study outcome.
Results and Discussion: A total of 819 patients were evaluated. Stepwise regression analyses identified seven independent factors for PCEA ropivacaine consumption, including body mass index (beta: 0.012; 95% CI: 0.005, 0.018), hypertension (beta: 0.228; 95% CI: 0.055, 0.400), parity (beta: -0.123; 95% CI: -0.167, -0.079), cervix dilatation (beta: -0.086; 95% CI: -0.103, -0.068), fetal station (beta: -0.046; 95% CI: -0.083, -0.010), ropivacaine concentration (beta: 4.100; 95% CI: 2.555, 5.644), and basal dose (beta: 0.045; 95% CI: 0.024, 0.065).
Conclusion(s): Patient factors, analgesic regimen, and PCEA infusion settings jointly affected the consumption of ropivacaine. These findings provide an implication for individualized and precision pain control for labor.

04AP05-07
Effectiveness of intravenous crystalloid coload plus ephedrine to prevent post-spinal hypotension in parturient undergoing elective cesarean section

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Background and Goal of Study: Hypotension is the most common complication after spinal anesthesia (SA) in parturients undergoing elective cesarean section (CS). We aimed to assess the effectiveness of intravenous crystalloid plus ephedrine to reduce the incidence of post-spinal hypotension in parturient undergoing CS.
Materials and Methods: The study was a prospective, triple-blinded, randomized, controlled trial. Hundred parturients undergoing elective CS under SA were randomized into two groups. Group E received the coload of 1,000 ml of Ringer's lactate solution (RLS) plus ephedrine 10 mg (2ml) and group C received the coload of 1,000 ml of RLS plus normal saline solution (2ml) at the time of administration of SA within 20 minutes. Blood pressure was recorded before performing SA, immediately after SA, and then every 2.5 minutes until delivery. The primary outcome was the incidence of hypotension after SA to delivery. Secondary outcomes were rescued vasopressor drug and the complications included tachycardia, hypertension, nausea and vomiting, and neonatal Apgar score. Pearson chi-square test or Fisher's exact test was used to finding the significance of study parameters between two groups. P value less than 0.05 is considered statistically significant.
Results and Discussion: The incidence of hypotension was 26% in group E which was lower than 58% in group C (OR 0.25, 95%CI 0.10 to 0.64, p = 0.001). Requiring bolus epinephrine was 12 mg in group C and 6 mg in group E (median difference 6 mg, 95%CI 0 to 12, p = 0.078). There were no statistically significant differences in hypertension, tachycardia, nausea, vomiting, and neonatal Apgar score between the two groups.
Conclusion(s): A combination of intravenous crystalloid and ephedrine coload was an effective method to prevent post-spinal hypotension in parturient undergoing elective CS and without significantly serious complications.

04AP05-08
Incidence and risk factors for intraoperative supplementation of analgesics/sedatives during cesearean section under epidural anesthesia

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Background and Goal of Study: There has been an ongoing interest regarding intraoperative pain in cesarean section (CS). Two recent studies showed an 11.9% incidence of intraoperative pain during CS under spinal anesthesia (SA) and a 4.7% need for intravenous supplementation. Intraoperative pain during epidural anesthesia (EA) is known to be higher than under SA. We checked the prevalence of IV analgesic/sedative supplementation under EA for CS, which drugs were used and risk factors.
Materials and Methods: After Institutional Review Board approval, retrospective data was collected using electronic medical software. All women who underwent CS under EA were eligible. A standard EA protocol for CS was used (20 ml Lidocaine 2%, 100 mcg Adrenaline, 2 ml Bicarbonate, 100 mcg Fentanyl). Women who received IV fentanyl / ketamine / propofol or a combination of these drugs were grouped into the supplementation group, all others were grouped into "no supplementation group". Primary outcome was need for supplementation of IV analgesics/sedatives. A multivariable binary logistic regression model was performed using age, weight, gravidy, gestational age, surgery time, postpartum hemorrhage (PPH) (yes/no), adhesions (yes/no), and emergent/nonemergent surgery (yes/no) as independent variables and need for supplementation as the dependent variable. SPSS (version 26) was used.
Results: Between 1.1.17-30.6.22, there were 1,095 CS performed entirely under EA (with no conversion to GA). Of these, 141 (12.9%) required IV analgesics/sedatives. Most of women (87.9%) received the supplementation after delivery. Sixty-three (44.7%) received only fentanyl, 50 (35.4%) only ketamine, 9 (6.4%) only propofol, and 19 (13.5%) received a combination of these drugs. Risk factors were younger age [OR 0.936 (0.901-0.972)], p=0.001 and longer surgery time [OR 1.015 (CI 1.004- 1.025)], p=0.007. No connection between emergency status of the CS and IV analgesics/sedatives was found.

Disscusion & Conclusions: 12.9% of women undergoing CS under EA received IV analgesic/sedative, most often after baby was born. IV fentanyl was the most common analgesic used, followed by ketamine. Emergency nature of the CS was unrelated to analgesic/sedative supplementation, yet a younger age and a longer surgery time did. Further studies must be performed to discover techniques to ensure pain free CS.

04AP05-09
The analgesic efficacy of dexmedetomidine for labour epidural analgesia

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Background and Goal of Study: Epidural analgesia is the most effective and preferred choice to manage pain during labour and delivery. The use of adjuvant drugs, such as opioids and alpha-2 adrenergic agonists, in combination with reduced doses of local anesthetics (LAs) has helped decrease the incidence of side effects while maximizing pain relief. This systematic review evaluates the efficacy of using dexmedetomidine as an adjunct to LAs for epidural labour analgesia.
Methods: PUBMED, EMBASE (Ovid), and Cochrane Controlled Trials Register, were searched to identify all English language high quality randomized controlled trials (RCTs) in humans. Selected RCTs compared either LAs only or LAs with an opioid (fentanyl or sufentanil) against dexmedetomidine as an adjunct in labour epidurals. Primary outcomes included efficacy of pain control and safety of dexmedetomidine as a labour epidural analgesic adjunct**.** The quality of the included RCTs were evaluated using Jadad scores and the Cochrane risk of bias tool.
Results and Discussion: Eight studies involving 1292 patients met the eligibility criteria. 664 received dexmedetomidine as an adjunct to LAs for epidural labour analgesia. Quality scores were high (median Jadad score = 4.25, range 3-5). Three studies compared dexmedetomidine to sufentanil, while 4 studies compared dexmedetomidine to plain LAs.
One study compared dexmedetomidine to clonidine. Pain scores were tracked throughout labour using the Visual Analog Scale (VAS). VAS scores were lower in all the groups that received dexmedetomidine, compared to those that received plain LAs, sufentanil or clonidine.
No significant differences were found between type of delivery (vaginal vs. cesarian section) or duration of labour. Adverse events such as pruritus, nausea and vomiting were significantly reduced in those parturients receiving dexmedetomidine as epidural adjunct.
Conclusion: This is the first systematic review to highlight that the combined use of low dose dexmedetomidine and LAs provided better pain relief based on lower VAS scores throughout labour. Furthermore, the use of dexmedetomidine resulted in fewer patients experiencing side effects, such as, nausea/vomiting, pruritis, shivering or fetal heart rate abnormalities, compared to the opioid adjunct groups. Despite the clear benefits of dexmedetomidine, it is not currently licensed for epidural use and its overall safety requires further investigation with larger-sample randomized trials.

04AP05-10
Risk factors for anxiolysis administration during cesarean section

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Background and Goal of Study: Labor is a stressful life event for a mother, with Cesarean section (CS) shown to be even more stressful. Peripartum stress and anxiety have been shown to have negative consequences, including spinal hypotension, increased postpartum pain, and postpartum depression.
However, anxiety is difficult to measure and therefore we decided to use midazolam supplementation as a surrogate measure for anxiety.
Materials and Methods: Institutional review board approved this retrospective study. All women who underwent CS under neuraxial anesthesia (NA) were included. Women who converted to GA and those who received a supplementary analgesic/sedative (Fentanyl, Ketamine, Propofol) were excluded. The primary outcome was the administration of midazolam.
A univariable binary logistic regression model was performed using age, weight, gravidy, first/repeat CS, gestational age, multiple gestation, emergency CS, adhesions, postpartum hemorrhage (PPH), placenta previa, surgery time, type of anesthesia (spinal, epidural, combined spinal anesthesia) as independent variables and use of midazolam as the dependent variable. SPSS (version 26) was used for statistical analysis.
Results: Between 1.1.17- 30.6.22 there were 6,953 CSs included. Anxiolysis was administered in 839 women (13.7%), where 93.8% of women received it after delivery. Risk factors were younger age [OR 0.98 (0.967-0.992)], p=0.001, lower gravidy [OR 0.958 (0.92-0.998)], p=0.041, first CS [OR 1.272 (CI 1.098- 1.473)], p=0.001, emergency CS [OR 1.452 (CI= 1.181-1.785)], p< 0.001, PPH [OR 2.275 (CI1.073-4.823)], p= 0.032, , p<0.001, surgery time [OR 1.014 (CI 1.01-1.019)], p <0.001, and epidural anesthesia [OR 2.79 (CI2.353- 3.309)], p<0.001.
Spinal anesthesia was a protective variable [OR 0.405 (CI0.345-0.475)], p<0.001. No association was found between CSE anesthesia and anxiolytic administration.
Disccusion and Conclusions: There is a non negliable rate of anxiolytic administration during CS, which occurs mostly after delivery. Younger age, lower gravidy, first CS, emergency CS, PPH, longer surgery time and use of non spinal anesthesia were associated with a higher risk for anxiolytic use. We believe this is a first step in identifying and modeling risk factors for anxiety during.

04AP06-01
Anesthetic management of vaginal delivery in a parturient with hereditary angioedema with normal C1-inhibitor

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Background: Hereditary angioedema (HAE) with normal functioning C1 inhibitor (C1-INH) is extremely rare and characterized by recurrent, self-limited episodes of cutaneous or submucosal edema, most commonly affecting the skin, and the upper respiratory and gastrointestinal tracts. The crisis does not respond to antihistamines, corticosteroids, or adrenaline and usually disappears spontaneously within 12-72 hours.

It is distinguished from other forms of HAE by the presence of normal complement studies. Estrogens play a significant role in the onset of symptoms which are usually exacerbated by hormone replacement therapy or pregnancy.

Case report: A 24-year-old female, G2P1, diagnosed with HAE with normal C1-INH had recurrent self-limited episodes of facial and periorbital edema after the introduction of oral contraceptives at 15 years old. In her current pregnancy, she was admitted into the hospital at 18 weeks of gestation with facial swelling which was reverted by intravenous administration of 2000 UI of plasma-derived C1-INH concentrate (pdC1-INH). Long-term prophylaxis was initiated with 1000 UI every 3 to 4 days, without further recurrence.

Labor was induced at 37 weeks due to intrauterine growth restriction. The case was evaluated by a multidisciplinary team and a preprocedural dose of pdC1-INH wasn't administered since the last one had been given two days before. Additional doses were kept ready for acute treatment. A lumbar epidural catheter was earlier placed and after a bolus of 20 mg of 0,2% ropivacaine and 10 mcg of sufentanil, patient-controlled epidural analgesia was started with 0.1% ropivacaine and 0.25 mcg/mL sufentanil. The pain was successfully controlled throughout 8 hours of labor. Delivery and hospital stay were uneventful.

Discussion: Anaesthesiologists should be aware of the prophylaxis and treatment of HAE with normal C1-INH acute crises especially in pregnant women, as even normal labor can precipitate airway difficulties. Regional anesthesia is preferred whenever possible considering the better stress response suppression and adequate pain relief.

Reference:

Maurer, M, et al.(2022). The international WAO/EAACI guideline for the management of hereditary angioedema-The 2021 revision and update. *Allergy: European Journal of Allergy and Clinical Immunology*,77(7),1961-1990.

Learning Points: Careful management of HAE is crucial for the establishment of an adequate level of care and support, prophylaxis, and rescue therapy.

04AP06-03
Unresponsiveness due to the inadvertent subdural catheter placement during Caesarian Section - a rare complication of epidural anaesthesia

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Background: Inadvertent subdural block (SDB) is a complication of epidural anaesthesia but seldom recognised due to the varied presentation, like high sensory block with limited motor block and substantial haemodynamic and respiratory involvement. The awareness of SDB is essential in early diagnosis and adequate management to avoid serious complications.

Case report: A 17-year-old (40 weeks, no co-morbidities, height 158 cm, BMI 24) received labour analgesia. Combined Spinal Epidural was given (2 ml 0.125% heavy bupivacaine intrathecal) followed by Patient Controlled Epidural Analgesia infusion (6ml/hr, Bolus 10ml and lockout 20 min). Apart from transient hypotension, she was stable.

One hour later, she underwent category 1 LSCS for foetal bradycardia. When in the OR, she moved both lower limbs but sensory level was not assessed. After confirming a negative aspiration, epidural was topped up with 10 ml of 2% lidocaine with 100 mcg Fentanyl.

Fifteen minutes into the procedure, she desaturated followed by hypotension. Bag mask ventilation and Phenylephrine infusion started. She gradually became unresponsive with dilated pupils. She was intubated after Rapid Sequence Induction and hyperventilated with head up position. CT Brain ruled out any intracranial event. She was ventilated in the ICU for a day and was extubated without any neurological deficit.

Discussion: SDB presents with extensive sensory blockade and cranial nerve involvement as the potential subdural space extends to the cranium. The block depends on the volume of local anaesthetics and spares motor and sympathetic distribution due to the subdural space anatomy. Patchy/ failed block and extensive sympatholysis are reported. The onset of action is delayed up to 30 minutes, lasting up to three hours with full recovery.[1]

The management is conservative with close monitoring and haemodynamic support till resolution and removal of the catheter.[2]

References:

1. Lubenow T, Keh-Wong E, Kristof K, Ivankovich O, Ivankovich AD. Inadvertent subdural injection: a complication of an epidural block. *Anesth Analg*. 1988;67(2):175-179.

2. Hoftman N. Unintentional subdural injection: a complication of neuraxial anesthesia/analgesia. *Anesthesiol Clin*. 2011;29(2):279-290.

Learning points: Even after negative aspiration, SDB is a possibility. Hence block level should be assessed and titrate the top-up volume. High suspicion is warranted in late onset of extensive block. The catheter must be removed due to its unpredictability.

04AP06-04
Total thyroidectomy during pregnancy: what is the ideal analgesic strategy?

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Background: Regional anaesthesia should be the preferred technique whenever possible for non-obstetric procedures[1]. The combination of both general and regional anaesthesia can minimize fetal drug exposure in comparison to general anaesthesia alone.
We present a case of a pregnant woman submitted to total thyroidectomy with a combination of bilateral superficial cervical plexus block (BSPB) and general anaesthesia.
Case report: 22-year-old woman, ASA II, 25 weeks pregnant, diagnosed with papillary thyroid carcinoma. Scheduled for total thyroidectomy performed under combined anaesthesia. During the procedure, displacement of the uterus through left tilt was made and the patient was monitored with ASA standard monitorization plus neuromuscular block monitorization and BIS®. Fetal heart rate was also monitored by an obstetrician before surgery.
The induction of anaesthesia was uneventful and accomplished with rapid sequence induction with perfusion of remifentanil, bolus of lidocaine, propofol and rocuronium. Intubation was successful at first try with direct laryngoscopy. After intubation an ultrasound guided superficial cervical plexus block was performed bilateraly. A total of 2 mL of ropivacaine 0,15% were administered on which side.
Maintenance of anaesthesia was made with Sevofluran with a MAC of 0.5-0.6, guided by a BIS® of 40-60. Analgesia was accomplished with 1g of paracetamol. Hemodynamic and ventilatory stability was maintained during the surgery.
Emergence from anaesthesia was uneventful. The patient was taken to the post anaesthesia care unit awake and well. After surgery fetal heart rate was monitored once again by the obstetrician to establish fetal viability.
Discussion: A combined anaesthesia may offer additional benefits for the pregnant woman and the fetus as it allows to reduce the dose of hypnotic agents used for maintenance of anaesthesia as well as the dose of systemic analgesics used during and after the surgery.
A BSPB as proven to be an efficient regional technique for thyroid surgery as it can reduce the requirements of sevoflurane for an ideal BIS and the need for additional analgesia.
Reference:
1.Upadya M, Saneesh PJ. Anaesthesia for non-obstetric surgery during pregnancy. Indian J Anaesth. 2016 Apr;60(4):234-41.
Learning points: A BSPB provided adequate analgesia and allowed the reduction of systemic analgesic doses.

04AP06-05
Tirotoxic crisis in an urgent cesarean section. How come is it missed?

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Background: Hyperthyroidism usually affects 3 out of every 1,000 women of reproductive age, so it is common for this pathology to coexist with pregnancy.[1]
Appropriate control of the thyroid hormone profile is essential for the course of pregnancy and for the correct neurological development of the embryo. Moreover, the consequences of a thyroid storm could be fatal for both.[2]
Case report: 35 years old pregnant woman who underwent emergency caesarean section due to prolapsed cord under general anaesthesia with endotracheal intubation. During the procedure, which was carried out without incident, the patient was haemodynamically stable although slightly tachycardic.
During the immediate postoperative period she presented hypertension and an episode of supraventricular tachycardia that was managed with beta-blockers.
After excluding pre-eclampsia and reinterviewing the patient, she reported a medical history of hyperthyroidism due to Graves' Basedow disease, without cronic treatment by her own decision. The thyroid study showed TSH<0.0001 with elevated T3 and T4, for which she started treatment with antithyroid drugs.
Discussion: Patients with Graves'disease carry thyroid-stimulating immunoglobulins that act on thyroid stimulating hormone (TSH)receptors. During the first trimester of pregnancy, this process is exacerbated by the affinity of human chorionic gonadotropin for TSH receptors.
In addition, a thyrotoxic storm leads to tachycardia, hypertension, neurological disorders and even seizures that can endanger the mother and the foetus. Hence, in pregnant patients with hypertensive symptoms, it is important to be aware of this entity and to exclude it when making the differential diagnosis among the hypertensive disorders of pregnancy.
Reference:
1-Emerg Med Clin North Am. 2014;32:277–92. 2-Thyroid. 2017;27: 315–89.
Learning points: Appropriate control of the thyroid hormone profile is crucial during pregnancy due to thyroid disorders can have serious consequences. The clinical manifestations of hyperthyroidism may resemble hypertensive disorders such as pre-eclampsia and therefore a differential diagnosis should be made between both entities. The diagnostic suspicion is crucial and must be early in order to manage it in a specific way.

04AP06-06
Spinal tumor and pregnant women: neurosurgery and caesarian delivery dilemma

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Background: Pregnant women has different pathophysiological changes, and often current diseases. We present a rare case of a pregnant women suffering from spinal tumor diagnosed during her second pregnancy. The progressive neurological deficit makes inevitable the tumor removal in the 29-th week of pregnancy.
Case Report: A 21 years old pregnant women was diagnosed in the 29-th week of pregnancy of spinal tumor based on her clinical signs (backache, and progressive neurological deficit of her legs) and on IMR examination.
These examinations revealed a spinal tumor on TH10-L1 level. The progressive motor deficit of her legs makes the surgery inevitable. A multidimensional team (obstetrician, neonatologists, anesthetists, and neurosurgeons) consulted the patient, concluding of neurosurgical approach and strict fetal monitoring in perioperative period.
This conclusion was appreciated by the women which did not permit to deliver the baby prior of term. Betamethasone, nifedipine, and magnesium sulfate) were started. Careful positioning of pregnant women in prone position was realized. Fetus monitoring was perioperatively realized taking care of maintaining fetal heart rate over 120.
The procedure was uneventful, and the women discharged from hospital without deficits and normal pregnancy course.
Discussion: This rare case presents an unusual situation of a pregnant women undergoing non-obstetrical surgery(1,2). Being in 29-th week of pregnancy minimize the risk of anesthetic effects on organogenesis, and the anesthesiologist must take care about fetal monitoring, maternal hemodynamic, and tocolysis (1,2).
References:
1. Qaiser R, Black P. Neurosurgery in pregnancy. Semin Nurol 2007; 27(5) : 476-481
2. Yimeng X, Xin M, Griffits B, Yan L. Medicine 2018; 97(37): pe 12360
Learning Points:
1. Pregnant women for non pregnancy surgery presents a challenge for the anesthesiologist.
2. Every anesthesiologist must be familiar with pregnancy physiological features.

04AP06-07
Delivery in patients with congenital heart disease: does one strategy fit for all? About five cases

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Background: Pregnancies in patients with Congenital Heart Disease (CHD) has been increasing drastically[1]. Recommendations for management of delivery is based on case reports or case[2]. we collected data on consecutive parturients with CHD attended at a tertiary university hospital over a one-year period.

Case Report: Between 01/11/2021 and 01/11/2022, we attended five parturients with CHD (table 1). Multidisciplinary team adjusted treatments to the complexity of underlying disease during pregnancy and childbirth.
In cases vaginal delivery (VD) was considered. VD was chosen in 4 cases, and caesarean delivery (CD) in 1 case at maternal request. Intrapartum CD was required for non-progression of labour in 1 patient. For the 4 patients admitted to delivery room, an early epidural analgesia (EA) was proposed at 1-2 cm of cervical dilation to avoid cardiovascular effects associated with pain. EA was induced with a bolus of 6-8 mL LBupivacaine 0.125% + fentanyl 1.5mcg/mL, and maintained with PIEB 8mL - 45 min interval.
Scheduled CD was performed under Combined Spinal Epidural (CSE) anaesthesia using 8mg heavy 0.5% bupivacaine + 20mcg fentanyl. For intrapartum CD, block extension was obtained with an epidural top up dose of 14mL Ropivacaine 0.75% + 50mcg fentanyl wit no haemodynamic changes. In all CDs, phenylephrine or noradrenaline infusion prevented hypotension. Uterus contraction was obtained using carbetocin 25-50mcg or oxytocin 3-10ui in 4 patients.
Immediate postpartum care was provided in the maternal ICU for postpartum invigilance in all cases. The epidural catheter was removed prior to discharge to the conventional hospitalization floor between postoperative day 1 and day 4, after an uneventful recovery.

	Age	Anesthetic technique / FInal delivery mode	Clinical presentation	Treatment
Patient 1	36	Epidural / Intrapartum CD	• Bicuspid aortic valve + Coarctation of aorta. • Effort >4METS • LVEF 63%	None
Patient 2	39	CSE / Scheduled CD	• Atrial Septal Defect (ASD) • Effort >4METS • LVEF 61%	AAS100
Patient 3	34	Epidural / VD	• Ebstein's disease intervened + Pacemaker. • Effort > 4METS • LVEF 63%	AAS100 replaced in 3rd trimester by LMWH 40mg until induction of labour.
Patient 4	34	Epidural /VD	• Ebstein's disease + ASD intervened. • Effort >4METS. • Suffered a STROKE • LVEF 60%	AAS100 replaced in 3rd trimester by LMWH 40mg until induction of labour
Patient 5	38	Epidural /VD	• Transposition of the great vessels intervened with functional single ventricle. • Effort <4METS • Reverserd Flutter • LVEF47%	Warfarine. LMWH 80mg/12h until week 32+4 takeover with IV UFH adjusted to aPTT.

Table 1: Patients characteristics:

Conclusion: Adequate delivery care is a decisive factor in reducing adverse maternal and neonatal outcomes in patients with CHD, especially in the most complex cases. Follow-up by multidisciplinary teams is primordial. More studies are required for a greater consensus on the proper management of these patients.
References:
1. Michaelson-Cohen R, J Obstet Gynaecol., 2011;
2. Roué M, Br J Anaesth. 2021

04AP06-08
Arachnoiditis following neuroaxial anesthesia in an obstetric patient

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Background: Arachnoiditis is a rare disease in which an extensive inflammatory response occurs in relation to a noxious stimulus, resulting in fibrosis and collagen bands, adhering nerve roots to each other and/or to the dural sac.
This may affect CSF circulation. It is most often seen as a complication of TBC, spinal surgery or as a response to contrast myelography, but has also been reported as an idiosyncratic reaction to neuroaxial anesthesia. Most common symptoms are burning pain in the low back that may radiate down the legs and persists at rest, urinary urgency, frequency and incontinence, loss of sensation below the area afflicted and paralysis.
Diagnosis is based on clinical history and can be confirmed by imaging tests. The most efficient test is T1-weighted MRI. The most common radiological finding is clumpling of nerve roots below L2.
Treatment is difficult as pain palliation and symptom relief are impossible in most cases.It includes pain management (NSAIDs, narcotics), steroids, neuromodulators, antidepressants, spinal cord neurostimulation and surgical release of scar tissue.
Case Report: A 41-year-old woman is admitted for induction of labor. No personal history of interest to note. Epidural puncture was performed at L4-L5(previous attempt at L3-L4). After 6 hours of dilation, cesarean section was performed under spinal anesthesia (single atraumatic puncture) with Bupivacaine+Fentanyl without incident. 9 days later she came to the emergency room for intense pain in the posterior aspect of both legs, loss of strength, difficulty walking and difficulty in starting micturition. RMI showed significant arachnoiditis. Lumbar puncture was performed, ruling out the infectious cause. Conservative treatment was established with steroids, neurontin, analgesia and vitamin B.
Discussion: Complications of neuroaxial anesthesia are rare when performed by experts but with generally serious consequences. Symptoms are similar to other neurological pathologies. Early diagnosis and treatment in order to avoid irreversible damage are important.
Reference:
Wright MH, Denney LC. A comprehensive review of spinal arachnoiditis. Orthop Nurs. 2003 May-Jun;22(3):215-9; quiz 220-1. doi: 10.1097/00006416-200305000-00010. PMID: 12803151.
Learning Points: Arachnoiditis is a very infrequent pathology but with devastating consequences (patients are at risk por depression, suicide and drug abuse). Taking into account the rise of regional techniques is a pathology that we must know to be able to suspect it.

04AP06-09
A novel parturient centered continuous labor pain monitoring system: a case report

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Background: Effectiveness of labor analgesia is usually monitored by means of unidimensional pain scales administered to the patient at predefined time intervals. These methods don't provide information on neuraxial block onset and duration, nor on pain reemergence pattern. Continuous evaluation of contraction pain, a method we are currently lacking, is expected to be more sensitive and accurate in describing such parameters.
We are developing a patient operated system that enables parturients to input onset and termination of contraction pain and its severity in real time by a simple and intuitive interface, which will be synced to a Uterine Activity Monitor.
We are then able to derive a relationship between Pain duration (Pd) as input by the parturient, and Contraction duration (Cd) as monitored through tocography. This Contraction Index (Pd/Cd) is a dimensionless parameter for monitoring individual response to administration of analgesia during labor.
Case report: We provided one parturient with a tablet supporting an application through which she has been able to easily report beginning, end and intensity of pain associated with each uterine contraction she perceived in the study time interval - between the first and second top-up after peridural catheter placement. We then compared contraction time duration as measured by the parturient with those recorded by tocography (Fig1, a).
Discussion: The contraction index (Fig. 1b) showed better sensibility than NRS (Fig. 1c) in describing onset and offset of neuraxial blockade.
Focusing on variations in pain's duration, instead of on its intensity, may provide a more objective parameter of analgesia effectiveness - especially with a continuous input from the parturient.
Real time labor pain monitoring could represent a 'telemetry like' tool, assisting practitioners in customizing analgesia based on moment-to-moment parturients' feedback.
Such a multimodal monitoring could also allow for a more objective comparison between different labor analgesia strategies and techniques.

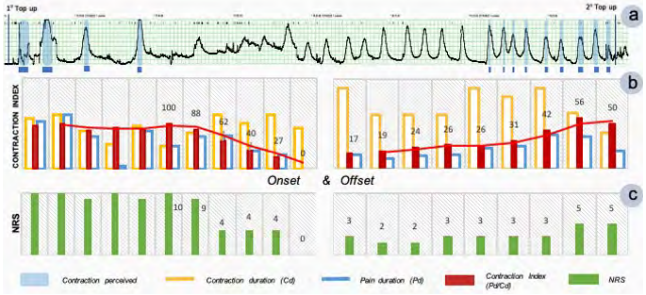

Figure 1.

Learning point: The system we are proofing is a mean to empower parturients receiving labor analgesia to be provided tailored treatment.

04AP06-10
A case of placental abruption after combined spinal-epidural technique for an elective cesarean

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Background: Administration of intrathecal (IT) opioids during labor has been associated with higher incidence of non-reassuring fetal heart rate (HR) tracing due to uterine hypertonicity.[1]
We present a case of a placental abruption immediately after combined spinal-epidural (CSE) anesthesia for an elective cesarean.
Case report: A 29-year-old G2P1 healthy woman at 39 weeks of gestation was proposed to elective cesarean (CST), with uncomplicated pregnancy and no relevant medical history. The patient was admitted in the operating theatre and monitored according to ASA standards.
A CSE technique was performed in the first attempt at the L4–L5 interspace with the patient in a sitting position and ropivacaine 12mg plus sufentanil 2,5 mcg was injected in the IT space. A rapid co-load of crystalloid 500 mL was administered.
The patient was positioned in dorsal decubitus with tilt to the left side. After 2 minutes, the patient started to feel lipothymia, nausea and blurry vision. HR raised from 76 bpm to 155 bpm and blood pressure was not measurable.
A total of 25mg of ephedrine was administered and volemic ressuscitation was started. CST was immediately started. At the time of uterine incision a significant volume of bloody amniotic fluid was found. Visual inspection of the placenta suggested the diagnosis of placental abruption. The neonate was successfully delivered and Apgar scores were 6/10/10.
Discussion: CSE analgesia or anesthesia is associated with transient imbalance in maternal catecholamine level, leading to uterine hypertonicity and fetal heart rate abnormalities, particularly when IT opioids are used.
When conducting CSE technique, the clinical pattern observed is more likely to be caused by the sympathetic blockade, however one should have in mind the possibility of placental abruption, as already reported in another paper.[2]
References:
1 Abrao KC, Elevation of uterine basal tone and FHR abnormalities after labor analgesia: a RCT. Obst Gyn 2009
2 Jaime F, Placental abruption occurring soon after labor CSE analgesia. Int J Obst Anesth. 2012
Learning Points: CSE analgesia and anesthesia in partum can cause uterine hypertonicity, therefore it is of most value to monitor mother and fetus wellbeing during and after the technique. Collaboration between anesthesiologists, obstetricians and obstetric nurses is mandatory.

04AP07-01
Specific features sedation for regional anesthesia during cesarean section with severe coronavirus pneumonia

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Background and Goal of Study: Regional (Spinal and Epidural) anesthesia (SA and EA) is the main type of anesthesia for caesarean section (SC). COVID-19 pneumonia whichcomplicates the course of pregnancy, requires a rational choice of sedation and respiratory support to ensure SA and EA.
Materials and Methods: The safe conduct of SA ore EA was ensured by the temporary discontinuation of the use of heparinoids in the perioperative period. SA ore EA was performed exclusively in the sitting position, then the patient was transferred to the horizontal position with the head end elevated by 30-45 degrees (depending on the needs). Respiratory support was used at all stages of preparation, performance, and administration of anesthesia: high-flow oxygenation (HFO) through nasal cannula or face mask, and non-invasive mechanical lung ventilation through the face mask.
Maintenance of normotension was provided by intravenous boluses phenylephrine. Sedation was provided by intravenous bolus small doses of propofol or ketamine.
Results and Discussion: The above-described features of SA/EA were used by us during CS in 60 women in labor with severe coronavirus pneumonia. Compliance with the characteristics of SA/EA for CS by coronavirus pneumonia was expressed in thefollowing:
1. Sitting position - half sitting at all stages of the perioperative period;
2. Constant respiratory support, mainly HFO;
3. Early transfer to the pron-position in the postoperative period;
4. Predominant use 25-50-75 mg ketamine (not propofol!) for sedation during CS.
This approach ensured that there was no need to use general anesthesia with tracheal intubation for CS.
Conclusion(s): Supplemented with HFO, ketamine sedation, half-sitting SA or EA is the method of choice for providing CS in labor with severe coronavirus pneumonia.

04AP07-02
Low dose spinal anaesthesia for CD and high rate of labour epidural anaesthesia. Any impact on safety and quality indexes in a university hospital during last year?

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Background: Minimum standards in obstetric anaesthesia (OA)[1] recommend using indicators to improve quality and safety of maternal care. Little evidence exists for the use of different local protocols in OA[2,3].

In the last years, in our hospital, we promoted routine protocolized Combined Spinal Epidural (CSE) (low spinal dose 8 mg 0.5% of Heavy Bupivacaine + Fentanyl 20 mcg) for caesarean delivery (CD), and a high rate of labour epidural analgesia (EA) by proposing it at patient's request until full cervical dilation.

We describe the impact of our practice on the most common indicators of quality in OA in our tertiary maternal university hospital.

Material and Methods: An 11-months internal audit was conducted to assess monthly indicators of obstetric and anaesthetic care: mode of delivery (vaginal birth (VB), instrumental delivery (ID) and CD), anaesthetic care in the delivery suite (EA or CSE), and anaesthetic care for CD: level of emergency (Scheduled (Category 4) vs Urgent (Categories 1 to 3)) and final anaesthesia technique employed.

Anaesthesia techniques were analysed depending on the level of urgency of CD.The indicators were analysed using a X^2 test. For CD, the requirement for GA was opposed to the level of urgency. $p<0,05$ was considered significant.

Results: 4451 parturient delivered in our centre during the audit, 2824(63,5%) by VB, 501(11,3%) by ID, and 1126 (25,3%) by CD, without significant variation during the period ($p=0,40$). Among parturients admitted to delivery room, 3497/3905 (89,6%) received a neuraxial block for labour analgesia, 895(25,6%) a CSE and 2604(74,4%) an EA, with no difference between months ($p=0,23$).

Urgent CD were performed in 787 /1126 (69,9%), most of which under EA (66,3%) or CSE (24,7%).

For scheduled CD, a neuraxial technique with epidural catheter (CSE or EA) in 293/324 (90,4%) patients allowed to administer low neuraxial doses. General anaesthesia was required in 48 (6,1%) of urgent vs 8(2,4%) of scheduled CD (OR: 2,56 95%CI [1,22; 5,36]; $p=0,006$), with no significant change during the period ($p=0,083$).

Discussion and Conclusions: In our tertiary centre, neither the use of low-dose CSE for scheduled CD, nor a high rate of labour neuraxial analgesia seem to have a significant impact on GA incidence, when compared to international standards of quality, despite a rotation of residents every 3 months.

Reference:

1. Guasch, EJA, 2020; [2]: MBRRACE report, 2022; [3]: Bamber, Anaesthesia, 2020; [4]: Miro, O, The Lancet 2000

04AP07-03
State of the art in labour neuraxial analgesia in Spain: national survey on current practice

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Background: Rapid evolution of evidence in obstetric anaesthesia (OA) obliges to constant actualization and assessment of practice[1]. This national survey was conducted to assess obstetric practice in Spanish maternal hospitals.

Material and Methods: Our National Spanish experts taskforce designed a survey, following a Delphi process, on most frequent techniques of labour neuraxial analgesia (LNA). Selected variables included centres characteristics, anaesthesia techniques, local anaesthetic doses and concentrations, use of adjuvants, and regimes of administration. The questions were transferred to Googleform. The survey was proposed to 195 Spanish maternities between April and September 2022. Results were presented as N (%) for qualitative variables or mean (SD) for quantitative variables.

Results: 105/195(53.9%) centres answered, covering all the territory. 88(83.8%) were public hospitals, 49(46.7%) offered a specialized perinatal care (ACOG Level 3-4), and 51(48.6%) attended >1.200 deliveries, vs 12(11.4%) < 600 deliveries per year. In 46(43,8%), an anaesthesiologist had exclusive dedication to OA. 69(65.7%) centres declared a rate of LNA > 80%. LNA was used daily in 97(92,4%) centres, versus 9(8,6%) for CSE, 5(4.8%) for spinal analgesia and 3(2.9%) for DPE. Saline loss of resistance was used in 74(70.5%) centres. Ultrasound guidance was only occasionally used in 21(20.0%). In 77(73.3%), a test dose was administered, using bupivacaine with epinephrine in 61(58.1%).

Bupivacaine and Levobupivacaine 0,10%-0,25% were the most common local anaesthetics (LA) used for induction of LNA in 25(23.8%) and 57(54.3%) centres. Fentanyl or sufentanyl were added to LA in 96(91.4%) centres.

For maintenance, 70(66.7%) and 33(30.5%) centres used continuous infusion and PIEB respectively. Rescue analgesia bolus were proposed in 62(59.0%) centres using PCA, or manual top ups administered by the midwife or attending anaesthesiologist in 36(34.3%) centres.

Levobupivacaine 0.0625-0.125%, bupivacaine 0.0625-0.125%, or ropivacaine 0.10-0.20% were employed in 63(34.3%), 13(12.4%) and 43(41.0%) centres respectively. Fentanyl was added at a concentration of 1-2mcg/mL in 102(97.1%) centres. 15(14.3%) centres declared no alternative technique to LNA.

Despite the publication of national protocols, 25(23.8%) centres do not follow protocols for obstetric patient.

Conclusion: The survey highlights the diversity of our national Spanish obstetric anaesthesia practice, within a range of acceptable practice, according to current knowledge and recommendations [2].

Reference:

1. Callahan, CJA, 2022;
2. Guasch, EJA, 2020

04AP07-04
Programmed intermittent epidural anesthetic bolus vs continuous epidural infusion in labor

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Background and Goal of Study: Many studies have been carried out comparing different methods for labor epidural analgesia and assessing their efficacy and patient satisfaction.
In this study, we observed the presence of motor block during epidural analgesia in these two different analgesic techniques for labor epidural analgesia: Programmed intermittent epidural anesthetic bolus (PIEB) versus continuous epidural infusion (CEI).
Materials and Methods: We develop a prospective observational study in which 54 parturient were included and evaluated. Both groups (PIEB and CEI) consisted of 27 patients. No statistically significant clinical or demographic differences were found between groups. Inclusions criteria were cervical dilation less than 6cm, spontaneous delivery and desire for epidural analgesia.
Analgesia for labor was performed with levobupivacaine 0.125% + fentanyl 1 microgram/ml. The initial analgesia was 10ml of the above solution in both groups. Analgesia was continued with 8ml/h of solution (administered as a bolus in the PIEB group and continuously in the CEI group). Rescue analgesia was performed with bolus of 4 ml of the dilution by the responsible anesthesiologist.
The modified Bromage scale was used to assess the degree of motor block, while the VAS scale was used to assess pain. The evaluation was performed every hour during labor.
Other variables studied were: total need for analgesic dilution, incidence of instrumental delivery, duration of delivery, and overall satisfaction of parturient. The statistical analysis was carried out with the program SPSS 20.0 and GraphPad 5.0.
Results and Discussion: We observed less motor block at delivery in the PEIB group compared to the CEI group (18.5% versus 50%; $p<0.05$). No statistically significant differences were found in pain control at any time of delivery.
No statistically significant differences were found at the incidence of instrumental delivery, the total amount of anesthetic dilution, the duration of delivery and overall patient satisfaction.
Conclusion(s): Results of the study show that epidural analgesia for labor with PIEB compared with CEI causes a lower incidence of motor block in parturient.
However, no statistically significant differences were found regarding pain control, the amount of anesthetic required, the rate of delivery instrumentation, or better patient satisfaction. We believe that PIEB could help a faster recovery and therefore an early mobilization of the parturient.

04AP07-05
The influence of physician/patient characteristics and interaction on intravenous sedative administration during elective Cesarean section

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Introduction: Spinal anesthesia (SA) is the gold standard for Cesarean section (CS) as it allows mother to be awake and pain free. However, rate of IV supplementation is not negligible and may be deleterious. Because the woman is interacting with the anesthesiologist, there may be psychosocial factors that influence the anesthesiologist's decision to administer sedatives. Therefore, we decided to investigate factors that led to sedative administration during CS from an anesthesiologist's perspective.
Methods: After IRB approval and signed informed consent, women undergoing elective CS under SA were enrolled. Postpartum, anesthesiologists and women were asked to fill out transference / countertransference forms; validated questionnaires measuring the patient's reactions to their provider and provider's reaction to their patients. In addition, the woman provided demographic details, socioeconomic status, native language and intraoperative anxiety and pain.
The anesthesiologist was also asked about gender, experience level, native language, assessed the woman's anxiety and pain level, and was also asked if the woman was cooperative, talkative, or annoying. The administration of anxiolytics or sedatives was retrieved from the electronic medical record.
Women who received anxiolytics versus those who did not were compared. We performed univariable and multivariable logistic regression with sedative administration (binary, yes vs no) as the dependent variable. In the multivariable regression model, we included the following variables: age, CS number, BMI, anesthesiologist's assessment of anxiety level, woman and anesthesiologist speaking the same language, and if the woman was talkative, cooperative, or annoying.
Results: There were 298 women/ anesthesiologist couplets. Women receiving supplementation had higher BMI (median 30.8 [1st quartile, 3rd quartile; 27.7, 34.8] vs median 30.6 [1st quartile, 3rd quartile; 26.4, 33.7]), $p = 0.03$. Female and senior anesthesiologists were more likely to give supplementation, OR 1.71 (95% CI; 1.04, 2.84), $p = 0.035$ and OR 1.70 (95% CI; 1.02, 2.86), $p = 0.043$, respectively.
In multivariable regression analysis, only anesthesiologist's assessment of the woman's anxiety and BMI influenced administration, OR 1.74 (95% CI; 1.52, 2.02), $p < 0.001$ and OR 1.04 (95% CI; 1.01, 1.09), $p = 0.034$, respectively.
Discussion: We found that only woman's BMI and anesthesiologist's assessment of the anxiety were predictive of supplementation.

04AP07-06
Dural puncture epidural: our experience in a tertiary hospital with a high rate of neuraxial analgesia in labour

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Background and Goal of Study: Standard epidural (E), combined spinal epidural (CSE), and may be dural puncture epidural (DPE) are effective described techniques for labor pain relief (LPR). It seems that DPE may have advantages over E (faster onset and better sacral spread) and over CSE (no intrathecal drug injected and less fetal side effects).
Our primary goal was to describe the overall quality of labor analgesia with DPE technique in parturients who asked for neuraxial analgesia for LPR. Our secondary goal was to assess the associated side effects of DPE.
Materials and Methods: After local ethics committee approval, we performed a retrospective study involving all parturients who received DPE for LPR in our hospital between October 1st and November 30th 2022. Our standard DPE technique was: epidural identification (Perifix 401 Filter set, Braun, Melsungen, Germany) and needle through needle spinal puncture with a 25 G 120 mm (Pencanneedle, Braun, Melsungen, Germany). As we saw liquor in the spinal needle, the 25 G needle was removed and we inserted the epidural catheter. Analgesia was started with a conventional PIEB regime (8-12 ml of L-bupivacaine 0.125% + 1.5 mcg/ml fentanyl as initial bolus + PIEB boluses every 45 min).
Analgesia was considered effective when VAS<3 at 30 min. We recorded onset time (time to VAS<3), the incidence of unilateral block (UB), catheter resiting (CR), sacral pain (SP), postdural puncture headache (PDPH) at the 24 h follow up visit and parturients' satisfaction (0-10). For statistical descriptive analysis, Microsoft Excel data was used. Continuous data were expressed as mean, categorical data as median, and incidences as N(Percentage).
Results and Discussion: 70 patients were included. Demographic maternal and fetal characteristics are shown in table 1. The average onset time was 15 minutes. 7(10%) parturients lasted >30 min until VAS <3 and 3(4.3%) needed CR. 3(4.2%) patients presented UB was and 2(2.9%) SP.1(1.4%) patient had PDPH (VAS 2-3 at 24 and 48h). The average satisfaction was 9.7.

	DPE (n=70)
Demographic data:	
Age (yr)	32
Height (cm)	162
Weight (kg)	76
IMC	29,1
Gestational age (wk)	39+2
Labor induction (%)	41 (58.6%)
Gestations:	
1	33 (47.1%)
2	17 (24.2%)
3	13 (18.6%)
4	5 (7.1%)
5	2 (2.9%)
Delivery mode:	
Vaginal delivery	46 (65.7%)
Operative vaginal delivery	13 (18.6%)
Cesarean section NICE I	0
Cesarean section NICE II	4 (5.7%)
Cesarean section NICE III	7 (10%)

Table 1. General characteristics of patients

Conclusion(s): DPE looks one more technique in our chart as its efficacy and safety profile are good.
Reference:
Heesen M, IJOA, 2019;40:24-31.

04AP07-07
Retrospective study to compare two epidural maintenance regimes in laboring women: patient controlled epidural analgesia versus programmed intermittent epidural bolus on outcomes of labor

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Background and Goal of Study: In the Tel Aviv Sourasky Medical Center we introduced a new pump system programmed intermittent epidural bolus (PIEB) in March 2021 for administering labor epidural analgesia (LEA). We transferred, in a staged process, from patient controlled epidural analgesia (PCEA) to PIEB. In July 2021PIEB was fully introduced in all 18 labor wards. This gives a unique window to examine a practice change and the effect on perinatal outcomes.
Materials and Methods: A retrospective study to investigate the perinatal outcomes for LEA using PCEA (July – December 2020) vs. PIEB (July-December 2021).
Primary Aim: To compare the rate of instrumental delivery (vacuum) for women who received LEA using PCEA vs PIEB. Data were retrieved using MDCLONE and Chameleon. Analysis was performed using descriptive statistics comparing PCEA vs.PIEB. $P<0.05$ was considered significant.
Results and Discussion: We present the analysis for our primary study outcome. During the two study periods, there were 5126 and 5519 labors; 2770 (54.0%) and 2976 (53.9%) women respectively received LEA. Among women who received LEA, the rate of instrumental delivery was 406 (14.7%) using PCEA vs 460 (15.5%) using PIEB, $p=0.574$, 95% CI of the difference -0.01 to 0.03.
Repeat epidural rate was similar for women receiving PCEA 82 (2.9%) vs 69 (2.3%) for PIEB, $p=0.02$, 95% CI of he difference -0.002 to 0.015. Physician administered top-ups were administered to 554 (20%) women receiving PCEA vs 302 (10%) receiving PIEB, $p<0.00001$, 95% CI of the difference 0.08 to 0.12.
Conclusion(s): The rate of instrumental delivery was not significantly different for women who received PCEA or PIEB in our cohort. The rate of women receiving physician administered top-ups was significantly lower when PIEB was used.

04AP07-10
Use of intramuscular dexmedetomidine as an adjunct for post operative analgesia following lower segment caesarean section under spinal anaesthesia

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Background and Goal of Study: Dexmedetomidine, an α2-adrenergic receptor agonist with proven analgesic, anxiolytic and sedative properties, when administered by the intramuscular route avoids the transient hypertension and bradycardia seen after an IV bolus and has prolonged duration of action.
In this study we tested the efficacy of intramuscular dexmedetomidine in enhancing postoperative analgesia in patients undergoing lower segment Caesarean section (LSCS) under spinal anaesthesia.
Materials and Methods: This was a prospective, analytical study conducted in a tertiary care hospital on 90 patients who underwent elective LSCS. Forty-five patients were observed under each group, Group D- receiving IM Dexmedetomidine (1mcg/kg to the thigh) and 45 patients under Group ND who did not receive the drug. Basal analgesia in the form of intravenous paracetamol was administered in both the groups and intravenous tramadol 50 mg was used as rescue analgesia whenever necessary. The requirement of additional analgesia was noted and compared between the groups.
Results and Discussion: Both the study groups were comparable in terms of weight, age and ASA physical status. The group receiving Dexmedetomidine was shown to have stable vital parameters(Mean arterial pressure (MAP) and heart rate (HR)), better analgesia and sedation scores as assessed by Visual Analog Score (VAS) and Ramsay Sedation Score (RSS).
The patients receiving Dexmedetomidine did not report pain for a longer period (mean time duration 370 min) and in contrast, the time until first analgesic request for the patients in Group ND comparably shorter (218 min). Requirement of rescue analgesic over a 24-hour period was found to be greater in the group which did not receive Dexmedetomidine.
Neonatal haemodynamics were also monitored for 24 hours in the post-operative period. There was no incidence of bradycardia, hypotension or respiratory depression in any of the patients of Group D or Group ND or amongst the neonates.
Conclusion(s): Our study findings indicate that Dexmedetomidine is a potent and highly selective α2-adrenoceptor agonist with sympatholytic, sedative and analgesic properties, which can be used as a useful and safe adjunct in managing postoperative pain in women who undergo lower segment caesarean section.
Reference:
Grosu I, Lavand'homme P. Use of Dexmedetomidine for pain control. F1000 Med Rep. 2010;2:90

04AP08-01
Anesthetic management of external cephalic version. Which is the best way? 6 months experience

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Background and Goal of Study: Breech presentation occurs in 3-4% of pregnancies at term. Breach position deliveries can lead to complications due to difficulties in the fetal head extraction,this is why the American College of Obstetricians and Gynecologists (ACOG) recommend to offer an external cephalic version (ECV) to all women with breech presentation in the third term.(1)
Different anesthetic and sedation techniques have been employed, but which one can offer a better success rate?In this article we make a revision of the experience in our hospital.
Materials and Methods: We describe the anesthetic management of 18 ECV that took place from January to June of 2022. All ECV attempts were carried out in surgery room, under US control. All patients had a perfusion of ritodrine as tocolytic.
Results and Discussion: 18 ECV were performed.11 were successful (60%) and 7 failed (38%). Of the 60% successful, 3 ended up by c-section. 11 procedures took place with iv sedation (propofol o remifentalin perfusion),and 7 with neuroaxial anesthesia. This rates are really similar to the results in other studies(1).
Factors that favour success are multiparous women, complete breech, posterior placenta or smaller fetus. ECV can be sometimes performed without anesthesia, but in orden to decrease maternal discomfort, relaxing the abdominal muscle tone and abolishing abdominal guarding, neuroaxial anesthesia or iv sedation are used (1) Pain relief increase success rate, but no differences were found associated to type of anaesthesia, and results are similar with neuroaxial anesthesia or intravenous remifenil. Sedation with propofol is less used, but also offers similar rates of success. Clinical hypotension occurs frecuently with neuroaxial tecniques and propofol.
No differences in APGAR scores were found comparing sedation with neuroaxial anesthesia.Other tecniques, as Nitrous oxide, hypnosis or accupunture have not been useful.In order to avoid placental abruption o fetal injury for excessive abdominal pressure, no more than two attemps are recommended
Conclusion(s): ECV is a safe alternative in breech presentation pregnancies,Pain relief increase success rates. Adverse events are rare, but even in successful VCE,the decrease in the cesarean section rate is relatively low
Reference:
1. Goetzinger et al. Effect of regional anesthesia on the success rate of external cephalic version: A systematic review and meta-analysis. Obstetrics and Gynecology. 2011 Nov;118(5):1137–44.

04AP08-02
Incidence and risk factors for need for conversion to general anesthesia during cesarean section under epidural anesthesia

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Background and Goal of Study: Neuraxial anesthesia (NA) for Cesarean section (CS) is the gold standard technique and is associated with less adverse events compared with general anesthesia (GA). Furthermore, the rate of adverse events raises significantly when NXA is converted to GA during CS. The rate of conversion from epidural anesthesia (EA) to GA is not negligible. We were interested in the incidence of conversion to GA from EA in our facility and what are its risk factors.
Materials and Methods: This retrospective study, approved by the Institutional Review Board, included all women who underwent a CS under epidural anesthesia. Data was collected using the electronic medical recording system. All women received a standardized EA protocol for CS (20 ml Lidocaine 2%, 100 mcg Adrenaline, 2 ml Bicarbonate, 100 mcg Fentanyl).
Primary outcome was conversion to GA. A multivariable binary logistic regression model was performed using age, weight, gravidy, gestational age, postpartum hemorrhage (PPH), surgery time, presence of adhesions, and whether the surgery was emergent/nonemergent as independent variables and conversion to GA as the dependent variable. Statistical analyses were conducted using SPSS (version 26).
Results and Discussion: Between 1.1.17- 30.6.22 there were 1192 CSs under EA. Conversion to GA occurred in 97 women (8.1%). Conversion occurred before delivery in 68 women (70.1%) and in 29 (29.9%) afterwards. Risk factors were younger age [OR 0.939 (0.897-0.984)] $p<0.01$, lower weight [OR 0.977 (0.961-0.993)], $p<0.01$, higher gravidy [OR 1.198 (CI 1.048-1.37)], $p<0.01$, lower gestational age [OR 0.875(CI 0.787-0.973)], $p=0.01$ and longer surgery time [OR 1.026 (CI 1.016- 1.037)],$p<0.001$. No association was found between emergent/nonemergent classification of the CS and conversion to GA.
Conclusions: There was a relatively high rate of conversion to GA from EA. Younger age, lower weight, younger gestational age, multigravidity and a longer surgery time were associated with a higher rate of conversion. Emergency CS was not a risk factor.
The finding of emergency CS not related to conversion is of interest since maybe those conversions could have been avoided.

04AP08-03
Implementation of the walking epidural protocol. What do we think about it?

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Background and Goal of Study: Labor is a natural process that often requires medical attention but has an emotional and social component that cannot be ignored. Therefore, both obstetric and anesthetic care has been adapted over the last few years. The walking epidural is a technique that attempts to respond to this need. Its aim is to generate an analgesic control, avoiding the sensory and motor blockade. In this way, pregnant women are allowed to ambulate during labor. During 2022 a protocol on walking epidural was implemented in our center. We decided to evaluate the acceptance and analgesic quality of the technique by the pregnant women and the entire professional team in the delivery room.
Materials and Methods: The opinion of pregnant women and delivery room staff regarding epidural walking was assessed by means of a short 10-question questionnaire after delivery. The health care team included obstetricians, midwives, nurses and auxiliary nursing care technicians.
Results and Discussion: A total of 20 pregnant women and 42 health professionals responded to the survey. If we analyze the first group, 15 midwives, 14 obstetricians, 7 nurses and 6 auxiliary nursing care technicians responded.
All pregnant women rated the analgesic quality of the walking epidural as excellent. Moreover, all of them felt that deciding on the analgesic option at each stage of labor improved the experience of labor. That is the reason why more than 90% thought that it should always be an anesthetic option during labor and that it was a good alternative for those women who initially wanted a natural delivery. Also, the majority felt that the ability to walk was an excellent way to improve the experience of childbirth.
We found similar results when we asked health professionals about the influence of walking epidurals on the experience of labor. However, most of them (52.4%) stated that the information provided to patients was insufficient and more than 90% said that they would like to receive more information as professionals about the technique. This contrasts with the results obtained from the patients, since all of them considered that the information received was sufficient.
Conclusion(s): The walking epidural is an analgesic technique for labor with great acceptance among pregnant women and health care workers in the delivery room. Likewise, all of them consider that it is an option that improves the experience of childbirth and that therefore it should be proposed more.

04AP08-05
The MaCriCare survey - the use of modified early obstetric warning scores in maternity units: an international cross-sectional survey

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Background and Goal of Study: For a critical illness to be effectively managed, early recognition is essential to allow rapid escalation of care. Early warning systems have been widely adopted in many countries as a standard of care for the general adult population. However, it is unclear whether their use in the obstetric setting is as widespread.
The purpose of this study was to report the use of modified early obstetric warning scores (MEOWS) in maternity units.
Materials and Methods: Between September 2021 and January 2022, we conducted an international cross-sectional survey of European hospitals to establish a baseline of current practices and service availability for maternity patients.
Results and Discussion: 1133 responses from 26 countries were included and analysed. The use of MEOWS by country ranged from 11 to 100% (Figure 1) and averaged 34.5% among the units surveyed. The use of MEOWS varied by unit characteristics (Figure 2).
Introducing MEOWS is challenging; few countries have succeeded in implementing it nationally. There are different reasons for this, including uncertainty about the precision and validity of MEOWS, lack of standardization, resource constraints (education programs, sufficient staffing, and capacity for patient management), and lack of MEOWS awareness in some regions.
Conclusion(s): Our survey found that MEOWS use is generally low throughout Europe and, worryingly, especially in smaller units that might be considered less resourced to cope with the sequelae of obstetric deterioration. Adopting standardised, well-designed, and validated systems cannot come soon enough.

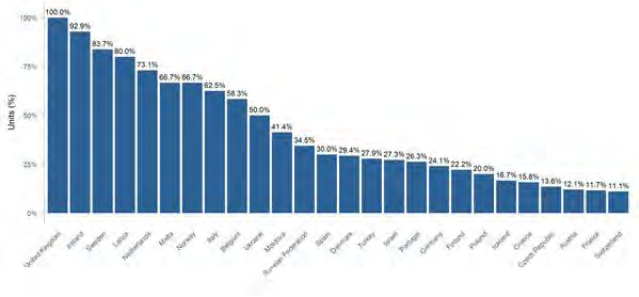

Figure 1. MEOWS use by country

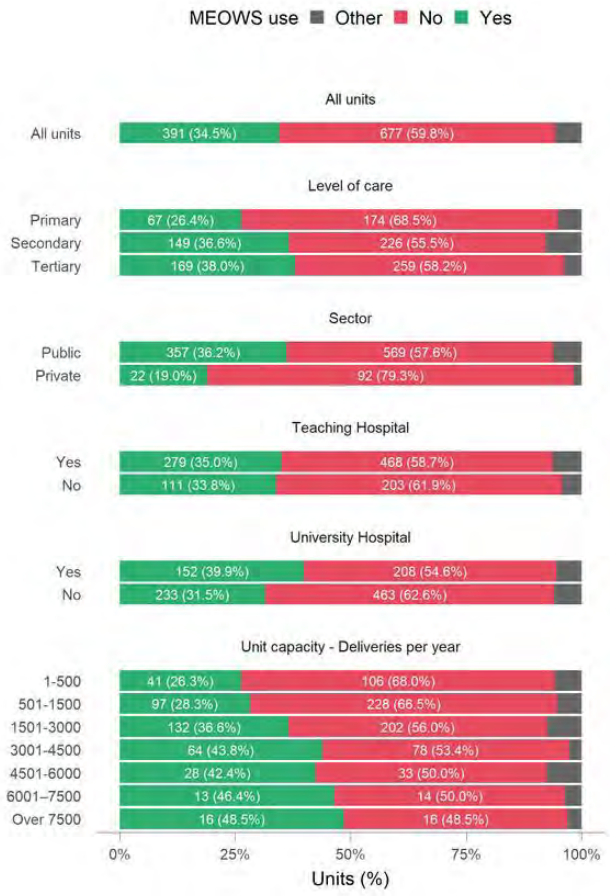

Figure 2. MEOWS use regarding the units' characteristics

Acknowledgements: The authors acknowledge National Coordinators and the survey respondents for their contribution to the MaCriCare study.

04AP08-06
The MaCriCare survey - availability of maternal critical care services and facilities in maternity units: an international cross-sectional survey

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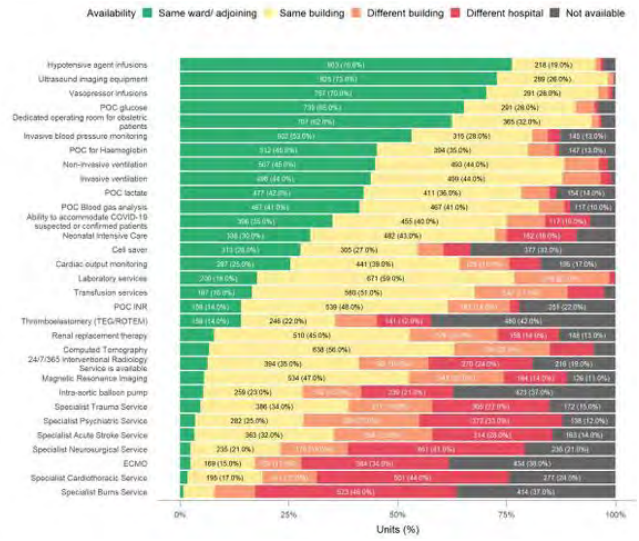
Background and Goal of Study: The availability of services and facilities to diagnose, resuscitate and treat deteriorating maternity patients has not yet been examined.
Our study set out to describe the availability of key services and facilities in European maternity units.
Materials and Methods: Between September 2021 and January 2022, we conducted an international cross-sectional survey of European hospitals to establish a baseline of current practices and service availability for maternity patients.
Results and Discussion: 1133 responses from 26 countries were included and analysed. We found significant variation in the availability of services and facilities, with some either not being immediately available or not available at all. 13% of centres lacked point-of-care haemoglobin. 15% lacked point-of-care lactate measurement. 11% lacked transfusion services.
Over 23% couldn't provide hypotensive agent infusions in the labour ward. Same-building access to cell saver and thromboelastometry was unavailable to over 45% and 64%, respectively.
Access to invasive ventilation was unavailable to 3.3% of centres. 12% were unable to offer same-building access to non-invasive ventilation. Extracorporeal membranous oxygenation was unavailable to 38% of units.



Economic and logistical factors may underpin local provision by region, however the causes of the wide variation are uncertain. It can be argued that some basic services and facilities should be universally and immediately available in every maternity unit, such as those essential to prevent and respond to common causes of maternal morbidity and mortality, including haemorrhage, preeclampsia, and sepsis.
The services required to support the delivery of maternal critical care have received little attention to date. The unnecessary variation in their availability may arise from a lack of appropriate guidelines.
Conclusion(s): Pregnant women who develop critical illness during or after pregnancy will have markedly different prospects depending on their chosen maternity unit. Consensus on which facilities and services should be universally available is urgently needed.

04AP08-07
Comparison of the safety and compilcation of preeclampsia parturients versus healthy parturients who underwent cesarean section under general anesthesia: A retrospective study

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Background and Goal of Study: It is known that the caesarean section rate is as high as 70% in cases of parturients with severe pre-eclampsia. However, previous studies on caesarean section performed under general anesthesia have often been conducted in low- or middle-income countries, with small number of participants, or before 2015.
Therefore, we retrospectively compared the recent safety and complications of preeclamptic mothers and healthy mothers who underwent cesarean section under general anesthesia.
Materials and Methods: Data were collected from electronic medical records in Korea University Ansan Hospital. The inclusion criteria were a consecutive parturients with American Society of Anesthesiologists (ASA) physical status classes Ⅰ-Ⅲ, over 18 years old with diagnosed preecplampsia, who underwent cesareansection under general anesthesia from January 2017 to december 2022. The informed consents of parturients were waived because this was a retrospective clinical study.
The parturients with ASA physical status classes Ⅳ, with sepsis and hemodynamic instability, or with an underlying condition resulting in hemodynamic instability were excluded from the analysis.
Results and Discussion: This study enrolled and analyzed 752 parturients.Except for platelet level and amount of fluid administered, the demographic data, operation time, and anesthetic time did not differ significantly between preeclampsia parturients group(PP group, n= 135) and healthy parturients group (HP group, n= 617). Platelet count was significantly lower in the PP group (P= 0.009) and the amount of fluid administered was significantly higher in the HP group (P= 0.019).
The overall hospitalization period was significantly longer in the PP group (P= 0.001).The rate of emergency surgery was significantly higher in the PP group (P= 0.003), and there was no difference between the two groups in re-admission, incidence of complications, and admission to the intensive care unit. Logistic regression analysis showed that the DM was an independent predictor of complications (odds ratio 4.528, p = 0.010).

Conclusion: In conclusion, general anesthesia in preeclampsia parturients is as safe as general anesthesia in healthy mothers. parturients with DM who undergo cesarean section under general anesthesua may require more careful patient management to prevent postoperative complications

Acknowledgements: No conflicts of Interest

04AP08-08
Acquisition of theorical concepts in obstetric anaesthesia: a pre-post training audit among anaesthesia residents in an tertiary obstetric hospital

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Background and Goal of Study: Introduction: Obstetric anaesthesia (OA) practice implies specific knowledge which anaesthesia trainees (AT) must acquire during their training in the Obstetric unit, according to European Training Requirements (ETR).

The aim of this audit was to check the efficacy of a training program in acquiring theorical concepts, using a pre/post-training test, in the obstetric anaesthesia department of a tertiary hospital in Spain for a year.

Materials and Methods: During their OA training, AT were enrolled in a teaching program which consisted of 12 weekly lectures related to OA, based on a flipped-class model. Each one-hour session included theorical content and problem solving.

The evaluation of knowledge was carried out through a questionnaire with 21 multiple-true-false MCQs with 5 answers each proposed to each trainee both at the principle and the end of the training. The questions were created by two OA experts and transferred to a googleform survey. The topics of the questions included basic science (pregnancy physiology and local anaesthetics), neuraxial anaesthesia (for labour and caesarean),anaesthesia complications, obstetric complications, general anaesthesia during pregnancy and critically ill obstetric patient, based on ETR.

The year of training (R2 or R3) and the test scores were analyzed before and after the training. Results were transferred to an excel datasheet and SPSS Statistics 21 was used for data analysis. Parametric and non-parametric test were used. $P<0.05$ was considered statistically significant.

Results: A total of 48 test were collected, 25 pre-training tests and 23 final tests. Mean score for final test was significantly higher (89.0 ± 5.13/105 points) than for initial test (83.0 ± 6.4/105 points) ($p=0.001$). No differences were found in mean score depending on the stage of training (2nd-yr trainee: 82.38/105 points; vs 3rd-year trainee: 86.58/105 points, $p=0.10$).

Nevertheless, none reached a test score >97/105 points in any period. The questions with significant improvement in scores after the training affected: uterotonics ($p=0.02$), preeclampsia ($p=0.01$), post-dural puncture headache ($p=0.04$), blood patch ($p=0.00$) and anaesthesia for non-obstetric surgery ($p=0.01$).

Conclusion(s): This original assessment of knowledge during training revealed an adequate progression of OA trainees, with high and improving marks along the OA training.

Further, these results validate our teaching model. The use of computer-based assessment was easy to develop and to use, both for teachers and AT.

04AP08-09
Parturient weights: is the problem getting bigger?

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Background and Goal of Study: Globally, parturients are becoming increasingly overweight (Body Mass Index ≥25 kg/m^2) and obese (BMI ≥30) with associated obstetric, anaesthetic and neonatal risk [1].

A 2005 retrospective analysis at the Princess Royal Maternity (PRM) hospital reported that 18.9% of parturients in 2002/2004 were obese at booking. Mean BMI was 25.5, increased from 24.6 in 1990 [2].

We aimed to record parturient weights at PRM and describe any changing trends over the intervening 20 years.

Materials and Methods: Caldicott Guardian approval was obtained. BadgerNet™ (Clevermed, UK) was used to obtain a list of all parturients who had given birth at PRM in May and October, 2021 and 2022. Data collected included maternal age; booking height, weight and BMI; postcode; ethnicity; and mode of delivery.

Descriptive statistical analysis was carried out using Microsoft Excel.

Results and Discussion: 1553 parturients were analysed. The median (IQR) age of the cohort was 31 (27-35) years. Parturients were predominantly White (N=1238, 79.7%). Vaginal delivery (N=1102, 70.9%) was more common than Caesarean section (N=449, 28.9%).

The median (IQR) weight of parturients was 71.2 (61.0- 84.2) kg. Mixed race parturients had the highest median (IQR) weight at 76.9 (54.0-83.9) kg; Asian parturients had the lowest at 62.0 (56.9-73.8) kg. Median (IQR) weight was higher in parturients who delivered via caesarean section: 74.2 (62.1-88.9) kg; compared to vaginal delivery at 69.8 (60.6-82.5) kg.

The median (IQR) BMI of all parturients was 26.3 (22.9-31.2). 59.2% of parturients were overweight or obese. 30.4% were obese, an 11.5% increase from the 2005 study. Mean BMI was 29.0 - a 3.5 unit increase from the 2005 study.

Conclusion(s): Mean parturient BMI has increased at PRM over the last 17 years. The average parturient is overweight. This has implications for women, babies, resource planning and service delivery.

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2. Kanagalingam MG, Forouhi NG, Greer IA, Sattar N. Changes in booking body mass index over a decade: retrospective analysis from a Glasgow Maternity Hospital. BJOG: An International Journal of Obstetrics & Gynaecology. 2005;112(10):1431-3.

04AP08-10
Setting up a multidisciplinary maternal cardiology team service

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Background and Goal of Study: Maternal heart disease is increasingly prevalent and has been associated with a significantly increased risk of maternal, obstetric, and neonatal complications and is the leading cause of nonobstetric maternal mortality. Many advocate for a multidisciplinary team model in management of cardiovascular disease during pregnancy. We describe our experience in setting up such a service in a major maternity center and its results.
Materials and Methods: A multidisciplinary service was launched in our hospital, which is a large tertiary center in Israel. It is led by members from obstetric, cardiology and anesthesia departments, providing preconception counselling, assessment of cardiac risk, personalized cardiac follow-up, delivery plan, anesthesia plan (mode and monitoring), perinatal care and postpartum follow-up for high-risk cardiac obstetric patients. A retrospective study was performed to assess outcomes for different pathologies between 2018 and 2022.
Results and Discussion: During this time period, 125 women were treated. 24 applied for preconception counseling, with 4 recommendations to avoid pregnancy. 63 deliveries, of which 32 regular vaginal deliveries (28 with epidural analgesia and 4 without), 9 assisted vaginal deliveries (all with epidural analgesia). 22 Cesarean Sections (18 cases with regional, epidural/combine spinal epidural and 4 general anesthesia), 14 cases with invasive BP monitoring. In all cases there was a primary recommendation for regional analgesia. We saw zero mortality, 4 admissions to CCU (3 for observation and 1 after emergent cardiac surgery, 12 neonates were small for gestational age. The multidisciplinary approach enabled for an organized treatment plan and resulted in only a few minor complications in this group.

Types of Cardiovascular pathology in research group by number, N=125

Repaired Complex	Fontan	Valvular Lesions	Simple Lesions	Marfan	Arrhythmias	Cardiomyopathy HCM	Primary Pulmonary HTN	Pericarditis Endocarditis	Other Conditions
26	14	29	22	11	3	2	2	3	13

Conclusion(s): Preconception counselling and case management by a multidisciplinary maternal cardiology team is essential to prevent maternal morbidity and mortality in complicated cardiac patients. Based on successful management in our group of patients we would suggest setting such a team in any large center with an active maternity unit.

04AP09-01
Reversible cerebral vasoconstriction syndrome induced by ephedrine: a case report during a caesarean section

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Background: Reversible cerebral vasoconstriction syndrome (RCVS) is a clinical and radiological syndrome attributed to transient disturbance in the control of cerebral arterial tone resulting in vasospasms. It is often triggered by known factors, such as vasoactive drugswhich are frequently used during spinal anaesthesia, pregnancy and postpartum state.
We describe the case of an ephedrine-induced RCVS during a caesarean section. The aim of this report is to highlight the diagnosis dilemma and to raise the awareness of this rare and serious syndrome.
Case report: A 37-year-old parturient was scheduled for caesarean section. She presented sudden and severe headache minutes after the administration of intravenous ephedrine to correct arterial hypotension following spinal anaesthesia. An urgent computed tomography and magnetic resonance (RM) were performed that day, with no findings, and yet the headache, although bearable, was still present. An angio-RM conducted 48 hours later revealed images compatible with RCVS of both middle cerebral arteries and distal Sylvian branches; verapamile was started.
On day 8 the headache disappeared. Two months after discharge, an angio-RM was interpreted as normal, which allowed verapamile discontinuation.
Discussion: In our case, the headache occurred in a very common scenario. Hence, it shows why RCVS assessment is a unique anaesthetic challenge due to several reasons.
First of all, it is an emergency that is being underrecognized.
Secondly, no imaging exam gives an irrefutable diagnosis of RCVS.
Thirdly, its pathogenesis remains poorly understood, which makes finding the effective treatment complicated; nimodipino, nicardipine, verapamil and magnesium sulphate have been used with limited evidence. Intra-arterial vasodilators, with and without angioplasty, are also administrated.
Finally, various common conditions are associated with RCVS. In conclusion, since the most serious complications are permanent neurological deficits , an early differential diagnosis should be carried out in all cases of acute headache in the peripartum period.
Learning points:
- A high index of suspicion is essential in all cases of sudden headache during the peripartum state.
- RCVS is often triggered by commonly used drugs, and its management can be challenging.
- The anaesthesiologist should rule out conditions with similar symptoms, such as cerebrospinal fluid leak, subarachnoid haemorrhage or ischemic stroke.

04AP09-03
Anesthetic management of pregnancy in a patient with limb-gridle muscular dystrophy: a case report

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Background: Limb-gridle muscular dystrophy (LGMD) type R1 is a calpainopathy caused by variants in the calpain-3-gene (CAPN 3). The phenotype ranges from asymptomatic disease to pelvic and shoulder girdle muscles weakness, with severe forms presenting extreme hip gridle weakness, impairing gait.(1)
Cardiovascular and respiratory adaptations to pregnancy can cause an important deterioration in mothers' condition, especially during the third trimester. Hence, early preterm caesarian section may be necessary. Labor or operative anesthetic management can become a challenge with difficult placement of epidural anesthesia due to increased lombar lordosis and with general anesthesia being an equally difficult option to manage.
Case Report: A 25-year-old parturient with autosomal recessive LGMD was admitted electively to the hospital to perform caesarian section delivery at 40 weeks of gestation.
She was diagnosed at the age of 14 years old due to investigation of limb weakness and waddling gait. The patient underwent routine cardiac screening that revealed a decreased left ventricular ejection fraction (LVEF) of 45% with normal cardiac chambers and an angiotensin converting enzyme (ACE) inhibitor was prescribed. She never developed low debit symptoms and, whilst growing up, LVEF improved to normal function. Routine respiratory function tests never revealed pulmonary disease.
During pregnancy she developed exertional muscle weakness with no cardiac nor respiratory symptoms, therefore with no need for cardiorespiratory interventions.
A combined spinal- epidural anesthesia was performed with 2,5 *µg of* sufentanil and 7,5 mg of bupivacaine without complications and the caesarean section was uneventful. A healthy baby was delivered with APGAR scores of 10/10.
Discussion: Women with LGMD are at risk of worsening symptoms and disease progression during pregnancy, with half of women showing deterioration with gestation. (2) A multidisciplinary approach is required to guaranty that the best care is provided throughout gestation and delivery.
References:
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2. Awater C. et al S. Pregnancy course and outcome in women with hereditary neuromuscular disorders: comparison of obstetric risks in 178 patients. Eur J Obstet Gynecol Reprod Biol. 2012 Jun;162(2):153-9
Learning Points: Obstetric and anesthetic management of women with LGMD.

04AP09-04
Late eclampsia complicated with posterior reversible encephalopathy syndrome

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Background: Posterior reversible encephalopathy syndrome (PRES) is a rare entity characterized by headache, visual impairment, seizures and altered mental status. Neuroimaging findings include cerebral edema affecting the parietal and occipital lobes. Preeclampsia and eclampsia are the most common causes of PRES. Prompt diagnosis and adequate treatment is crucial to prevent adverse maternal and perinatal outcomes.
Case report: A 39-year-old woman, 39+4 weeks pregnant, presented at the emergency department with complaints of headache and high blood pressure (BP). On examination, BP was 145/70mmHg. Urinalysis revealed 3+ proteinuria. She had no history of hypertension or neurological illness.
The patient was admitted to induction of labour and taken to the delivery room where epidural analgesia was performed.
At one point the patient started complaining with visual impairment. As she was being evaluated, she had a tonic-clonic seizure that stopped with the immediate rescue measures: oxygen, intravenous midazolam and perfusion of magnesium sulfate.
After converting the epidural analgesia to anesthesia, the patient was taken to the operating room and emergency cesarean section was performed. A perfusion of labetalol was started to maintain normal BP and the perfusion of magnesium sulfate was continued.
As the patient maintained the visual impairment complaints, urgent neurology examination was requested. Brain magnetic resonance imaging revealed bilateral hyperintensities predominantly in the parieto-occipital region, establishing the diagnosis of PRES secondary to eclampsia.

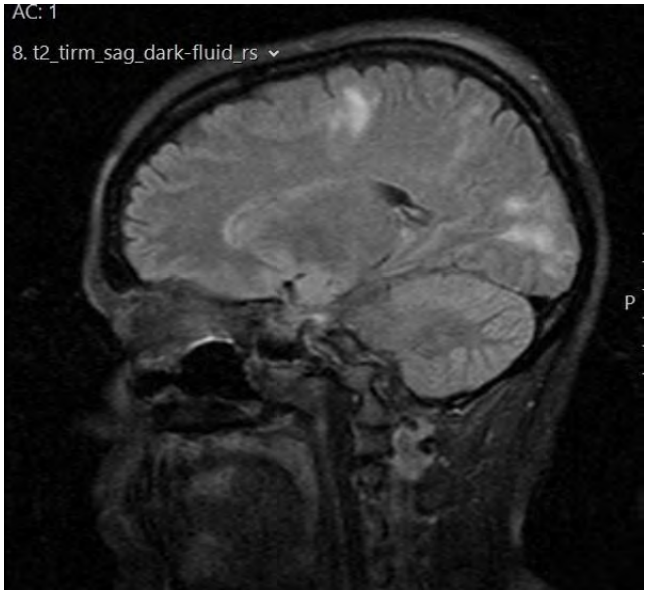

Figure.

She was admitted to the neurological intensive care unit for further treatment to relieve cerebral edema and was discharged home 7 days after delivery with normal blood pressure and without any visual symptoms.

Discussion: PRES is a rare clinical-neuroradiological entity associated with significant maternal and perinatal morbidity and mortality. Early recognition, prompt correction of increased blood pressure and treatment of seizures are essential to prevent permanent neurological sequelae. Clinical and neuroimaging manifestations are reversible in the majority of patients within 2-3 weeks.

04AP09-05
Ecographic measurement of the optic nerve sheath in severe preeclampsia. Is it useful?

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Background: Preeclampsia is a multisystem progressive disorder, whose incidence is between 5-8% pregnancies. It refers to the new onset of hypertension and proteinuria or the onset of hypertension and organ dysfunction with or without proteinuria after 20 week of gestation or postpartum[1]. Clinical signs of intracranial hypertension are difficult to interpret, and its incidence in preeclampsia is unknown.

Early detection and treatment are critical to avoid fatal consequences. Ocular ultrasound has become a great point of reference, as a relation between the diameter of the optic nerve sheath and intracranial pressure has been observed.

Compared with gold standard measures of intracranial pressure, diameter values greater than 5.8 mm have been shown to be associated with increased intracranial pressure[2].

Case report: We present the data of two pregnant women with preeclampsia, after obtaining informed consent, who were admitted to the delivery room of the Hospital Gregorio Marañón in Madrid. In both cases, ultrasound measurement of the optic nerve sheath was performed in the supine position, with a high frequency linear probe and using a transverse approach. The first patient, a 33-year-old primiparous woman, diagnosed with mild preeclampsia, a diameter value of the optic nerve sheath of 5.3mm was obtained, compatible with normal values. The second one, a 37-year-old primiparous woman, with a diagnosis of severe preeclampsia due to arterial hypertension, analytical abnormality and headache, presented a pathological value, greater than 5.8mm, for which she began treatment with magnesium sulphate.

Discussion: Ocular ultrasound has been postulated as an alternative non-invasive technique with high sensitivity for the diagnosis of intracranial hypertension in pre-eclampsia, as there is evidence of a correlation between the diameter of the optic nerve sheath and intracranial pressure values.

References:

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2. Brzan Simenc G.et al. Correlation between cerebral biomarkers and optic nerve sheath diameter in patients with severe preeclampsia. Hypertension in pregnancy 2021Feb;40(1):9-14

Learning Points: Due to the importance of early detection and treatment of cases of severe pre-eclampsia, ultrasound measurement of the optic nerve sheath could be considered as a complementary method in women with preeclampsia, becoming a predictor of severity in cases where it is found to be increased.

04AP09-06
Pregnant woman with seizures in the emergency room: posterior reversible encephalopathy syndrome

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Background: Posterior reversible encephalopathy syndrome (PRES) is an acute neuro-clinical disorder characterized by vasogenic edema mainly in the parieto-occipital region. It is closely linked with complications of preeclampsia and eclampsia.

Case report: A 32-year-old pregnant woman was brought to the emergency room with altered consciousness, aphasia and tonic-clonic seizures. At admission she was hypertensive 188/100 mmHg. Laboratory testing oriented diagnosis to eclampsia. The abdominal ultrasound confirmed fetal heartbeat. The patient was treated with diazepam, magnesium sulphate and labetalol. Urgent cranial CT-scan detected vasogenic edema at multiple levels (image), including bilateral occipital region, being diagnosed of PRES. Caesarean section was performed and the postoperative period progressed without incident.

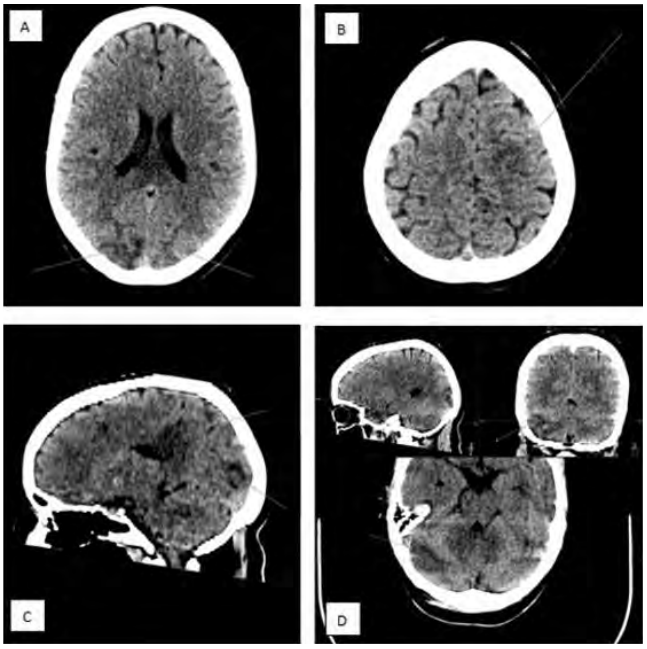

Figure. Vasogenic edema A: Bilateral occipital region. B: Left upper frontal region. C: Deep white-matter and occipital region. D: Right cerebellar region.

Discussion: PRES was first described in 1996. Clinical features include headache, seizures, encephalopathy, visual disturbances and focal neurological deficits[1]. It is associated with renal failure, autoimmune conditions, immunosuppression and sepsis, but especially with preclampsia and eclampsia[1].

PRES is believed to be the result of altered autoregulation and endothelial dysfunction causing hyperperfusion mainly of the posterior circulation[1], enhanced by abrupt elevations in blood pressure. Diagnosis is radiologic with CT-scan or MRI, where reversible vasogenic edema predominantly in white-matter of the parieto-occipital region is seen.

In one study, 97.9% of patients with eclampsia had confirmed PRES on imaging, suggesting that these entities are essentially one. Differential diagnosis includes cerebral ischemia. Complete recovery occurs in 75-90% of cases and its mortility is 3-6%.
Treatment consists in management of the offending trigger and should be given promptly. Aggressive blood pressure management including magnesium sulphate and expeditious delivery in case of preecampsia are recomended[1].
Reference:
1. Gewirtz AN et al. Posterior Reversible Encephalopathy Syndrome. Curr Pain Headache Rep. 2021 Feb 25;25(3):19.
Learning Points: PRES should be suspected in pregnant women with seizures. Early recognition is vital to prompt treatment.

04AP09-08
CHRNB1- congenital myasthenia syndrome: safe management of cesarean section

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Background: Inherited defects in the neuromuscular junction (NMJ) can cause congenital myasthenia syndrome (CMS), a heterogeneous group of neuromuscular transmission disorders. CMS-subtypes vary from mild symptoms (abnormal fatigability) to respiratory insufficiency and early death with variable onset[1,2].
One of the 32 genes is the CHRNB1, which encodes the β subunit of the post-synaptic acetylcholine receptor at the NMJ[1].
We report the anesthesia management of a patient with CMS who underwent an elective cesarean.
Case report: A 24 y/o female G1P0 was admitted for an elective cesarean delivery at 36 weeks. Targeted gene panel testing showed a heterozygous sequence variation c.309C>G in the gene CHRNB1, which was absent from public databases. She has motor abnormalities since 8 months of age and corrected scoliosis in 2011.
Neurologic examination showed fluctuant ptosis, incapacity for orthostasis, limb weakness, and moderate restrictive lung disease. Airway evaluation revealed no signs of difficult airway management and she was classified as ASA PS IV. Under standard ASA monitoring with BIS and TOF, induction started with propofol and rocuronium. Anesthesia was maintained with a TCI of propofol and fentanyl was administered after delivery. Neonatal Apgar score was 9/10. Sugammadex was administered and quick emergence was observed with adequate tidal volumes. The surgery was uneventful and after confirming neuromuscular block recovery, the patient was extubated. She was admitted to the ICU for 1 day until fully recovered.
Discussion: Considering the presence of posterior spinal implants from D1 to L5 neuroaxial blockade was not an option. The safety of propofol and fentanyl is not clear[3], and some CMS patients might have an exaggerated response to nondepolarizing neuromuscular blockers. We used a small opioid dose to avoid reduced airway reflex at tracheal extubation. Rocuronium and sugammadex had no adverse reaction and we chose to extubate in the OR. There was no need for NPPV even though there was a lung-thoracic abnormality. We report a unique successful anesthetic management case of a pregnant women with a previously unidentified mutation.
References:
1. Orphanet J Rare Dis (2019), 14(1),57
2. Am J Med Genet Part A (2021), 185(3),827–835
3. JA Clinical Reports (2022), 8(1),8–10
Learning points: Since the field of CMSs is rapidly expanding, it's crucial for patient safety that anesthesiologists share their experience regarding neuromuscular disorders.

04AP09-09
Spinal anesthesia for caesarean section in a parturient with dwarfism

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Background: Dwarfism is characterized by short stature. Patients suffering from this condition can be a challenge to the anesthesiologist. Patients may present anatomic abnormalities that interfere with intubation and ventilation. Also, the analgesic and anesthetic levels are unpredictable in neuraxial techniques. We present a successful case report of a pregnant woman proposed for caesarean section under spinal anesthesia.
Case Report: A 24-year-old, 39 weeks pregnant, ASAII, was proposed for elective caesarean section due to cephalopelvic disproportion. She was 135cm and weighed 67kg (BMI 38kg/m^2). We performed a spinal anesthesia in the sitting position, midline approach, at L4-L5 level. Subarachnoid space was achieved on the first try and 0.5% hyperbaric bupivacaine 6mg and sufentanil 1.5mcg was administered (total volume 1.5mL). The patient had a T4 level block and remained hemodynamically stable during the entire procedure. The Apgar scores for the newborn were 9 at 1 minute and 10 at 5 and 10 minutes, respectively. The patient and the newborn were discharged home 2 days after labour without any complication.
Discussion: Due to the difficulty in predicting level of neuraxial blockade when using neuraxial techniques in patients suffering from dwarfism, historically, general anesthesia was preferred. Nonetheless, this population has an increased risk of airway and respiratory complications [1] and pregnancy may exacerbate these risks. Lately, it has been an increasing number of case reports with regional anesthesia as the first choice. In a previous report of 14 cases article, 2 epidural and 1 combined spinal-epidural had the need to convert to general anesthesia due to high block or inadequate block [2]. Even though the reported cases of patients under spinal anesthesia is less than the other neuraxial techniques, none of the complications described above were reported with spinal anesthesia so we decided to perform it. We reduce the doses of local anesthetic and the adjuvant in order to decrease the total volume of injected solution. That way, we aimed to control better the level of the blockade, which happened in fact.
References:
1. Berkowitz et al. Anesthesiology (1990) 73:739–759
2. E. M. S. Lange et al. Can J Anesth/J Can Anesth (2016) 63:945–951
Learning Points: Spinal anesthesia can be seen as a secure and successful option for caesarean section in dwarfism patients. Using lower doses of the drugs likely contributed to the success of the case.

04AP09-10
Anesthesia management of a pregnant woman with Von Hippel-Lindau disease (VHLD): still a challenge

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Background: Von Hippel-Lindau disease (VHLD) is a rare autosomal-dominant genetic disorder, characterized by haemangioblastomas in the brain, spinal cord and retina. It is known to be associated with renal cell carcinoma, pancreatic tumors and phaeochromocytoma. Recommendations for obstetric anesthesia in these patients, remain limited.

Case report: A 31-year-old woman, with a bicorionic/biamniotic twin pregnancy and a history of VHLD, presented to our center at 35 weeks of gestation, for an elective c-section. Her medical history was significant for haemangioblastomas of the retina and spinal cord (C3/C4 level); she had been submitted to a bilateral adrenalectomy, due to phaeochromocytoma. Her lab results were normal, and an MRI of the brain and spine, from 2019, showed a cervical hemangioblastoma.

A general anesthesia was performed, with ASA monitoring and invasive arterial pressure instituted prior to the induction. Blood pressure was maintained stable, through labetelol boluses and a perfusion of remifentanil. The procedure was uneventful and the patient was transferred to the post-anesthetic care unit.

Discussion: The management of childbirth in patients with VHLD, including neuroaxial anesthesia, should be determined on a case-by-case basis. The possible presence of central nervous system tumours needs to be taken into account. According to the literature, most haemangioblastomas are located in the cervical and thoracic regions, so the possibility of disrupting a tumor at the level of the lumbar region is minor. However, if neuraxial anesthesia is planned, an MRI should be performed before.

As our patient's MRI was not recent, a lumbar hemangioblastoma could not be excluded. Therefore, we proceded with general anesthesia. We attempted to reduce the risk of bleeding by maintaining a stable blood pressure throughout the procedure and blunting any pressure response that might occur, such as during laryngoscopy.

Reference:

Razvi, S. A. H., Stefak, Y., & Bird, J. (2009). Caesarean section for a woman with Von Hippel-Lindau disease. *International Journal of Obstetric Anesthesia.*

Learning points: Anesthesia management of pregnant women with VHLD is not straightforward. Due to limited evidence, the anesthetic technique needs to be individualized. Even with a careful approach to these patients, doubts remain about the safest anesthetic technique. As more cases are reported, a more complete picture of this issue will emerge.

04AP09-11
Miller-Fisher syndrome in pregnancy - anesthetic approach

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Background: Miller-Fisher syndrome (MFS), a variant of Guillian-Barré syndrome is a rare disorder that is characterized by the acute onset of ophthalmoplegia, ataxia, and areflexia/hyporeflexia. The differential diagnosis includes Wernicke encephalopathy, myasthenia gravis and brainstream stroke.

We aim to present a clinical case of a pregnant woman who developed MFS and alert to the anesthesia considerations of this syndrome.

Case Report: A 39 weeks pregnant woman presented to the emergency department with retro-orbital headaches, photophobia, dizziness, and blurred and double vision. On examination, she had bilateral ptosis, ophthalmoplegia, and hyporeflexia. She had a diminished force at the right inferior extremity.

Brain magnetic resonance imaging revealed no areas of restricted diffusion. The electromyogram of the extremities was normal. MFS was suspected and intravenous immunoglobulin was prescribed. The obstetric team decided to induce labor. She was proposed for an elective cesarean section due to unpredictable labor duration and dubious pregnant collaboration.

General anesthesia (GA) was performed. Anesthetic monitoring included ASA standards and neuromuscular monitoring. An ultrasound-guided bilateral quadratus lumborum block was performed at the end of the surgery. The postoperative period was uneventful and she was discharged 5 days after surgery with a scheduled Neurology appointment

Discussion: Our aim was to describe the anesthetic approach of a patient with MFS since there are no international guidelines on this matter. A complete clinical history with the careful characterization of the neurological examination is mandatory. We should be aware that these patients may show increased sensitivity to the neuromuscular blocking agents.

Therefore, neuromuscular monitoring is essential. In this case, we performed GA because the patient already had motor weakness in the lower extremities. There is no evidence of the use of regional versus GA techniques in pregnant women with MFS.

References:

1. B. R. Wakerley, "Guillain-Barre´ and Miller Fisher syndromes—new diagnostic classification," Nature Reviews Neurology, 2014.
2. Sanz MP, "Consideraciones anestésicas en el síndrome de Miller-Fisher". Rev Esp Anestesiol Reanim. 2011;
3. Ono M, "Clinical Features of Miller-Fisher Syndrome in Pregnancy." Case Rep Obstet Gynecol. 2015;

Learning Points: A complete clinical history and a neurological examination should be performed as well as postoperative surveillance.

Paediatric Anaesthesiology

05AP01-01
Premedication use in children undergoing general anaesthetic at the Austin Hospital – a retrospective audit

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Background and Goal of Study: Preoperative anxiety in children is associated with adverse outcomes[1].
Therefore, premedication should be considered when non-pharmacological strategies fail to alleviate preoperative anxiety. Pre-medication is often required in children with special behavioural needs, previous traumatic anaesthetic experiences or parental anxiety[2].
The benefit of premedication use should be considered against potential for clinical complications and requirements for intensive postoperative monitoring[3].
This study investigated incidence, indications and complications of premedication use at a tertiary Australian hospital.
Materials and Methods: In this retrospective audit, children (<17) who received a general anaesthetic at Austin Health, Melbourne, Australia between 01/01/2022 and 18/08/2022 were included.
Electronic medical records were reviewed for patient demographics, surgical specialty and, in cases with premedication: drug name, dose, indication and any complications.
Statistical analysis included calculation of percentage of GAs with premedication.
Results and Discussion: Of 423 cases (176 elective and 247 non-elective) identified (265 male, 158 female, median age 10.47 years), premedication was used in 31 (7.3%) instances. Oral midazolam was used in 27 cases (range 0.20–0.51 mg/kg, median = 0.48 mg/kg) and oral clonidine was used in 4 cases (range 1.8 mcg/kg–3.93 mcg/kg, median = 3.24 mcg/kg).
Indication for premedication was 5 maternal request, 5 Autism Spectrum Disorder (ASD), 3 both ASD and ADHD, 1 developmental delay in and 17 anaesthetist preference. Prolonged awakening occurred in 20 of 31 (64.5%) premedicated GAs, with no other complications.
Incidence of premedication use in paediatric general anaesthetics varies according to multiple confounders such as complexity of cases and institutional practice.
Conclusion: Premedication use was relatively low and usage should be considered with respect to complications.
References:
1. Heikal S, Stuart G. Anxiolytic premedication for children. *BJA Educ*. Jul 2020;20(7):220-225.
2. Manyande A, Cyna AM, Yip P, Chooi C, Middleton P. Non-pharmacological interventions for assisting the induction of anaesthesia in children. *Cochrane Database Syst Rev*. Jul 14 2015;(7):CD006447.
3. Davidson AJ, Shrivastava PP, Jamsen K, et al. Risk factors for anxiety at induction of anesthesia in children: a prospective cohort study. *Paediatr Anaesth*. Sep 2006;16(9):919-27.

05AP01-03
Double-blind randomised control study of intranasal Dexmedetomidine versus intranasal Midazolam as anxiolysis prior to elective infra-umbilical surgeries under general anaesthesia in children of age 2 – 12 years

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Background and Goal of Study: Preoperative anxiety increases anaesthetic requirement, aggravates hemodynamic instability, and can lead to adverse postoperative outcomes, increased postoperative pain leading to delayed recovery time, and increased length of hospital stay in children. Midazolam & Dexmedotomidine reduces anxiety, and causes sedation.
The goal is to compare intranasally administered the above drugs intranasally and to evaluate the efficacy of sedation caused by intranasal dexmedetomidine and intranasal midazolam
Materials and Methods: The study design is a prospective, randomised control, double-blind, clinical trial with a duration of one year, in the preoperative room, AIIMS Raipur Hospital.
Group(G) 1 received 0.3mg/kg of intranasal midazolam. Group(G) 3 received 1mcg/kg of intranasal dexmedetomidine Group(G) 2 received 2.5ml of 0.9% saline intranasally.
After administration of an intranasal drug, HR, RR, mean blood pressure, SpO2 were recorded every 5 min until the child is transferred to the operation theatre. Sedation status and anxiety score were assessed every 5 min by the University of Michigan Sedation Scale and Modified Yale Preoperative Anxiety Scale respectively
Results and Discussion: Premedication in children is essential to alleviate anxiety, allow smooth separation from parents. It can also reduce the anaesthetic drug requirement intraoperatively by enhancing the hypnotic effects of anaesthetic drugs. Among both the drugs, dexmedetomidine has better tolerance. Dexmedetomidine did not cause any nasal irritation, respiratory depression, hiccups, paradoxical reactions. As it acts on locus coeruleus, it produced quiet calm cooperative form of conscious sedation.

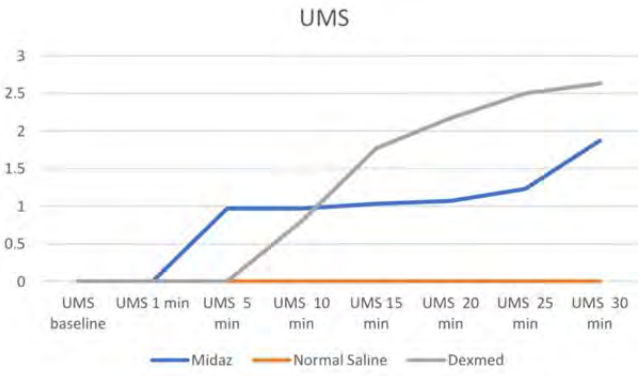

Figure.

Conclusion(s): We observed, both intranasal dexmedetomidine at 1 mcg/kg and intranasal midazolam at 0.3 mg/kg, when given as premedication before 30 min of induction, produced less anxiety and sedation than with intranasal saline. While intranasal midazolam had early onset sedation, higher sedation scores with onset at 10-15

min and prolonged sedation postoperatively were seen with intranasal dexmedetomidine. Nasal irritation with intranasal midazolam is however a major concern.

05AP01-04
Parental care in pediatric ICU might reduce requirement in sedative drugs in the postoperative period

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Background and Goal of Study: There are some benefits to using sedation in critically ill pediatric patients; however, it can lead to side effects and even iatrogenic complications. The pediatric patient cannot properly express the intensity or location of the pain, discriminating the cause of their irritability and agitation can be more complicated than in adults. Thus, sedation therapy for children requires more careful attention.
An objective of this study was to assess the effect of the implementation of internal parental care protocol on sedative dose reduction in postoperative pediatric ICU patients
Materials and Methods: This retrospective observational study was performed in PICU of the tertiary medical center that has a bed capacity of 280 Astana, Kazakhstan. The internal parental care protocol was developed and implemented by critical care physicians of the University Medical Center.
The level of agitation was evaluated with the Richmond Agitation-Sedation Scale. If the level of agitation reached 1 or 2, sedation therapy was performed. Before the sedation, other reasons for agitation, such as pain, hunger, or uncomfortable temperature were excluded.
All statistical analyses were performed using Stata version 16.1. The independent t-test or Mann-Whitney U-test was used to compare continuous data between two groups. Univariate and multivariable logistic regression analyses were performed to examine associations of parental care with sedation therapy
Results and Discussion: A total number of 289 patients were included in the study. Of them 167 patients were hospitalized before and 122 after the implementation of parental care. In multivariable analysis, parental care was associated with lower odds of prescribing diazepam (OR=0.11, 95% CI 0.05-0.25), controlling for age, sex, cerebral palsy, and type of surgery. The limitations of this study are being single-centered, relatively small sample size, and a non-experimental design.
This study can be valuable for ICU quality improvement, reduction in unnecessary sedative drug prescriptions and associated with these negative effects such as drug-related complications, and prolonged ICU- and hospital length of stay. Implementation of parental care in the ICU can also lead to more natural pediatric patient management.
Conclusion(s): The results of this study show that parental care was associated with only decreased odds of prescribing sedative drugs. While no differences were observed for analgesics.

05AP01-05
Analgosedation with peripheral nerve blocks for orthopedic procedures in children

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Background and Goal of Study: The use of ultrasound-guided peripheral nerve blocks in daily clinical practice for pediatric patients is increasing. This prospective study aimed to evaluate the duration of anesthesia, surgical intervention, and time of awakening from anesthesia for orthopedic surgery.
The study was done on analgosedation patients who had peripheral nerve blocks.
Materials and Methods: Since the trial began in Jun 2022, 90 children aged 1 to 18 with ASA-PS scores of I to III have been randomly assigned to the dexmedetomidine or propofol groups. All subjects underwent ultrasound-guided peripheral nerve blocks and breathed spontaneously during the surgical intervention.
Results and Discussion: The operation time is significantly longer in the dexmedetomidine group (62.2±16.9) than in the propofol group (51.8±16.2); this difference is highly statistically significant (t= -2.988, DF=88, $p<0.01$). The anesthesia time is longer in the dexmedetomidine group; the difference is statistically significant (t= -2.301, DF=88, $p<0.05$).
The time of awakening from anesthesia is longer in the propofol group; the difference is highly statistically significant (t=10.884, DF=88, $p<0.01$).
Conclusion(s): For young patients undergoing orthopedic surgery under peripheral nerve blocks and spontaneous breathing, dexmedetomidine and propofol are safe and efficient anesthetics.
Although the operation and anesthesia lasted longer in the dexmedetomidine group compared to the propofol group, patients in the dexmedetomidine group awoke from anesthesia more quickly.

05AP01-06
Preoperative fasting in children undergoing elective surgery

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Background and Goal of Study: The guidelines for paediatric surgical procedures currently in place recommend preoperative fasting interval of 6 hours for milk and light meals, 4 hours for breastmilk and 2 hours for clear fluids. A recent publication by the European Society of Anaesthesiology and Intensive Care recommends shorter fasting periods(1).

The extent to which preoperative fasting times in the paediatric population undergoing elective surgery within Mater Dei Hospital (MDH) complies with such guidelines was assessed. The results of this assessment help provide recommendations for the optimisation of national pre-operative fasting for paediatric surgery.

Materials and Methods: A random sample of patients below the age of 16 years who underwent elective surgery within MDH in October 2022 was chosen. Data was collected retrospectively from medical records, and included the time the child last ate and drank, the time surgery started and duration of surgery.

Results and Discussion: Data for 113 patients were analysed, with a median age of 6.0 year (IQR: 3.0 – 9.0 yrs). Most surgeries were planned for the morning (81%).

The median fasting time was 11.8 hours (IQR: 9.5 – 13.5 hrs). Most children started fasting around 21:00 hrs (18%), with very few children actually having breakfast in the morning, even if surgeries were planned for late in the day. 60% of children planned for surgery in the afternoon still skipped breakfast. Infants tended to be fasted later on.

These excessively prolonged fasting times were noted across all surgical specialities covered by the study. Fasting times were not dependant on age, type of surgery or planned time of surgery.

Conclusion(s): In view of the role of an optimal fasting practice to lower the incidences of dehydration, ketoacidosis, hypoglycaemia, and cardiovascular complications during anaesthesia, it becomes critical that systematic analysis is directed to align observed fasting practices in paediatric surgery with international guidelines.

This can be achieved by emphasis on education of healthcare professionals and family members. Re-auditing after implementation of such measures will be useful to monitor this important factor within the paediatric surgery population.

Reference:

1. Frykholm P, Disma N, Andersson H, Beck C, Bouvet L, Cercueil E, et al. Pre-operative fasting in children A guideline from the European Society of Anaesthesiology and Intensive Care. Eur J Anaesthesiol. 2022;39:4–25.

05AP01-07
Postoperative emergent agitation in children anaesthetized with Sevoflurane

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Background and Goal of Study: Sevoflurane is the most popular and the most used anesthetic in pediatric anesthesia. The last reports about Sevoflurane exposure and its' influence to increase the serum levels of enolase and later development of the postoperative cognitive disorders (POCD) in children, were very disappointing.

The occurrence of emergent agitation (EA) in the awaking period (30 minutes) after sevoflurane anesthesia may be related to this event.

Aim: To detect the incidence of development of EA after solo sevoflurane anesthesia compared to sevoflurane with adjuvants.

Materials and Methods: Observational longitudinal study. 1 month period 30 children undergoing different types of surgery. Divided by the type of anesthesia, Group I: solo sevoflurane given by face mask, Group II: iv induction (propofol, opioids, muscular relaxant); maintenance: sevoflurane. In the first postoperative day 30 minutes after extubation the level of pain was measured using visual analogue scale (VAS) or Wong-Baker faces scores. The level of agitation/sedation using the Richmond agitation and sedation scale (RASS), was recorded.

On the second postoperative day, 24 hours after anesthesia the level of serum neuron-specific enolase (NSE) and S100 protein were obtained in all patients. The results were analyzed and compared between the groups.

Results and Discussion: The level of pain for group I was higher than in group II (6,4 ±2,1 Vs 3,2±2,2) ($p<0.05$). EA was registered only in one case in group I (RASS 4). The levels of NSE and S100 compared with preoperative values were increased in two cases in group II.

Conclusion(s): It was concluded that the postoperative pain is less when sevoflurane is combined with an adjuvant (opioid). The EA is very rare and is more often occurred in solo sevoflurane anesthesia. The increase of the level of NSE and S100 related to the duration of the sevoflurane exposure.

05AP01-08
Cryoanalgesia for children undergoing Pectus Excavatum repair. Ad interim results from the COPPER randomized controlled trial

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Background and Goal of Study: Patients undergoing Pectus Excavatum repair with the minimally invasive approach frequently report severe postoperative. Analgesia includes a thoracic epidural catheter and/or intravenous opioids. Recently cryoanaglesia has been proposed as alternative technique, aimed at providing short and long term pain.

The goal of the study is to determine if cryoanalgesia is superior than standard of care for postoperative pain relief and return to normal quality life.

Materials and Methods: A randomized active controlled, parallel group, trial (category IIb medical device) was designed for patients older than 12 years undergoing Pectus Excavatum repair. Participants are randomly assigned to one of the two study arms: cryoanalgesia vs standard of care. Cryoanalgesia is administered bilaterally on 5 to 6 costal levels.

Primary outcome is: Paediatric Quality of Life (PedsQL) 14 days after surgery. Secondary outcomes include: days of hospitalization, morphine consumption, severity of pain, any complication.

Non-parametric analysis (Mann–Whitney U-test) for continuous variables and Chi square or Fisher's exact test for categorical variables were used to measure differences between the groups. All values were based on two-tailed tests.

Results and Discussion: Protocol has been approved by Ethic committee (278/2021 – DB id 11421) and registered at clinicaltrial.gov (NCT0520182041) and recruitment is still active. Ad interim analysis was performed on 42 patients out the 88 patients (as for sample size calculation).

Twenty-two were assigned to epidural arm and twenty to cryoanalgesia. The PedsQL mean (95%CI) at 14th day was 65.00 (56.5-73.5) in the study group vs 53.56 (45.7-61.4) in the control group. The mean (SD) hospitalization length was 4.45 (1.0) days in the epidural

arm and 3.30 (1.5) in the cryoanalgesia arm. (p=0.001). The mean (SD) quantity of morphine consumption in the first operative day was 14.95 (12.41) mg versus 10.88 (5.61) mg, in the standard vs cryoanalgesia group respectively. Postoperative complications occurred in 5 patients: 1 in the epidural and 4 in the cryoanalgesia arm.

Conclusion(s): Based on the preliminary results, quality of life at day fourteen is not statistically improved by the use of cryonalagesia. Cryoanalgesia significantly reduce hospitalization length and morphine consumption in the early postoperative period.

05AP01-10
Determine dexmedetomidine dose and pharmacokinetics in children under 2 years of age. Secondary analysis from the TREX study

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Background and Goal of Study: Dexmedetomidine is the sedative agent administered in combination with remifentanil and low dose of sevoflurane in the interventional arm of the ongoing TREX trial (Trial Remifentanil DExmedetomidine). The TREX pilot study (published in Paediatr Anaesth 2019;29:59-67) established infusion rates higher than those initially proposed. This could be attributed to an inappropriate target concentration for sedation or incorrect initial pharmacokinetic parameter estimates. The goal of the current analysis is determine PK of dexmedetomidine in the TREX population.

Materials and Methods: The TREX study is a Phase III, randomized, active controlled, parallel group, blinded evaluator, multicentre, superiority trial comparing neurological outcome after standard sevoflurane anaesthesia with dexmedetomidine/remifentanil and low dose sevoflurane anaesthesia in children aged less than 2 years undergoing anaesthesia of 2 hours or longer. In this report, dexmedetomidine pharmacokinetics were analysed in the interventional arm of the Italian population.

Results and Discussion: There were 162 blood samples from 32 infants (22 male and 10 female). The median (IQR) age was 12 (5.2-15.5) months, weight 9.9 (7.3-10.8) kg. Duration of anaesthesia ranged from 2-6 hours. None of the children were born premature (median postnatal age 39 weeks, IQR 38-40 weeks). A 3-compartment PK model that incorporated allometric scaling and a maturation function demonstrated plasma concentration observations from the current Italian arm of the TREX study were consistent with those predicted by a "universal" model using pooled data obtained from neonates to adults.

Conclusion(s): This current PK analysis from the Italian arm of the TREX study confirms that plasma concentration of dexmedetomidine is predictable using known covariates such as age and size. The initial target concentration (0.6 μg.L-1) used to sedate children cared for in the intensive care after cardiac surgery was inadequate for infants in the current TREX study. A target concentration 1 mcg.L-1, corresponding to a loading dose of 1 mcg.kg-1 followed by an infusion of 1 mcg.kg-1.hour-1, provided adequate sedation.

Reference:

Morse JD, Cortinez LI, Anderson BJ. A Universal Pharmacokinetic Model for Dexmedetomidine in Children and Adults. J Clin Med 2020;9:3480

Acknowledgements: TREX steering committee and consortium

05AP01-11
Baby CHiX: caudal, high flow oxygen and Dexmedetomidine sedation for inguinal hernia surgery in neonates and infants, a feasibility study

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Background and Goal of Study: To investigate if the Baby CHiX anaesthetic technique is feasible for infants undergoing inguinal hernia surgery.

Outcomes: Primary- successful completion of the surgery without converting to general anaesthesia (GA). Secondary- duration of anaesthesia and surgery, post operative intubation or increased post operative respiratory support, cardiovascular events, apnoeas and unexpected ICU admission.

Study Design: Prospective multi-centre feasibility study.

Study Sites: Flinders Medical Centre and Women's and Children's Hospital, Adelaide, Australia.

Eligibility Criteria: Infants < 64 weeks post menstrual age (PMA) undergoing inguinal hernia surgery. Exclusion; contraindication to caudal, high flow nasal oxygen (HFNO) dexmedetomidine, or mechanical ventilation.

Materials and Methods: Baby CHiX anaesthetic technique – IV dexmedetomidine loading dose 1-2 mcg/kg over 10 mins and maintenance 0.2–3 mcg/kg/hour, titrated to level of sedation, HFNO 2l/min with blender to titrate $Fi0_2$ to baseline $Sa0_2$, and caudal 1ml/kg of 0.2% ropivacaine.

Results: 16/17 (94%) infants had successful completion of surgery with the Baby CHiX technique. Cases were performed by 10 anaesthetists and 6 surgeons. 1/7 (6%) required conversion to GA due to failed caudal. Mean birth weight 1.91kg (range 490g – 3.69kg), mean weight on day of surgery 3.86kg (range 2.11 – 6.37kg). Mean gestational age at birth 33^{+4} weeks (range 23^{+0} – 40^{+0}), mean PMA on day of surgery 43^{+5} weeks (range 36^{+6}- 59^{+1}). Mean anaesthetic duration 70 mins (range 29- 113mins), mean surgical duration 45 mins (range 18 - 93mins). Of 16 babies who had successful completion of surgery with Baby Chix method, 1/16 (6%) had postoperative oxygen desaturation events. 2/16 (12%) had postoperative apnoea. 3/16 (18%) required increased postoperative respiratory support (2/16 (12%) short period nasal specs 02, 1/16 (6%) HFNO for 9 hours). None required re-intubation. No intraoperative or postoperative cardiovascular events.

Discussion: This study shows the Baby CHiX technique is a safe, feasible alternative to GA for inguinal hernia surgery in infants up to 59 weeks PMA, in different hospitals with different anaesthetic and surgical teams. The longest surgical duration of 93 mins demonstrates it is feasible for longer, more complex surgeries.

Conclusion(s): This study provides support for a multi-centre randomised controlled trial comparing Baby CHiX technique to GA for inguinal hernia surgery in infants.

05AP01-12
Peculiarities of providing medical care and anesthesia in the time of war at the National Children's Specialized Hospital Okhmatdyt

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During the war the quality of assistance depends greatly on the administrative organisation of work, the availability of qualified personnel, the provision of medical equipment, medicines, communication between team members, the work of psychologists and volunteer assistance, the availability of a powerful 24-hour laboratory and diagnostic base for CT, MRI, ultrasound, and a bank blood products and the possibility of using extracorporeal detoxification methods.
At the beginning of the war in Ukraine help was provided to 104 wounded at the National Children's Specialized Hospital Okhmatdyt. Adults aged 22 to 84 years, including 24 children aged 10 days (newborn) to 18 years and members of their families (5 families). 10 children were admitted at the stages of treatment from territories with the active military operations.
Upon admission, the victims were examined by a multidisciplinary team, where the FAST-BLUE protocol, CT, MRI of the brain and parts of the body, X-ray, sonography, laboratory diagnostics of blood count were performed immediayely after the patients admission. All patients had multiple anesthesia during their staying. 3 of the wounded children had 15 narcosis each. Extracorporeal detoxification methods were needed by only one child, autohemotransfusion with the help of Cell saver was performed in one adult and 1 child. Regional anesthesia methods as a component of multimodal analgesia during anesthesia and in the postoperative period were performed in 78% of adults and in 50% of children, in 37% of children regional anesthesia was performed more than 2 times during all the stages of treatment. Patients were given endotracheal anesthesia. For regional anesthesia, the anesthetics of choice were naropin 0.25% 1-2 mg/kg, bupivacaine hydrochloride 0.25%. The choice of initial antibacterial therapy depended on the nature of the traumatization, and then on sensitivity. The children and their family members had specific induced psychological reactions as a result of military operations, which required psychological treatment at all stages. Providing help required not only professionalism but also psychological endurance of the medical staff of Okhmatdyt.

05AP02-01
Accidental esophageal intubation via a large type C congenital tracheoesophageal fistula

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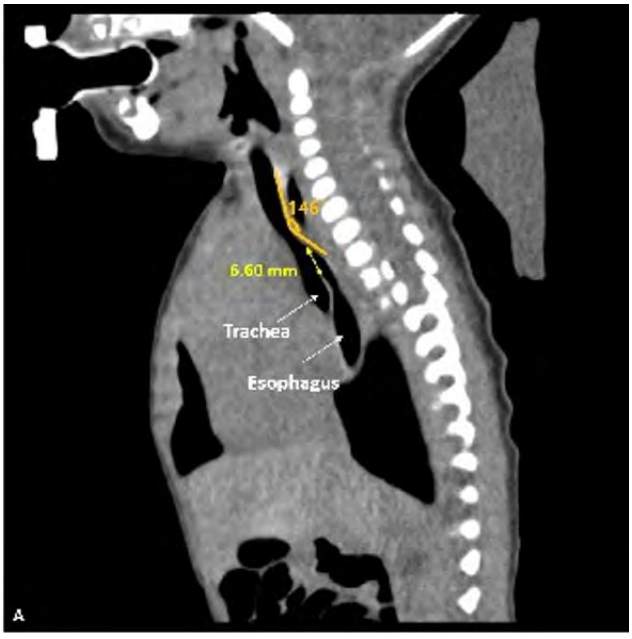
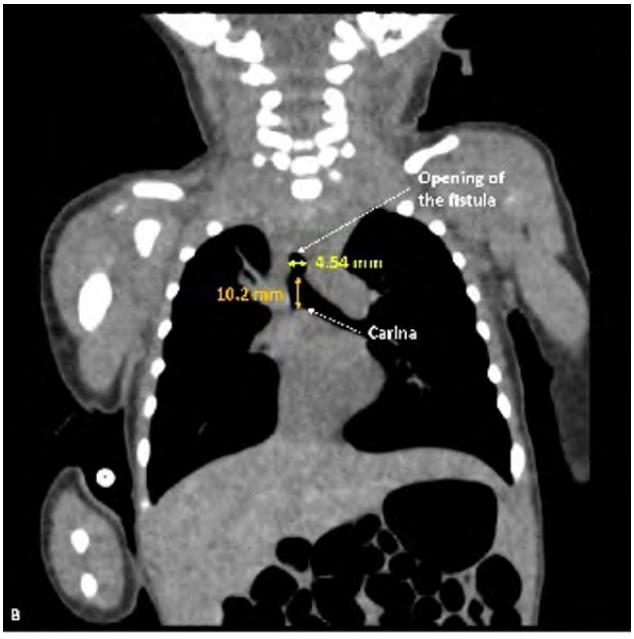
Background: Anesthetic management during Tracheoesophageal fistula (TEF repair is challenging because of the difficulty of perioperative airway management. It is important to determine the appropriate position of the endotracheal tube (ETT) for proper ventilation and to prevent excessive gastric dilatation.

Case report: A full-term, one-day-old, 2.4 kg, 50 cm male neonate was diagnosed with TEF type C. During induction, an ETT was inserted using video-laryngoscopy and advanced deeply to ensure that the tip passed over the fistula, according to known strategies.
The passage of the ETT through the vocal cords was confirmed via video-laryngoscopy. However, after inflating the ETT cuff, breath sounds were not heard on bilateral lung auscultation. Instead, gastric sounds were heard.
Considering that a large fistula (approximately 6.60 mm x 4.54 mm) located 10.2 mm above the carina was confirmed on preoperative tracheal computed tomography (CT), the possibility of unintentional esophageal intubation was highly suspected.
Therefore, we decided to uncuff and withdraw the ETT carefully for repositioning, while monitoring auscultation and end-tidal CO_2 simultaneously. At a certain point (9.5 cm from the lip), clear breath sounds and proper end-tidal CO_2 readings were suddenly achieved, and adequate ventilation was possible.





Discussion: Preanesthetic anatomical evaluation with imaging studies in TEF is necessary to minimize complications related to airway management.

References:

1. Broemling N, Campbell F. Anesthetic management of congenital tracheoesophageal fistula. Paediatr Anaesth 2011; 21: 1092-1099
2. Holzki J. Bronchoscopic findings and treatment in congenital tracheo-oesophageal fistula. Pediatr Anaesth 1992; 2: 297-303

Learning Points: In our case, esophageal intubation was unintentionally performed because of the large fistula. We predicted the possibility of this event based on the preceding tracheal CT, which helped us to obtain a better clinical outcome.

Evaluating the anatomy of each patient with TEF using imaging studies before induction is essential to minimize complications and facilitate prompt management as necessary.

05AP02-04
Paediatric epiglottitis-case study

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Background: Epiglottitis, is an inflammation of structures above the insertion of the glottis and is most often caused by bacterial infection. Due to vaccinations in Armenia cases of epiglottitis are unique.

Case report: A 1.5 year-old previously well boy was admitted to our hospital by his mother with a 4-day history of rightside cervical lymphadenopathy, weakness and fever. His immunisations were complete for age. His heart rate was over 140, respiratory rate 30 and oxygen saturation in air 96%.

In paediatric department was administered Amoxiclav and infusion therapy with NS. After 2 days the paediatric team noted inspiratory stridor,hypoxia, marked hypersalivation, anuria. The working diagnosis was croup . The child was admitted to PICU.

Following three doses of nebulised adrenaline, IV dexamethasone and supplemental oxygen his oxygen saturations rose to 100% in room air but there was no improvement in his respiratory effort , he also preferred a sitting posture. Chest X-ray showed narrowing of the airway below the vocal cords.

Considering the further worsening of the condition decision was made to do direct laryngoscopy under general anaesthesia. After induction with sevoflurane the saturation was critically drop to 33% and respiratory arrest was occured. It was impossible to ventilate and rapid intubation was done.

Direct laryngoscopy demonstrated marked swelling and erythema of his epiglottis and false cords consistent with epiglottitis and he was intubated by paediatric anaesthesiologist with a size 4.5 uncuffed endotracheal tube. The CT scan demonstrated also retropharyngeal abscess and the next day surgical intervention was done.

Our patient was extubated after 2 days . He received IV dexamethasone and 5 days of IV cefuroxime. Both blood culture and epiglottis swab were negative and his recovery was uneventful.

Discussion: The cause of the epiglottitis is uncertain but could have been viral, which we did not test for, or one of several bacteria but with negative cultures. This infrequency makes diagnosis more challenging.

Had the diagnosis been suspected, initial management and referral would have been markedly different. We urge others, particularly those in peripheral settings, to keep this rare diagnosis in mind.

Reference:

Adams WG, Deaver KA, Cochi SL, et al. Decline of childhood Haemophilus influenzae type b (Hib) disease in the Hib vaccine era. JAMA. [QxMD MEDLINE Link].

Learning points: epiglottitis

05AP02-05
Abdominal compartment syndrome caused by rapidly progressing intestinal pseudo-obstruction in a patient with Multiple mitochondrial dysfunctions syndrome type 3

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Background: Multiple mitochondrial dysfunctions syndrome type 3 (MMDS3) is a disorder characterized by a varied phenotype with only 59 recorded cases.[1] Intestinal pseudo-obstruction progressing to abdominal compartment syndrome (ACS) has never been associated with this disease. The affected gene is IBA 57, responsible for the integrity of mitochondrial respiratory chain.

Case report: A 1-year and 8-months-old boy with MMDS3 on invasive ventilation, mycotic sepsis, anemia, lactic acidosis and hypothermia was admitted having extreme abdominal distension and hemodynamic instability. The diagnosis of ACS was evocated from the clinical presentation. Non-invasive strategy consisted of evacuating intraluminal contents and corrective measures. After a dramatic deterioration, abdominal percutaneous puncture enabled transfer in the operating theater. Decompressive laparotomy (DL) was performed. Ventilation improved, but hemodynamic instability persisted without restoration of renal function.

The surgical founding concluded a megacolon without mechanical obstruction, bleeding or intestinal ischemia. Biopsies were obtained from locations with elevated intestinal tonus. During closure, QRS-morphology changes diverted into ventricular tachycardia. Restoration of sinus rhythm by Lidocaine was followed by asystole and death was reported 30 minutes post-operatively.

Discussion: ACS leads to multi-organ failure and its mortality with DL is estimated as 57%[2]. Intestinal pseudo-obstruction is one of the gastrointestinal manifestations of mitochondrial disorders and can lead to ACS.[3]

This is the first case of MMDS3 and ACS, exemplifying the rate of deterioration and impossibility of restoring the homeostasis once it was disrupted.

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1. Elise Lebigot,Manuel Schiff,Marie-Pierre Golinelli-Cohen;A Review of Multiple Mitochondrial Dysfunction Syndromes, Syndromes Associated with Defective Fe-S Protein Maturation; Biomedicines 2021,9,989
2. Anthony di Natale,Ueli Moehrlen,Hannah Rachel Neeser; Abdominal compartment syndrome and decompressive laparotomy in children: a 9-year single-center experience, Pediatric Surgery International(2020)36:513–521
3. Josef Finsterer,Marlies Frank;Gastrointestinal manifestations of mitochondrial disorders: a systematic review; Ther Adv Gastroenterol 2017, Vol.10(1)142–154

Learning points: MMDS3 is potentially life-threatening. Early recognition of ACS, multidisciplinary approach and urgent supportive treatment are essential for the patient's outcome.

05AP02-06
Tracheal rupture after endoscopic balloon dilation in an infant with congenital subglottic stenosis

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Background: Subglottic stenosis represents a common cause of airway obstruction in children. Their management remains challenging for both the otolaryngologist and the anesthesiologist who have to carry out an adequate evaluation and prevention of possible airway complications.
Case report: The patient is a 1 month and 25 days old infant affected by congenital subglottic stenosis proposed for endoscopic balloon dilation procedure. At the end of the dilation, the patient presents problems in ventilation, so the procedure is suspended and it is decided to intubate again.
Despite this, the ventilation problems persist, evolving into cervical subcutaneous emphysema that extends to the thorax, entering cardiac arrest for which advanced cardiopulmonary resuscitation maneuvers are initiated. Emergent tracheostomy is performed and the patient is finally ventilated. Likewise, during CPR, bilateral pulmonary, abdominal and pericardial drainage are performed. After 48min of resuscitation, the patient finally recovered cardiac activity.
Discussion: Intraoperative tracheobronchial injury is a rare complication after endoscopic ballon dilatation. It can have very serious consequences with high morbidity and mortality rates if it is not detected in time or is handled inappropriately and requieres close collaboration between surgical teams.[1]
It can manifest clinically as pneumothorax, pneumomediastinum, subcutaneous emphysema, cyanosis, and respiratory failure, leading to cardiac arrest either due to hypoxemia and/or obstructive shock due to tension pneumothorax or cardiac tamponade due to pneumopericardium, as in our case.
The fundamental of anesthetic management is to ensure adequate ventilation. This becomes a challenge since positive pressure ventilation through the ET will cause a loss of tidal volume including anesthetic gases through the tracheal defect in addition to promoting the extension of the tracheal lesion. The airway must be ensured bypassing the lesion, so depending on its level, urgent tracheotomy or selective intubation of the healthy bronchus may be required.
Reference:
1. Yellon, R. F. (2004). Prevention and management of complications of airway surgery in children. Paediatric Anaesthesia, 14(1), 107–111.
Learning Points: Iatrogenic tracheal rupture in the surgical setting is extremely rare but can have fatal consequences. The priority is to maintain the airway and treat complications arising from the injury.

05AP02-07
Ketodex – a weapon to sedate children with spinal muscular atrophy type I (SMA I)

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Background: SMA I is a rare autosomal recessive disorder characterized by loss of motor neurons in the spinal cord. Main features are progressive muscle weakness, respiratory failure, scoliosis and bulbar dysfunction. The onset is usually before 6 months of age and the prognosis is poor, with most patients dying in the first 2 years.
Case report: A 2-year-old female weighing 8,5 Kg was scheduled for a flexible bronchoscopy due to persistent right upper lobe atelectasis and an upper GI endoscopy (EGD) for planning a Nissen fundoplication.
She had progressive SMA I diagnosed at 3 months of age and was medicated with Zolgensma® since she was 6-months-old. She had marked hypotony, short stature, severe scoliosis, and *pectus carinatum*. She suffered from nocturnal hypoventilation requiring NIV for the last 18 months. Bulbar dysfunction was present with severe dysphagia and impaired airway protection.
Considering the risks of respiratory complications, sedation with ketamine and dexmedetomidine was chosen. Standard ASA monitoring was applied. The patient was preoxygenated and a sedation with sevoflurane was started for peripheral intravenous cannulation. Afterwards, a slow bolus of 5mL mixture of ketamine 1mg/kg and dexmedetomidine 1mcg/kg was administered. A nasal cannula provided supplemental oxygen.
Flexible bronchoscopy started after 5 minutes and lasted for 15 minutes. A second bolus of the same dose was administered before the EGD which lasted 10 minutes. Procedures conditions were excellent and the patient maintained adequate spontaneous breathing. Hemodynamic stability was also preserved.
She was admitted to PACU afterwards. No complications were registered and the patient was discharged home after 2 hours.
Discussion: SMA I is a severe condition and respiratory complications are a main concern for the Anaesthesiologist. Despite being off label, the use of ketamine and dexmedetomidine has shown excellent results for sedation in the paediatric population.
In this case, the use of these drugs made it possible to provide adequate conditions for the procedure, without any respiratory or hemodynamic complications.
Reference:
Shababi M, et al.Spinal muscular atrophy: a motor neuron disorder or a multi-organ disease? J Anat. 2014 Jan;224(1):15-28.
Learning Points:
Sedation with ketodex is increasingly used in paediatrics.
Sedation with ketodex allows maintenance of spontaneous breathing.
Correct titration of ketodex allows adequate hemodynamic stability.

05AP02-08
Acute airway obstruction in an infant with herpetic necrotizing tonsillitis: an airway emergency

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Background: Although herpetic necrotizing tonsillitis is rare in children, it may cause airway obstruction which warrants an emergency airway management.
Case report: An 8-month-old boy presented with fever, respiratory distress and leukopenia was diagnosed with acute tonsillopharyngitis. He was prescribed intravenous(IV) C-penicillin and commenced on non-invasive ventilation. At day 3 of treatment, he became more stridorous requiring intubation.
A difficult pediatric airway drill was initiated. Intubation was assisted using Miller blade size 0, CMAC® video laryngoscope following preoxygenation with FiO_2 1.0, IV fentanyl 2mcg/kg and IV succinylcholine 1.5 mg/kg. Endotracheal tube size 3.5 was successfully placed at 2nd attempt as intubation was initially complicated with large amounts of thick copious secretion and oedematous floppy epiglottis.
There was a brief desaturation but immediately improved while the heamodynamics remained stable. The CT scan reported a large multiloculated collection with mild rim enhancement centered at the mucosal pharyngeal space of the peritonsillar and tonsillar region bilaterally, measuring 2.4x3.9x3.8cm. There was a collection that extended to the base of tongue, body of the hyoid bone and the valleculae with evidence of aspiration pneumonia.
Multiple surgical debridement of the naso-oro-pharyngeal showed necrotic areas while serum IgG was positive for herpes simplex(HSV). Clinical and infective parameters gradually improved after 21 days.
Discussion: An upper airway HSV infection may cause adenoid and tonsillar inflammation and hypertrophy[1].
The infection may worsen into necrotising tonsillitis with or without airway obstruction in an immunocompromised or immunosuppressed patient. Anticipation of airway compromise is crucial to ascertain a definitive airway management involving multidisciplinary teams[2]. The role of difficult airway drill is no doubt important.
References:
1. Richardsona,C.*et al*(2018)Necrotizing epiglottitis treated with early surgical debridement: A case report. AmJOtolaryngol.
2. Huang,A.S.*et al*(2019)Focused review on management of the difficult paediatric airway. Indian Journal of Anaesthesia,63(6),428-436.
Learning Points: High suspicion and early diagnosis of herpetic tonsillitis followed by prompt targeted therapy is crucial especially in an immunocompromised/suppressed patient. Early recognition and thorough multidisciplinary team preparation is pivotal to ensure successful difficult airway management.

05AP02-09
Double anaesthetic challenge: foreign body aspiration in a paediatric difficult airway

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Background: We present the case of a near-fatal aspiration in an infant with congenital temporomandibular joint ankylosis (CTJA), a maxillofacial disorder which limits the opening of the mouth.
Our aim is to discuss the management of two potentially life-threatening situations – such as foreign body aspiration and known difficult airway – taking place simultaneously in a child.
Case report: A 2-year-old male was brought to the operating room after total insertion of a pacifier in his mouth. His medical history included mouth opening limitation due to CTJA. The child was conscious and his saturation was 89%. The emergency surgical airway pack and the otorhinolaryngologists were prepared, together with two size 4 endotracheal tubes, one supraglottic device, one Airtraq™ videolaryngoscope and a fibrobronchoscope.
After prolonged pre-oxygenation with 100% oxygen with the bed at a 45 degree head-up position, oxygen saturation rose up to 97%. Then, inhalation induction with sevofluorane was started and, while maintaining spontaneous ventilation, a venous catheter was inserted.
Normal laryngoscopy was impaired by restricted mouth opening, but a size 2 Macintosh blade could be introduced into the mouth, revealing the pacifier logged within the upper airway and the digestive tube. We kept the spontaneous ventilation by delivering sevofluorane through a nasal cannula, and then we introduceda Magill forceps into the mouth, in order to fold the pacifier on itself and remove it.
Discussion: Our case of near asphyxiation required full assessment of the Paediatric Difficult Airway Management Guidelines. The “5-P-Rule” (Anesthesia Plan, Trained staff, Position, Preoxygenation and Adequate depth of anaesthesia) was set in motion.
We could not overcome congenital trismus by using analgesics or neuromuscular-blocking drugs, so, our main plan was maintaining the spontaneous ventilation. Our backup-choices were intubating through the nose or performing a tracheostomy.
Children with airway obstruction present a high number of complications resulting from inadequate management, poor knowledge of the paediatric airway physiology and shortage of material for this age group and scenario.
Learning Points:
- Emergencies related to paediatric airway management not only can be technically demanding but require great experience to judge correctly.
- Non-adquired trismus do not improve with paralyzed agents or narcotics.
- Team work is crucial to obtain the best results in a crisis.

05AP02-10
Post-extubation negative pressure pulmonary oedema: role of lung ultrasonography: a paediatric case

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Background: Post-extubation negative pressure pulmonary oedema (NPPE) is a rare potentially life-threatening complication.[1] This noncardiogenic pulmonary oedema can occur after acute upper airway obstruction.[1]
Case report: A 16yo male, ASA II, was scheduled for right tympanoplasty. A balanced general anaesthesia was conducted. The surgery was uneventful. A few minutes after extubation, patient developed laryngospasm, which was promptly resolved. Upon arrival at the post-anaesthesia care unit, the patient started to cough and a pink frothy sputum was observed. Physical exam revealed fine crepitations in all lung fields.
A lung point-of-care ultrasonography was carried out and more than 3 B-lines per intercostal window were found in all lung fields, suggesting an alveolar-interstitial syndrome (Figure 1). The chest x-ray also showed bilateral pulmonary infiltrates.
Discussion: High negative intrathoracic pressure can lead to noncardiogenic pulmonary oedema, due to increased pulmonary blood flow and alveolar-capillary membrane disruption.[1]
Diagnosis of NPPE is based on the medical context supported by imaging studies. Ultrasound can mark the difference in this field providing fast, bedside and dynamic diagnosis without constant exposure to radiation, an issue in the paediatric population.[2-3]
The number of B-lines offer a semiquantitative measure of extravascular lung water.[2-3]

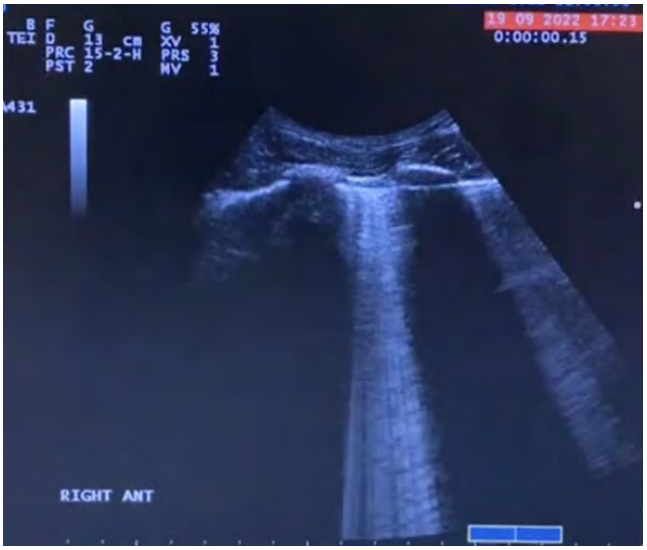

Figure1. Lung ultrasound: B-lines.

References:
1. Lemyze M, et al. Understanding negative pressure pulmonary edema. Intensive Care Med. 2014, 40:1140–3.
2. Maw AM, et al. Diagnostic Accuracy of Point-of-Care Lung Ultrasonography and Chest Radiography in Adults With Symptoms Suggestive of Acute Decompensated Heart Failure: A Systematic Review and Meta-analysis. JAMA Netw Open. 2019 Mar 1;2(3):e190703.
3. Nakao S, et al. "Diagnostic Accuracy of Lung Point-Of-Care Ultrasonography for Acute Heart Failure Compared with Chest X-Ray Study among Dyspneic Older Patients in the Emergency Department." The Journal of Emergency Medicine, vol. 61, no. 2, Aug. 2021, pp. 161–168.
Learning points: Bedside ultrasound has become a potential diagnostic tool, useful in several clinical emergency settings.

05AP02-11
Ketamine-Dexmedetomidine combination for the pediatric difficult airway: the perfect combo?

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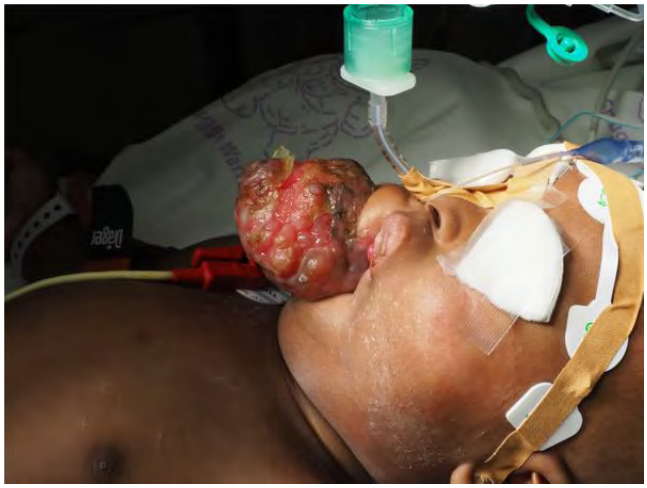
Background: The pediatric difficult airway is a challenge for the anesthesiologist. Compared to the adult population, mild sedation with topical anesthesia is difficult to complete since pediatric patients will not be able to cooperate during an awake intubation.
Ketamine and dexmedetomidine are two drugs with complementary effects that can be used to maintain ventilation without compromise of airway reflexes and suitable for the management of pediatric difficult airway.
Case report: A pediatric patient five-month-old with the diagnosis of a primary palatal teratoma was proposed for surgical excision of the tumor, preferably with nasal intubation to accomplish better surgical access.
There were two major challenges to solve: the airway approach and the sedation for the airway approach. Face mask ventilation was impossible due to the size of the teratoma and there was the risk of airway patency loss if a standard induction was used.
We chose to do a sedation with a mixture of ketamine and dexmedetomidine intravenously and topical airway anesthesia with lidocaine. Oxygenation and monitoring of the end-tidal CO_2 was accomplished by introducing an uncuffed tube through the left nostril, as a nasopharyngeal airway, connected to the ventilator.
The plan A was nasal fiberoptic intubation, plan B videolaryngoscopy and plan C tracheostomy. The sedation was adequate, and we had no apnea, no desaturation, and no airway reactivity during the airway manipulation, accomplishing a nasal intubation. Surgery was completed and the patient was extubated at the end of the procedure.



Discussion: Airway planning is essential for successful management of the pediatric difficult airway. Ketamine and dexmedetomidine provide excellent conditions for airway manipulation without

compromise of ventilation and airway reflexes. The pharmacological effects of these drugs balance each other, with minimal side effects, suitable for the pediatric population.

Learning points: Ketamine and dexmedetomidine combination for sedation may be the perfect combination for the management of difficult airway in the pediatric and uncooperative patient.

05AP03-01
Erector spinae plane block for open nephrectomy in an infant - case report

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Background: Open nephrectomy is associated with severe acute pain after surgery.[1] A combination of general anesthesia and a loco-regional technique, such as thoracic epidural or paravertebral block, has been widely described for the pain management of open nephrectomy in pediatric patients. The erector spinae plane (ESP) block is a relatively new regional anesthetic technique.[2]

Apart from case reports and small series, the literature regarding pediatric use is limited.[2]

We report a successful case of a single shot ESP block combined with general anesthesia for open nephrectomy in a pediatric patient.

Case report: A 9-month-old male infant, 9,5 kg, ASA III, diagnosed with a left Wilms tumor with no intravascular invasion, was proposed for total open nephrectomy. Apart from an increased abdominal volume, the infant was asymptomatic.

After parental consent, inhalation induction and tracheal intubation were performed. The ESP block was part of a multimodal perioperative analgesia that also included intravenous lidocaine, ketamine and paracetamol.

The patient was placed on the right lateral position and after adequate asepsis, a high-frequency ultrasound probe was placed in the sagittal plane over the spinous process of the T7 vertebra and was moved laterally until visualization of its transverse process.

After identification of the erector spinae muscle (ESM), a total of 5 ml of 0.2% ropivacaine was injected unilaterally, between the transverse process and the ESM, using an in-plane needle technique.

The intraoperative period was uneventful. Intravenous paracetamol was prescribed every 6 hours along with morphine for rescue. Postoperative pain FLACC score remained low (0-1) and no rescue analgesia was needed.

Discussion: Fascial plane blocks like the ESP block are technically easier to perform compared with neuraxial and targeted nerve blocks and relate with fewer serious side-effects.[1]

In our case, the ESP block was an effective and safe alternative for pain management regarding open nephrectomy in an infant.

References:

1. E Chapman, FRCA, AC Pichel, MB ChB FRCA, Anaesthesia for nephrectomy, *BJA Education*, Volume 16, Issue 3, March 2016, Pages 98–10.

2. Holland, EL, Bosenberg, AT. Early experience with erector spinae plane blocks in children. Pediatr Anesth. 2020; 30: 96–107.

Learning points: The ESP block may be considered a safe and effective alternative in the management of postoperative pain associated with thoraco-abdominal procedures in pediatric patients.

05AP03-02
Neonatal brachial plexus palsy. Is there any surgical solution? The paper of target controlled infusion system and the specific anesthetic management in these situations

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Background: Brachial plexus is a structure formed by cervical and thoracic nerve roots that innervate upper limb skin and muscles. Multiple conditions could damage it in the neonatal stage. Due to the scientific lack of evidence, there are controversies about its etiology and management. It would be necessary a multidisciplinary approach between anesthesiologists, surgeons, and neurophysiologists.

Total intravenous anesthesia (TIVA) and target controlled infusion (TCI) as well as new perioperative neuromonitoring resources have been developed in pediatric patients and have become an alternative in these cases based on recent studies.

Case Report: The patient was a 3-month-old female who presented left brachial plexus palsy after an abnormal delivery. Surgical treatment was decided to repair the left upper limb nerve injury.

Specific anesthetic considerations were taken, avoiding neuromuscular blockers and volatile anesthetic agents for an adequate neuromonitoring; using TIVA based on TCI system (ELEVELD Propofol model) and multimodal analgesia with dexmedetomidine, lidocaine, fentanyl, and ketamine; monitoring basic hemodynamic and respiratory parameters as well as Bispectral Index (BIS) and Near Infrared Spectroscopy (NIRS). Surgery was uneventful with the patient being transferred to the ICU and discharged on post operatory day two.

Discussion: Even though TIVA and TCI have been useful tools in adults, new pharmacokinetic and pharmacodynamic models for pediatric patients have been developed last years. There are still many issues to improve the accuracy of these systems and it will be necessary to continue in this direction.

Also, neuromonitoring in pediatric patients has become a defy. Even if the brain has not reached its maturity, they have shown benefits and we have to continue investigating these technological devices.

References:

1. Brian J. Anderson, Oliver Bagshaw; Practicalities of Total Intravenous Anesthesia and Target-controlled Infusion in Children. *Anesthesiology* 2019; 131:164–185.

2. Grasso C, Marchesini V, Disma N. Applications and Limitations of Neuro-Monitoring in Paediatric Anaesthesia and Intravenous Anaesthesia: A Narrative Review. J Clin Med. 2021 Jun 15;10(12):2639.

Learning Points: Pediatric anesthesia presents challenging pathologies with a complex management. Thus, we must continue researching along these lines, developing new anesthetic alternatives, or adapting those validated in adults.

05AP03-03
Management of an infant for thrombectomy under cardiopulmonary bypass

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Background: Extensive venous thromboembolism is a rare complication of central venous line usage in the neonate. This case report describes the perioperative management of a neonate with life-threatening thrombus occluding bilateral subclavian and internal jugular veins needing urgent thrombectomy under cardiopulmonary bypass.
Case report: A 5-month-old former 29-week male infant presented with a large left innominate vein thrombus and resultant SVC syndrome. This non cerebral thrombotic event was a result of an indwelling central line catheter. Patient was medically managed with oral Aspirin and intramuscular enoxaparin followed by Alteplase (tPA) for 72 hrs.
However, there was no response to this treatment and the follow up CT scan was notable for left brachiocephalic/SVC calcified thrombus with persistent occlusion of the bilateral subclavian and internal jugular veins and extensive venous collateralization. Factor Xa assay to monitor anticoagulant effects indicated anti-Xa level in the range of 0.7- 0.88 IU/ml.
Decision was taken to surgically manage the thromboembolic pathology.
We obtained a pre CPB ROTEM values. Surprisingly the ROTEM parameters were within the normal range.
Total CPB time was 104 minutes. Post CPB ROTEM obtained 10 minutes post-CPB.
Clinically there was evidence of clot formation at the incision site and chest tube (CT) drainage was not concerning in the operating room. The decision was taken to closely monitor the patient and transfuse the blood products as needed in the pediatric intensive care unit (PICU) to avoid circulatory fluid overload.
Postoperative labs: hematocrit of 33.6%, fibrinogen of 60 mg/dl, platelet count of 76,000/μL. Prothrombin time, partial thromboplastin time and INR were 21.3 sec, 76.2 sec and 1.8 respectively. Approximately 7 hours post-operatively the hematocrit trended downward to a value of 25.3%. Considering low hemoglobin and high INR, patient received 10 cc/kg FFP.
Over the next 7 hours hematocrit further trended down to 18.9%, INR 1.3, platelets 95,000/ μL, and fibrinogen 116 mg/dl. Patient was given 10cc/kg platelets and packed red cells. The laboratory values normalized, and CT drainage was 0-2 cc/hr. Patient was hemodynamically stable during the PICU stay.
Discussion: Immediate post-CPB ROTEM values did not correlate with the CT output, however the ROTEM information did tend to imply a possibility of a weak clot and need for vigilance and blood loss monitoring.

05AP03-04
Bilateral continuous infusion erector spinae block for Nuss procedure: a safe and effective approach

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Background: The erector spinae plane (ESP) block is a newer regional anesthetic technique that can be used to provide analgesia for a variety of surgical procedures. The Nuss technique for pectus excavatus repair, although minimally invasive results in severe postoperative pain.
Case report: A 15 year old boy with pectus excavatum with no other relevant medical history underwent a Nuss procedure. A bilateral continuous erector spinae plane (ESP) was performed under GA to provide analgesia during the intraoperative and postoperative period.
The patient was placed on the left lateral position and, following asepsia, T6 to T7 right paravertebral ultrasound was performed using a high-frequency linear probe. A bolus of 20ml of Ropivacaine 0.2% was injected before surgical incision, between the transverse process and the erector spinae muscle (ESM), using an in-plane needle technique.
After the bólus, an echogenic catheter-over-needle system was inserted deep into the ESM under ultrasound control. The catheter was secured with FixoCath. Similar steps were performed on the contralateral side. During the procedure, the patient also received a multimodal intravenous analgesia regimen with lidocaine, dexamethasone, ketamine, acetaminophen, tramadol and morphine.
The intraoperative period was uneventful. Postoperative analgesia included acetaminophen 6/6h, ketorolac 8/8h, tramadol 8/8h plus a continuous ESP bilateral infusion of Ropivacaine 0.2% at 12ml/h and morphine for rescue.
The patient's Visual Analogue Scale (VAS) score at rest in the first 24 h was 2. Postoperative VAS score remained low (1-3) and bilateral ESP catheters were removed on the fourth day after surgery. No opioid rescue analgesia was needed and none postoperative complications were recorded.
Discussion: The Nuss procedure has been associated with significant and prolonged postoperative pain. In this case report we demonstrate that bilateral continuous ESP block provides safe and effective pain management as part of multimodal analgesia in Nuss procedure for pectus excavatum repair.
Reference:
David P. Bliss Jr. et al; Ultrasound-guided erector spinae plane block versus thoracic epidural analgesia: Postoperative pain management after Nuss repair for pectus excavatum; J Pediatr Surg. 2022; 57, P207-212
Learning Points: Ultrasound-guided erector spinae plane block has been used in a few centers as a feasible, safe, and effective alternative to epidural regimens.

05AP03-06
Challenges in the anesthetic management of pediatric patient undergoing surgery for removal of 14 hydatid cysts located on liver

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Background: *E granulosus* is a cosmopolitan parasite, and endemic regions exist in each continent. Individuals of all ages are affected. In some endemic countries, children have higher infection rates because they are most likely to play with dogs. Multiple liver cysts in the pediatric age group is relatively uncommon. We report a rare case of a 6-year old female with approximately 14 hydatid cysts on the liver and a single cyst on the left upper lobe of the lung.
Case report: She was admitted to the hospital with abdominal pain and difficulty breathing with a history of a rash the day prior. The CT scan showed multiple cysts on the liver and a single major cyst on the lung. A surgical removal of the cyst in the lung was performed. The real challenge was the multiple cysts on her liver.
The patient went through second surgery in which cystectomy was performed and all of the fourteen cysts of the liver were successfully removed.
This is a report of our experience with anesthetic management considering the possible complications such as anaphylaxis and hemorrhage. The blood loss was successfully substituted with SAG-M, FFP, cryoprecipitate and Tranexamic acid.
During the removal of the cysts only one of them had ruptured and spilled in the surrounding tissue but was immediately aspirated and managed with antihistaminic and corticosteroid drugs IV. No signs of anaphylactic shock have developed after. She was transferred to surgical ward from intensive care unit on her 17th postoperative day.
Discussion: In conclusion, hydatid cysts are seen in children of all ages and localization in the lungs is more common than the liver. This case had an unusual presentation of multiple liver cysts in a 6-year old girl.
References:
1. Hydatid Disease. Spector JM, Gibson TE. *Atlas of Pediatrics in the Tropics and Resource-Limited Settings*. Elk Grove Village, IL: American Academy of Pediatrics; 2009. 113-117
2.Brunetti E, Junghanss T. Update on cystic hydatid disease. *Curr Opin Infect Dis*. 2009 Oct. 22(5):497-502. [QxMD MEDLINE Link].
3.Todorov T, Boeva V. Echinococcosis in children and adolescents in Bulgaria: a comparative study. Ann Trop Med Parasitol. 2000;94(2):135–144. doi: 10.1080/00034980057473. [PubMed] [CrossRef] [Google Scholar]
Learning points: Consequently, a close monitoring for anaphylactic reaction and providing hemodynamic stability considering the location of the cysts, are essential to produce the best outcome.

05AP03-07
Central venous line placement that could have been fatal: CVC malpositioning and consequent haemothorax in two newborn babies with congenital heart desease

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Background: Central venous catheter (CVC) placement requires training and experience and is not without risk for patients, even when performed by skilled professional. In babies with congenital heart defects malpositioning of the CVC are usually attributed to variations in the venous anatomy. A common congenital variation with clinical significance is a persistent left-sided SVC, which is seen in 4,3% of patients with congenital heart desease(1).
Case Report: We present you two case reports of small babies, less than 5kg, with congenital heart desease, who underwent CVC placement in the left internal jugular vein with ultrasound guidance. During the procedure there were no complications, and the guidewire and catheter went into the vein without any obstructions in both cases.
In both cases the catheter tip was misplaced in the hemiazygos vein and there was a subsequent leftsided hemothorax. In both cases, later we discovered venous anatomical variation with persistent left sided SVC. Fortunately, both babies had good outcomes after the CVC was pulled out and pleural drain was inserted.
Discussion: An understanding of the more common congenital anatomical variations is important for those regularly placing CVCs. Embryological variations such as a persistent left-sided superior vena cava are often diagnosed incidentally only after placement of a CVC, which is seen to take an abnormal course on X-ray.
Minor vein wall tears are common and generally will go unrecognized during guidewire/dilator/catheter insertion, and are usually without consequence as the low-pressure system is tamponaded by the surrounding structures.
Major bleeding can occur when a tear connects to a low-pressure body cavity (such as the pleural, peritoneal, or pericardial spaces). Massive haemothorax can occur due to uncontrolled bleeding and is exacerbated by infused fluids through a misplaced catheter within the pleural cavity(3).
References:
1. Wang L, Liu ZS, Wang CA. Malposition of Central Venous Catheter: Presentation and Management. Chin Med J (Engl). 2016 Jan 20;129(2):227-34. doi: 10.4103/0366-6999.173525. PMID: 26830995; PMCID: PMC4799551.
2. Gibson F, Bodenham A. Misplaced central venous catheters: Applied anatomy and practical management. *Br J Anaesth.* 2013;110:333–46. doi: 10.1093/bja/aes497.
Learning Points: Anatomical venous variations, congenital heart defects, ultrasound guided CVC placement.

05AP03-08
Anesthetic management in a toddler with type 1 neurofibromatosis

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Background: Neurofibromatosis type 1 (NF1) is an autosomal dominant disorder caused by pathogenic variants in the *NF1* gene that encodes the protein neurofibromin.[1]
NF1 manifestations include pigmentary changes (café-au-lait macules), neurofibromas, increased risk of central nervous system gliomas, higher risk for vasculopathy, which may manifest as renal artery stenosis with renovascular hypertension[2], airway involvement with difficulties in laryngoscopy and tracheal intubation and also central hypoventilation syndromes due to cerebral involvement.[3]
Case Report: We report our anesthetic approach of a 3-year-old toddler with NF1 diagnosis with glioma of the optic pathways and renovascular hypertension, who was proposed for renal artery diagnostic angiography and percutaneous angioplasty.
We performed a balanced general anesthesia using 30 mcg of fentanyl, 40 mg of propofol, 20 mg of rocuronium for induction and intubation was accomplished using direct laryngoscopy with no difficulties.
After induction, a brachial arterial catheter was placed to monitor invasive arterial pressures. Sevoflurane was used for maintenance. Successful catheterization of left renal artery and dilation was accomplished, but right renal artery catheterization was not achieved. The surgical procedure was uneventful, with hemodynamic stability and no need for hypotensive or vasopressor drugs.
At the end of surgery, the patient was extubated uneventfully, and was then transferred to the pediatric intensive care unit.
Discussion: NF1 is a multisystemic disease which result in a wide variety of presentations and clinical implications for the anesthesiologist, such as difficulty on airway approach, central hypoventilation syndromes, altered sensitivity to some drugs and increased risk of renovascular hypertension.
Preoperative evaluation is therefore crucial and the anesthetic plan must be well defined before surgery.
References:
1. Korf,B., et al, *Neurofibromatosis type 1 (NF1): Pathogenesis, clinical features, and diagnosis*, Nov 22;
2. Korf,B., et al, *Neurofibromatosis type 1 (NF1): Management and prognosis*, Nov 22;
3. Bagam, K., et al, *Anaesthetic Considerations in a Patient with Von Recklinghausen Neurofibromatosis*, J Anaesthesiol Clin Pharmacol. 2010 Oct-Dec; 26(4): 553–554.
Learning Points: The disease´s multisystem involvement and all the potential complications associated make the management of patients diagnosed with NF1 a challenge for any anesthesiologist, particularly in pediatrics.

05AP03-09
Emergency vascular access in critically ill baby - the role of intraosseous line

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Background: Vascular access in neonates and preterm infants could be extremely challenging, especially in critically ill or during CPR. Intraosseous lines are alternative[1,2].
There isno difference in pharmacokinetic and type of medication used via i.o. compared to i.v. Associated complications are: osteomyelitis, skin infection, fat embolism, fractures, compartment syndrome, bleeding[1]
Case Report: Preterm infant, born 33g.w, 2200gr with esophageal atresia and tracheal-esophageal fistula. Surgical treatment-lig. fistulae,T-T anastomosis. Complicated postoperative period: prolonged mechanical ventilation, seizures, mediastinitis, fungal neuro sepsis. At 4m transfered to the department, suspected for persisting fistula and malfunction of anastomosis. At arrival: opistotnus, stable hemodynamics, reactive pupils, spontaneous breathing.
Several surgeries were performed, including esophagostoma and gastrostoma. Difficulties in vascular access, including US-guided central venous lines and venesection.1.5 months after admission-leaking CVL (subclavian), massive neck and shoudlers hematoma, PLT 4 (pancytopenia). HR 45/min., impossible noninvasive arterial pressure measurement. US scan of femoral veins:obstruction of left vein (previous CVL), narrowed right vein.
Several unsuccessful attepmts for US-guided CVL in v.fem.dex. Prolonged bleeding. Intraosseous needle was used in tub.tibiae dex. Atropine was administered-immediate response. I.o line was removed in 7 hours following difficult venesection of v.fem.dex. Patient discharged in 3 months: 3440gr., sterile microbiological samples enteral gastrostomic feeding, no neurological symptoms.
Discussion: In deteriorating patients, especially preterm infant, vascular access could be technicaly impossible. No time should be wasted-use i.o line. ERC suggests i.o. access in the course of CPR if no peripheral venous line could be obtained in 5min after initiating CPR[1]. Aseptic and antiseptic rules, anatomical markes, accurate needle size and technique of insertion should be used.
References:
1. Patrick Van de Voorde et al.-European Resuscitation Council Guidelines 2021: Paediatric Life Support, Resuscitation, 2021, vol 161 p327-387.2.Helmut Ellemunter et al- Intraosseous in preterm and full term neonates and infants, 01.01.199, vol. 80, issue 1
Learning Points: I.o. lines are successfully used in critically ill infants. They save lives. We emphasize on prompt i.o. needle use when there is no other vascular access, consdering the balance risk:benefits.

05AP03-10
Caudal anaesthesia for emergent testicular torsion surgery in a neonate with severe aortic valve stenosis Silva I1, Trovisco S2, Guerra M1 1Serviço de Anestesiologia, Centro Hospitalar e Universitário de São João 2Departamento Anestesiologia, Instituto Português Oncologia do Porto

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Background: Neonatal testicular torsion (NTT) occurs in 6.1:100000 births, it can lead to organ loss.2 Emergent inguinal surgery (EIS) is crucial.2 Severe aortic valve stenosis (AVS) accounts for 3–6% of congenital heart defects.1

Anaesthesia for patients with severe AVS undergoing emergent noncardiac surgery is challeging, since it can result in rapid clinical deterioration and mortality.

Case report: A male infant with prenatal diagnosis of severe AVS was born at 38 weeks, through C-section delivery without complications. An echocardiogram shows a dysplastic AV, a peak gradient of 76mmHg, mean gradient of 48mmHg, a wide foramen ovale with left-right shunt and a hypertrophic left ventricle.

A postnatal right enlarged, not transilluminant testicle was observed at day 2 of birth, an emergent orchiopexy was proposed. Informed consent was obtained. A caudal block anaesthesia (CB) with 0.2% ropivaine (6 mg) was performed using a 25G EpicanPaed needle, under sedation with N2O and O2 mixture via face mask.

A sensory T10 level was achieved. Scrotal exploration revealed a non viable testicule, an ochidectomy was performed. Only acetaminophen was used for postoperative pain control. Within 2 days he was discharged without complications.

Discussion: Neonates with AVS are a major anaesthetic challenge, the presence of significant left ventricular outflow tract obstruction may impair cardiac output and coronary perfusion.

Postnatal TT have favorable salvage rates and should undergo emergent surgical intervention, despite the potential anaesthetic risks.3

Our anaesthetic plan was based on the report that heart rate and mean arterial blood pressure are not modified by CB, avoiding potential general anaesthesia haemodinamic instability and postoperative apnea.4 There are no reports of the use of CB for EIS in neonates with AVS.

References:

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2. Gaynor JW et al: Late Outcome of Survivors of Intervention for Neonatal Aortic Valve Stenosis. Ann Thorac Sur,1995 Jul;60(1):122-5
3. Broderick KM et al:The current state of surgical practice for neonatal torsion: A survey of pediatric urologists.Pediatr.Urol(2013)9:542–5
4. Eric L et al:The Hemodynamic Effects of Pediatric Caudal Anesthesia Assessed by Esophageal Doppler.Anesth Analg 2002;94:1165–8

Learning points:A CB is a safe option to perform inguinal procedures in neonates with AVS.

05AP04-02
Development and validation of a risk model for perioperative respiratory adverse events in children undergoing noncardiac surgeries in a low-middle-income-country setting

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Background and Goal of Study: Perioperative respiratory adverse events (PRAE) are the most common child anaesthetic complications. Given the importance of identifying and estimating perioperative risks, especially in low-middle-income countries, this study aimed to identify risk factors, develop and validate a risk model for PRAE and compare its performance with other risk tools in the pediatric population.

Materials and Methods: In a cohort of patients <16 years in two public hospitals in Brazil, we developed and evaluated the performance of a multivariate logistic regression model to predict PRAE, including predictors related to anaesthesia, surgery, and patient clinical condition.

Results and Discussion: The cohort included 1339 patients. PRAE occurred in 214 patients (15.9%). The final model comprehended age <1 year (OR 2.08 95% IC 1.41 - 3.08,) current cold(OR 3.7 95% IC 2.06 - 6.66,), prematurity(OR 2.56 95% IC 1.8 – 3.63,), lung or airway disease(OR 2.17 95% IC 1.55 – 3.05,), and the interaction between tracheal intubation and airway surgery(no airway surgery * tracheal intubation OR 2.13 95% IC 1.40 – 3.24, no tracheal intubation * airway surgery OR 3.16 95% IC 1.49 – 6.68).

It showed good discrimination with an area under the receiver operating characteristic curve (AUROC) of 0.718 (95% CI 0.68-0.756). Calibration was adequate; Hosmer-Lemeshow was 3.06 (p=0.801). Brier score was 0.1204 (95% CI 0.1195-0.1215), which confirmed its excellent overall performance.

The bootstrapping procedure for internal validation provided AUCs varying from 0.707 to 0.717 for each generated sample. Our model had superior accuracy to the COLDS Score (AUROC, 0.717 vs 0.635; p<0.01).

Conclusion(s): We provided a tool to identify children at risk for PRAE and help bedside decision-making in the perioperative process. This model could be tailored to the many varied contexts of low-resource scenarios where perioperative process improvements are still needed.

05AP04-03
Evaluation of cuff pressures of endotracheal tubes inflated by subjective techniques in pediatric patients

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Background and Goal of Study: The cuffed endotracheal tube (ETT) is frequently used in pediatric patients. The cuff pressure is used as an indirect guide to ensure a safe seal and to limit the potential for damage. The gold standard to evaluate cuff pressure is using a pressure gauge manometer. However, having a manometer at every site may not be feasible or cost-effective. There are subjective methods to inflate ETT cuff such as minimum occluding volume technique (MOV) or stethoscope-guided technique (Steth), but these techniques themselves do not provide quantitative measurements of cuff pressure, so their results must be measured against a pressure gauge manometer. The present study aimed to evaluate the mean cuff pressures in pediatric patients whose ETT cuff was inflated using the MOV or Steth technique.
Materials and Methods: The present study was a prospective observational study in the operating room, at the Faculty of Medicine, Khon Kaen University, Thailand. Our participants were pediatric patients aged 2-7 years with ASA I or II who underwent elective surgeries under general anesthesia with cuffed ETT from August 2021 to February 2022. A pediatric anesthesiologist inflated the cuff of ETT using either the MOV or Steth technique at their discretion, then an anesthetic nurse recorded the cuff pressures using a pressure gauge manometer. The primary outcome was the mean cuff pressure. The secondary outcomes were incidences of achieving targeted cuff pressures (20-30 cmH_2O), inappropriate cuff pressures, factors that associated with inappropriate pressure, and post-intubation complications within 24 hours after intubation.
Results and Discussion: Sixty-four pediatric patients were enrolled and included for analysis. The mean cuff pressure of all ETT sizes was 26.52 ± 8.68 cmH_2O. The targeted cuff pressure was achieved in 46.88% of the patients, while overpressure happened in 32.81% and underpressure in 20.31% of the patients. The MOV and Steth techniques achieved the correct pressure level in 53.33% and 46.67% of the patients, respectively. Other factors were not associated with inappropriate pressure. The median time from intubation to extubation was 88.5 (70-141.5) minutes. There were no post-intubation complications.
Conclusion(s): The MOV and Steth techniques result in a significant chance of overpressure and underpressure. In patients with expected long intubation time and/or risks of aspiration, pressure gauge manometer may be a safer choice.

05AP04-05
Perioperative mechanical ventilation in children: a cross-sectional observational study

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Background and Goal of Study: Postoperative pulmonary complications (PPCs) are common in children. In adults, PPCs are associated with ventilator settings. Guidelines and studies of perioperative ventilator settings in children are lacking. Consequently, variance in practice could be substantial. The aim of this study is to describe the current practice of perioperative mechanical ventilation in children under general anesthesia and to determine associations between practice and outcome. We hypothesize that ventilator settings are associated with PPCs.
Materials and Methods: This is a single center prospective observational cohort study of children undergoing mechanical ventilation during general anesthesia. During a 4-week period children were included. Exclusion criteria were objection for participation, age above 18 years, receiving extracorporeal circulation or one-lung ventilation. During general anesthesia ventilator settings were recorded. PPCs were defined as in the LAS VEGAS study. (1) PPCs were recorded daily until discharge or postoperative day 5. Associations between ventilator settings and PPCs were analyzed by a univariate logistic regression model as an exploratory analyses, as this study was not powered for this endpoint.
Results and Discussion: A total of 142 patients were eligible for analysis of which the majority was male (64%). The median age was 6.0 years [IQR: 1.0-13]. Most patients underwent general (20%), urologic (23%), orthopedic (15%), ENT (16%) or plastic (15%) surgery. The majority of patients were ventilated using an endotracheal tube (61%), a supraglottic device was used in 39%. Ventilator settings varied among patients and only respiratory rate was associated with PPCs. (table 1) 10 out of 142 patients (8.5%) developed PPCs.

	All patients N = 142	Univariate logistic regression	
		OR (95% CI)	P-value
V_T (ml/kg)	6.4 [5.3-7.5]	0.96 [0.73-1.13]	0.70
P_{max} (cm H_2O)	13 [11-16]	1.05 [0.91-1.20]	0.46
PEEP (cm H_2O)	4.7 [3.1-5.0]	1.26 [0.90-1.79]	0.19
Respiratory rate (1/min)	18 [14-24]	1.14 [1.04-1.27]	0.006
FiO_2 (%)	49 [40-72]	1.01 [0.99-1.04]	0.30
Driving pressure (cm H_2O)	9 [7-13]	1.03 [0.86-1.19]	0.72

Table 1. Practice of ventilation and associations with outcome. Ventilatory variables and parameters are presented as median and IQR. ORs are calculated for an increase of 1.
Abbreviations: Fraction of Inspired Oxygen (FiO_2), Maximum Airway Pressure (P_{max}), Tidal Volume (V_T)

Conclusion: In this cohort of children undergoing general anesthesia ventilator settings and parameters varied between patients. A higher respiratory rate was asscociated with an increased risk of developing PPCs.
Reference:
1. Eur J Anaesthesiol 2017; 34:492

05AP04-06
Direct versus video laryngoscopy with standard blades for neonatal and infant tracheal intubation with supplemental oxygen: a multi-centre, non-inferiority, randomized controlled trial

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Background and Goal of Study: Tracheal intubation in neonates and infants is a potentially life-saving procedure. Videolaryngoscopy (VL) has been found to improve first attempt tracheal intubation success and reduce complications compared to direct laryngoscopy (DL) in children less than 12 months. Supplemental, periprocedural, oxygen may increase the likelihood of successful first attempt intubation due to an increase in safe apnea time. This multicenter, prospective randomized controlled trial tested the hypothesis that direct laryngoscopy is not inferior to videolaryngoscopy when using standard blades and supplemental oxygen is provided.
Materials and Methods: From 26.10.2020 to 11.3.2022, we randomly assigned 250 neonates and infants aged less than 52 weeks post-menstrual age scheduled for elective tracheal intubation to either DL or VL (1:1 ratio) at seven tertiary level pediatric hospitals in Australia, Canada, Italy, Switzerland and USA. All infants received supplemental oxygen (1 L/Kg/min) during laryngoscopy until the correct tracheal tube position was confirmed. The primary outcome was the proportion of first-attempt tracheal intubation success between the two groups. A 10% non-inferiority margin between DL or VL was applied.
Results and Discussion: 244 patients were included in the final analysis. There is insufficient evidence that DL is non-inferior to videolaryngoscopy ($p>0.99$). First-attempt tracheal intubation success rate with no desaturation was higher with VL (89.3%; n=108/121) compared to DL (78.9%; n=97/123), with an adjusted absolute risk difference 9.5% [95%-CI: 0.8-18.1%]; $p = 0.033$). The incidence of oxygen desaturation between the two groups was comparable (-2.5% [95%-CI: -9.6% to 4.6%]; $p = 0.490$). This international trial confirmed that first-attempt success rate for tracheal intubation in anesthetized neonates and young infants is significantly higher with VL than with DL. The low incidence of complications in both groups, might be related to the use of continuous supplemental oxygen and the expertise of staff at the tertiary level pediatric hospitals involved.
Conclusion(s): The combination of videolaryngoscopy and supplemental oxygen should be considered a standardized practice when neonates and infants are intubated for general anesthesia. The exact amount of oxygen to be delivered needs to be determined.

05AP04-07
Pediatric neck rescue: randomized comparison of two emergency approaches to the trachea in an advanced simulated rabbit model

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Background and Goal of Study: The rapid-sequence-tracheotomy (RST) and the scalpel-bougie-tracheotomy (SBT) are two recently introduced approaches that have explored establishing emergency front of neck access (eFONA) in an unanticipated difficult paediatric airway situation using a rabbit cadaver as a simulator. The objective of this study was to assess the two techniques in a simulated environment with enhanced realism including operative haemorrhage.
Materials and Methods: 30 doctors were allocated to two groups for this randomized controlled cross-over equivalence trial. After watching an illustrated training video and practicing one of the eFONA techniques four times, participants performed one final tracheotomy which was video recorded and rated. This sequence was then repeated for the other eFONA technique. Randomization determined whether the RST or SBT-technique was done first. Primary outcome was the comparison of the performance times between two surgical rescue techniques. Secondary outcomes included success rate, structural injuries, and subjective participant self-evaluation of their performance.
Rabbit cadavers were acquired commercially and had been slaughtered exclusively for food purposes in accordance with the Swiss law in the presence of the cantonal veterinarian of the canton of Aargau. Based on previous data, we chose an equivalence margin of $\Delta = \pm 10$ seconds with respect to the duration of the procedure.
Results and Discussion: The two techniques were not equivalent with respect to the predefined margin of +/- 10 seconds. The median-time difference of 11.0 (95% CI: -4.9 – 29.0) seconds serves as weak evidence suggesting shorter performance time for the the SBT, yet there was no significant difference between the performance times of the two techniques ($p = 0.07$). The overall success rate was 93.3% (CI: 83.8% – 98.2%). Participants expressed a significant highly preference for the SBT-technique ($p < 0.001$). The median performance time difference exceeded our equivalence margin of 10 seconds and therefore we did not find equivalency between the two techniques. Nonetheless there was no significant difference between the performance times of the two techniques.
Conclusion(s): Previously inexperienced clinicians can acquire the skillset needed to perform eFONA in small children in about a minute, by watching training videos. Fewer tracheal injuries and participants' indicated preferences may favour the SBT.

05AP04-08
CLOCKS kids observational study: do children experience phase shift of sleep-wake timing after anesthesia?

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Background and Goal of Study: Good sleep is essential for normal development and good health. Disturbance of the circadian timing system has negative effects on health in both adults and children. The perioperative phase is filled with disturbances of the circadian timing system and sleep. In adults, we found a phase advance on the night before and two nights after surgery and general anesthesia. However, there is no research on phase shifting of sleep-wake timing and post-operative sleep quality in children. We hypothesized that children would show a similar phase advance after general anesthesia (both for surgery and MRI) and would have lower sleep quality the week after surgery.
Materials and Methods: In this single centre prospective cohort study, we aimed to include 50 children scheduled for elective surgery with general anesthesia and 50 children scheduled for an MRI-scan with general anesthesia aged 1 to 11 years. Pre-operative chronotype, sleep-wake timing and sleep quality were determined with the Children's Chronotype Questionnaire and Children's Sleep Habits Questionnaire (CSHQ) respectively. Night-to-night changes in sleep-wake timing were assessed peri-operatively from 3 nights before until 7 nights after surgery. Post-operative sleep quality was assessed with a second CSHQ 7 nights after surgery.
Results and Discussion: Preliminary analysis was done on the first 44 patients (32 surgical patients, 12 MRI patients), with a median age of 5 (IQR 1 – 7 years). Midpoint of sleep three nights before surgery had a mean of 01:49 (SD 0:43), which shifted to 01:33 (SD 0:52) the night after surgery ($p = 0.028$). Midpoint of sleep the night before surgery showed a similar phase advance (to 01:34 (SD 0:48), $p = 0.031$). Sleep quality was the week after surgery was comparable to the week before surgery, with a mean preoperative score of 18.00 (SD 5.15) and mean post-operative score of 18.87 (SD 5.57) ($p = 0.664$). These results are in conjunction with the phase advance found in adults, although the phase shift in children is slower. However, adults also had a decrease in sleep quality, which wasn't found in children, possibly due to the smaller sample size. Inclusions are still ongoing and expected to be complete in May 2023.
Conclusion(s): In this preliminary analysis, we found a significant phase advance in perioperative sleep-wake timing in children 1-11 years old. Furthermore, postoperative sleep quality was comparable to preoperatively.

05AP04-10
Depth of anesthesia in pediatric patients: a prospective observational trial

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Background and Goal of Study: The optimal depth of anesthesia in the case of measurement using the bispectral index (BIS) is between the values of 40 - 60. Shallow general anesthesia (BIS over 60) may be associated with an increased incidence of perioperative wakefulness episodes. Deep anesthesia (BIS below 40) can lead to a more frequent occurrence of adverse effects of anesthesia, including hemodynamic instability.1
The primary aim of the study is to evaluate the cumulative time spent outside the recommended depth of anesthesia as measured by the bispectral index, when measured from the beginning to the end of the surgery. The secondary aim of the study is to evaluate the incidence of episodes outside the established range of depth of anesthesia and the anesthetist's ability to respond to fluctuations.
Materials and Methods: The trial was designed as a prospective observational trial. Patients from 1 year to 19 years who underwent general anesthesia from January 14, 2022 to November 28, 2022 with an expected surgery duration of more than 60 minutes were included in the study. BIS monitoring was blinded to the anesthesiology team. The start of BIS monitoring was recorded at the beginning of the surgery and ended at the end of the surgery.
Results and Discussion: 63 patients were included in the study. The average surgery time was 72.5 minutes. The average time spent outside the BIS 40 - 60 was 29.1 minutes. The average percentage time spent outside BIS 40-60 was 40.7 %. The average number of episodes outside BIS 40-60 was 4.7/anesthesia. The average number of responses to fluctuation outside BIS 40-60 was 0.3/anesthesia. The anesthetist responded to a fluctuation outside BIS 40-60 in 6.8 % of cases.
Conclusion: The average time spent outside BIS 40-60 was 29.1 minutes, i.e. 40.7% of the total time of anesthesia.
Reference: 1. JOHANSEN, Jay W. Update on bispectral index monitoring. Best practice & research Clinical anaesthesiology, 2006, 20.1: 81-99.
Acknowledgements: This research was supported by Specific University Research provided by MŠMT ((MUNI/A/1105/2022, MUNI/A/1109/2022), supported by MH CZ – DRO (FNBr, 65269705).

05AP04-11
DNA methylation profile in children presenting emergence delirium: an observational and prospective study

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Background and Goal of Study: Emergence *delirium* is frequent in preschool children and can be observed in up to 30% of cases. Although not yet proven, the emergence *delirium* may be related to postoperative cognitive and behavioral changes. The identification of epigenetic alterations could contribute to the understanding of this adverse event. It was hypothesized that postoperative behavioral changes might be related to epigenetic modifications, analyzed through the DNA methylation profile. We aimed to analyze the DNA methylation profile in children presenting emergence *delirium*.
Materials and Methods: An observational and prospective study was conducted to evaluate children aged between one and 12 years undergoing endoscopic procedures under general anesthesia. After Inhalation induction with sevoflurane and a peripheral line in place, 3 mL of whole venous blood were collected. Upon awakening, *delirium* was assessed using the Pediatric Anesthesia Emergence *Delirium* (PAED) scale. In children with a PAED score ≥ 10, the blood sample was sent to analyze the DNA methylation profile. Patients were paired and randomly selected as a control group among those who did not have emergence *delirium*.
Results and Discussion: Eighty-five patients were included. The median age was 4.6 years, and 48 children were male. The incidence of emergence *delirium* was 44.7%. Samples of 16 children with emergence *delirium* and 14 control children were randomly selected for building the DNA methylation profile through an array using the Illumina® platform. The copy number variation analysis observed no pathogenic deletion or duplication in children with emergence *delirium*. Differently methylated sites were observed in the regions of genes *SLC22A23*, *GNA12*, *MATN4*, *RBPJL*, in addition to sites cg01033205, cg17393140, cg11400068, cg15619333, cg03901462, cg02775842 and cg00400810. The *SLC22A23* gene is a large family of transmembrane proteins functioning as uniporters, symporters, and antiporters of organic ions across cell membranes. The *GNA12* gene is a modulator or transducer in several transmembrane signaling systems, in addition to the activation of binding to the dopamine D5 receptor.
Conclusion: Children presenting emergence *delirium* had hypomethylation of the *SCL22A23* gene and hypermethylation of the *GNA12* gene. These epigenetic alterations might be related to the physiopathology of emergence *delirium*, especially in children undergoing repeated anesthesia procedures.

05AP05-01
Anesthetic challenge: management of a patient with dystrophic epidermolysis bullosa undergoing syndactyly release surgery. A case report

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Background: Epidermolysis bullosa is a group of rare inherited diseases. Its main clinical manifestation is the formation of mucocutaneous blisters both spontaneously or after minimal trauma to the skin[1]. One of its major clinical subtypes is dystrophic epidermolysis bullosa (DEB), caused by a mutation on the type VII collagen gene[2]. Patients suffering from this condition can represent a challenge for the anesthesiologist, as many procedures performed involve trauma to the skin and mucosae. In order to avoid skin lesions or more severe events, it is essential to know the principles for its management. Based on the protocol from a reference tertiary hospital, we present a case report and the approaches that were taken.
Case report: 11-year-old female diagnosed with DEB was admitted for elective syndactyly release surgery. Clinical manifestations included extensive skin involvement with blisters and scars, keratitis and esophageal stenosis requiring previous dilations. Assessment of the airway revealed inter-incisor gap< 3cm and presence of severe oral mucosal lesions. Non-invasive monitorization was performed, using non-adhesive patches and pulse oximeter. The team decided to measure blood pressure only when necessary to avoid damage. An intravenous catheter was inserted in the left hand, while another operator performed minimal pressure around her wrist instead of using the elastic band. The catheter was protected with gauze pads covered with vaseline. Then, a dexmedetomidine perfusion was initiated and oxygen was given through nasal cannula. When an adequate level of sedation was obtained, an ultrasound-guided axillary block was performed.
Discussion: During the anesthetic management of patients suffering from DEB is it highly recommendable, if possible, to perform locoregional techniques to protect skin from shear damage. Another essential reason is to avoid manipulation of the airway, because new injury can occur, leading to potential severe complications. Maintenance of spontaneous breathing seem to provide successful results. If puncture is needed, it is advisable to avoid previous harmed areas.
Learning Points: To avoid new harm and potential complications, it is essential to standardize perioperative care given to these patients, from the right monitoring selection to the proper anesthetic technique. As DEB is a really unusual disease, we consider relevant to report cases of successful anesthetic management in patients with this condition.

05AP05-02
Anaesthetic approach to an open paraganglioma resection in a pediatric patient – a case report

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Background: Paragangliomas (PGL) and pheochromocytomas are chromaffin cell tumors. The overall annual incidence is 2-5 cases per million, with only 10% occurring in children.
Case report: We report a case of a 14-year-old girl presented to our hospital with a suspicion of a PGL from the Zuckerkandl organ. She had no previous relevant medical history and the initial symptoms were hypertension, headache, diaphoresis and palpitations. Diagnose was confirmed by the raised catecholamine levels in urine and plasma. Imaging exams showed an isolated left lumbo-aortic, infrarenal mass (3.3x3.9cm). She was proposed for surgery and started phenoxybenzamine titration and high water and salt ingestion. Atenolol was also added, to control persistent tachycardia
Discussion: Anaesthetic management of PGL is challenging. Our goal was to minimize and control the periods of hemodynamic instability, starting with good preanesthetic evaluation, preparation and premedication. Tracheal intubation (TI) is a critical step in these patients, so our initial approach was the placement of an arterial line for continuous blood pressure (BP) evaluation and a second venous access for nitroprusside perfusion. Those were made possible with light general anaesthesia and assisted ventilation. This was followed by TI, other invasive monitorization and a lumbar epidural catheter placement for postoperative analgesia. All those steps elapsed without any type of instability. The surgery began and the near tumor's manipulation imposed us to start and titrated a nitroprusside perfusion, in order to obtain adequate BP. When the vascular drainage of the tumor was interrupted, hypotension occurred due to sudden drop in endogenous catecholamine levels and downregulation of alpha-adrenergic receptors. Thus, we stopped nitroprusside and started a noradrenaline perfusion. An analgesic multimodal strategy was adopted and we started epidural analgesia with an initial bolus followed by an infusion of 0.15% ropivacaine. The patient was extubated in the operation room and transferred to the intensive care unit being discharged after two days.
Reference:
Teng, L. W., et al (2021). Anesthetic Management of Pheochromocytoma in Pediatric Patient—Case Report. Open Journal of Anesthesiology, 11(06), 175–183
Learning Points: Adequate preparation and anticipation of all steps, as well as teamwork and close communication, were essential for the success of the procedure.

05AP05-03
Hyperphenylalaninemia: a case of low protein anesthesia

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Background: Metabolic diseases represent a challenge for anesthesiologists as little is known about the ideal anesthetic management. Hyperphenylalaninemia is an error of metabolism (prevalence 1:10 000) leading to bloodstream accumulation of phenylalanine, which can cause global development delay, seizures and eczema. The treatment consists of a diet without high-protein food. In the perioperative setting, the main goal is to avoid protein catabolism which can ultimately lead to increases in perioperative blood glucose, muscle weakness and respiratory failure.
Case report: We present a 2-year-old girl, 15 Kg, with a history of a well-controlled hyperphenylalaninemia, diagnosed at neonatal period, undergoing amygdalectomy and bilateral myringotomy. The patient was admitted the day prior to the surgery to monitor perioperative fasting and a balanced solution with 5% dextrose was initiated. For anesthesia induction, fentanyl, sevoflurane and rocuronium were used, after which we proceed with endotracheal intubation. After induction, a pharyngeal packing was placed. Maintenance of anesthesia was made with a mixture of air/oxygen and sevoflurane. An infusion of plasmalyte+ 5% dextrose was maintained during all surgery. Nausea and vomiting prophylaxis were made with dexamethasone and ondansetron. For analgesia we administered paracetamol, cetorolac and tramadol and performed a greater palatine nerve blockage. Before anesthetic emergence, the stomach was emptied. Intraoperative and postoperative periods elapsed without complications.
Discussion: Preventing fasting, pain and nausea as the main causes of protein catabolism was the goal in this case. Fasting time was kept the minimal necessary to proceed with the anesthesia, with the patient being allowed to drink a small quantity of clear liquids until 2 hours prior to the surgery. Swallowed blood could also be a source of proteins, so we tried to minimize the ingestion of blood with the pharyngeal packing and the suction of the stomach before anesthetic emergence. Propofol was avoided as both hyperphenylalaninemia and propofol inhibit the activity of mitochondrial complex, leading to hyperthermia and acidosis.
Reference:
Veyckemans, F. V. (2020). *Phenylketonuria and ther hyperphenylalaninemias*. OrphanAnesthesia.
Learning Points: Children with hyperphenylalaninemia can be successfully anesthetized if planned in order to avoid administration of protein-containing drugs and situations that induce protein catabolism.

05AP05-05
Anaesthetic management of congenital lobar emphysema in a four month female infant

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Background: We present the anaesthetic challenges for dealing with a left lobectomy on a 4mths female infant who presented with congenital lobar emphysema (CLE) a rare congenital malformation of lung.
Case report: The 5 kg infant, was diagnosed after signs of respiratory distress and persistent cough and a CT with emphysema in the left upper lobe. In the operating room, preoxygenation and basic monitoring was started. Premedication with iv Atropine 0,05mg and Fentanyl 0,05mg iv and Sedation with iv 10 mg Ketamine, 0,01mg dexmedetomidine and 0,05mg morphine was given, so left femoral artery and right internal jugular vein was cannulated. Trachea was intubated with size 3 mm ID cuffed ETT after Sevoflurane graded induction. The tube was advanced to right lobe. Pressure Support Ventilation was initiated. In right lateral position a US-Guided Ser-

ratus Intercostal Plane (4ml 0.2% Ropi) was performed. Anaesthesia was maintained with Sevoflurane 2% in 80% O2 and supplementary Ketamine. When the thorax was opened cis-atracurim 1mg was administrated and pressure control ventilation was started. After lobectomy, the tube was withdrawn to the trachea to allow recruitment of the remaining left lung. After extubation the infant was cared in PICU. Post operative analgesia was provided by IV paracetamol and continuous interpleural analgesia with Ropi 0.075% 0.3mg/kg/h.

Discussion: Induction of anaesthesia are the most critical phase in the management of children with CLE. Administration of IPPV can increase the amount of trapped gas and result in cardiovascular collapse. We overcame this hazard by keeping spontaneous ventilation both during cannulation -titrating sedation agents- and during intubation and surgery -facilitating analgesia with SIPB. Moreover, the tube was advanced to the right lobe to prevent any air entering left. Good analgesia allowed extubation on the table and was continued in the PICU.

Learning points: In infants operated for CLE, with Dexmetomidine, morphine and ketamine in low doses can facilitate cannulation to allow intubation after full monitoring and central vein access. Preemptive analgesia in the form of SIPB decreases the requirement of inhalational agents and opioids intraoperatively and allow spontaneous ventilation during thoracotomy

Reference:

1. S.Saini, S.Prakash,M.Rajeev, K.Gidhar: Congenital Lobar Emphysema:Anaesthetic Challenges and Review of Literature J Clin Diagn res 2017 Sep;11(9):UD04–UD06

05AP05-06
Anaesthesia management of a child with Hunter syndrome for adenotonsillectomy

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Background: Mucopolysacharidosis type II (MPS II), also known as Hunter's syndrome, is a rare X-linked recessive disorder, characterized by deficiency of lysosomal enzymes, accumulation of glycosaminoglycans in various tissues including airways, which makes airway management challenging.

Case Report: A 3-year-old, 22kg male child, diagnosed with Hunter's syndrome and history of hypoplastic corpus callosum, placed VP shunt for hydrocephalus, mitral insufficiency, dysostosis multiplex, was scheduled for adenotonsillectomy. He had macrocephalia, macroglossia, prognatia, and a short neck, with restricted neck movements, dismorphic facies, generalized stiff joints. The child has been on enzime replacement therapy for two years with echographically diagnosed hepatosplenomegaly. Mouth opening and Mallampati grading could not be assessed as the child was uncooperative.

After atropine-0.2mg and methylprednisolon-0.9mg/kg i.v., induction with Sevoflurane, Fentanyl 1 μg /kg, Propofol 2mg/kg was started. Tracheal intubation was successful with a 4.5 mm ID ETT without using any muscle relaxants due to the possible high risk of respiratory problems and difficult airways. Anesthesia was maintained with 3-3.5‰ Sevoflurane and 75μg Fentanyl as needed. Patient was put on pressure-controlled ventilation, peak airway pressure around 25 mmHg and respiratory rate of 17/min were kept to achieve $EtCO_2$ between 32 and 35 mmHg. Intraoperatively, the child was hemodynamically stable with heart rate 105-115/min, blood pressure 90/40(55)mmHg and SpO_2-99%. Postoperatively paracetamol 200 mg and tramalgin 50mg were given for analgesia. Extubation was uneventful.

Discussion: Anaesthesia management in MPS II patients is a high-risk procedure and a challenge for anesthesiologists, due to possible difficulties in intubation because of anatomical deformities. We report a successful general anesthesia for patient with Hunter's syndrome without using any muscle relaxants.

Reference:

Punj J, Kaler P. Successful anaesthesia management of a child with Hunter syndrome for adenotonsillectomy. Intractable Rare Dis Res.2019 Nov;8(4):286-288

Learning Points: In patients with Hunter's syndrome, a careful anesthesia induction with anticipation of a difficult airway, a careful consideration of the the risks involved in anesthesia management from experienced anesthesiologist , is recommended.

05AP05-08
Anesthesia management in the patient with Tatton Brown Rahman syndrome: a case report

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Background: Tatton-Brown-Rahman syndrome (TBRS) is an overgrowth/intellectual disability syndrome characterized by length/height and/or head circumference ≥2SD above the mean for age and sex, obesity/increased weight, joint hypermobility, hypotonia, psychiatric issues, kyphoscoliosis and seizures[1].

To our knowledge, there is no case presentation regarding anesthetic management in the literature.Patient consent was obtained.

We aim to share our anesthetic management in our patient with TBRS who was referred to our clinic for strabismus surgery.

Case Report: The patient is a 7.5-year-old girl with a diagnosis of TBRS, weighing 31kg(>97p), who was taken to the operating room for strabismus surgery.The patient with a syndromic facial appearance was diagnosed with tracheal malacia at the age of 2.After induction, the patient was comfortably mask-ventilated and intubated with a 5.5 mm cuffed tube on the first attempt.Remifentanil and propofol infusion was preferred for maintenance to reduce the risk of malignant hyperthermia.After operation, muscle relaxation was reversed with sugammadex before extubation.Patient was sent to the wand.

Discussion: Preoperative head and neck examination should be performed to evaluate the patient for a difficult airway.In particular, facial deformity accompanying TBRS will be a determining factor for a difficult airway(1).Although the relationship between TBRS and malignant hyperthermia has not been explained, we performed TIVA anesthesia because the patient had a history of strabismus.We believe that it is necessary to keep antiepileptic drugs ready in the operating room because the risk of intraoperative epileptic attacks(1). The extubation of the patient should be performed by evaluating the lung capacities depending on the degree of kyphoscoliosis and any intraoperative events.

Reference:

1. Ostrowski PJ, Tatton-Brown K. Tatton-Brown-Rahman Syndrome. 2022 Jun 30. In: Adam MP, Everman DB, Mirzaa GM, Pagon RA, Wallace SE, Bean LJH, Gripp KW, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993–2022.

Learning Points: Distinct incisors, macrocephaly, obesity, OSA history, and the degree of scoliosis will be determinant factors for difficult airway.These patients are more sensitive to respiratory depression from sedative, opioid, and inhalation anesthetics.It is advisable to avoid long-acting drugs and high doses.

05AP05-10
Eisenmenger's syndrome: a rare illness diagnosed after idiopathic scoliosis surgery

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Background: Eisenmenger's syndrome is a complication of an uncorrected cyanotic congenital heart disease due to left-to-right cardiac shunts. Resulting pulmonary hypertension (PHT) leads to bidirectional shunting with increasing right-to-left blood flow and consequently perioperative hypoxemia (PeH) and heart failure. Although there is no proven causal link between this syndrome and idiopathic scoliosis (IS), these are known to be comorbid1.
Case report: An 18 year old woman was submitted to an uneventful posterior instrumentation of the spine for IS correction from T6 to L3 under combined anesthesia (endovenous general anesthesia and intrathecal morphine). In the postoperative period, she developed an asymptomatic hypoxemia (PaO2 52,5mmHg), requiring mechanical ventilation. Evaluation of the functional capacity of the patient was compromised by physical limitations due to IS. No signs of pulmonary or cardiac disease were found. Following the postoperative event, a CT angiography revealed a large interventricular shunt, later confirmed by transthoracic echocardiogram along with PHT. After admission to the ICU, she received directed treatment and was extubated after 24 hours. She was then transferred to a cardiology ICU.
Discussion: Surgical stress can unmask undiagnosed chronic congenital cardiac diseases. In this case the patient had one symptom that pointed to a comorbid condition, however the most likely diagnosis would be restrictive lung pathology2. Although a shunt is part of the differential diagnosis of PeH, it is only considered when more common causes are excluded. Despite IS not being associated with other comorbid conditions, a careful preoperative assessment must be done to rule out coexisting pathologies.
References:
1 Tsidiris E, et al. Prevalence of congenital IS in 3538 surviving adolescents with congenital heart disease. Orthopaedic Proceeding. 2018 Feb.
2 Johari J, et al. Relationship between pulmonary function and degree of spinal deformity, location of apical vertebrae and age among adolescent IS patients. Singapore Med J. 2016 Jan.
Learning points:
Early diagnosis of an interventricular shunt is essential, allowing its treatment and preventing PTH from ever developing.
Preoperative cardiac and pulmonary assessment of patients with IS should based on clinical suspicion, location of the apical vertebrae, length of curve and cause of scoliosis. Patients' with congenital scoliosis are more prone to comorbidities.

05AP05-11
Anesthetic management for pediatric patient with Williams syndrome

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Background: Patients with Williams syndrome have neurocognitive, gastrointestinal, endocrine, cardiovascular abnormalities and characteristic facial features that may be associates with difficult intubation. Reduced elastin production is associated with noncompliant vessels and vascular stenosis throughout the body. Patients frequently presents with pulmonary artery stenosis, supravalvular aortic stenosis, coronary arteriopathy, then hypertension and left ventricular hypertrophy (1). Cardiovascular abnormality is the main reason for morbidity and mortality and sudden cardiac deaths (2).
Case report: Our patient was a 4.5-year-old boy, admitted for inguinal hernia surgery in tertiary pediatric hospital. The echocardiographic findings indicated mild peripheral pulmonary stenosis and trace of mitral and tricuspid regurgitation. The ECG findings were normal. The patient had a characteristic facial feature. He had no other health problems, which placed him in the moderate risk group for anesthesia. He ingested clear liquids up to 2 hours before the intervention. He was premedicated with oral midazolam. The iv line was placed in a pleasant environment. Standard monitoring was placed in the operating room. Patient received fentanyl at a dose of 1.5 mcg/kg and was gently induced into anesthesia with propofol. Mask ventilation was successful. Caudal block was applied with 0.25% levobupivacaine and 2mcg/ml fentanyl. Maintenance of anesthesia was with propofol at a dose of 2 mg/kg/h. The patient breathed spontaneously during the intervention. The operation lasted 30 minutes. There were no adverse perioperative events.
Discussion: Detailed preoperative evaluation of the patient, maintenance of spontaneous breathing, sedation with propofol, adequate hydration, pain relief with caudal anesthesia were the main strategies to reduce the risk of complications in moderate-risk Williams syndrome patient.
References:
1. Matisoff AJ, Olivieri L, Schwartz JM, Deutsch N. Risk assessment and anesthetic management of patients with Williams syndrome: a comprehensive review. Paediatr Anaesth. 2015 Dec;25(12):1207-15.
2. Staudt GE, Eagle SS. Anesthetic Considerations for Patients With Williams Syndrome. J Cardiothorac Vasc Anesth. 2021;35(1):176-186.
Learning points: Caudal block and propofol sedation with spontaneous breathing may be the adequate choices for the moderate-risk patient with Williams syndrome.

05AP06-01
Influence of intraoperative fluid balance on the incidence of adverse events in pediatric cardiac surgery

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Background and Goal of Study: Intraoperative fluid management in children undergoing cardiac surgery with cardiopulmonary bypass represents a major challenge for anesthesiologists. We hypothesize that intraoperative fluid balance, contributes to postoperative morbi-mortality in this high-risk population.

Materials and Methods: This retrospective study included all consecutive children admitted for cardiac surgery with cardiopulmonary bypass from 2008 to 2018 in a tertiary children's hospital where clinical practice was standardized. Intraoperative fluid balance was calculated considering all fluids received and lost by the children during the procedure. Fluid balance was categorized in 3 levels within the IQR (P25-P75), within Quartile 1 (<P25) and within Quartile 4 (> P75). Our primary outcome (MODS) was a composite measure including either hospital death and/or the presence of at least 2 of the following events: pulmonary failure, prolonged inotropic support, and renal failure[1]. The effect of categorized fluid balances on MODS was analyzed using Tukey's multiple comparison tests for binary data.

Results and Discussion: A total of 1364 consecutive pediatric patients were included in the study. Median age was 9,6 [IQR 3; 43] months. 57% were male and 13,5% were younger than one month. Overall, median intraoperative fluid balance was 14 [IQR 0; 31] ml kg^{-1}. 342 children (25%) developed MODS. Patients developing MODS were younger, had a lower body weight, had a higher RACHS-1 and ASA score, were more frequently cyanotic, and had longer CPB time, and higher blood losses. A high positive but also a negative fluid balance were significantly associated with a higher incidence of MODS (Figure).

Conclusion(s): In the conditions of our study, intraoperative fluid balance is significantly associated with severe postoperative morbi-mortality. Whether intraoperative fluid balance represents a marker, or a prognostic factor of postoperative morbi-mortality remains to be determined.

Reference:

1. Willems A et al. Eur J Cardiothorac Surg 2014; 45:1050-7.

05AP06-04
Intraoperative management of pediatric renal transplants results and reflections from a tertiary referral center

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Background and Goal of Study: Pediatric renal transplants are commonly performed in the US. Due to the large number of tertiary centers the number of transplants performed at each hospital is small. From 2011-2022 in North Carolina, an average of 9 children <10 years received kidney transplants[1].Pediatric anesthesiologists may not have frequent exposure to these operations. We hypothesized that without guidelines from anesthesia societies, there is wide variability in anesthetic practice.

Materials and Methods: The charts of pediatric renal transplant patients at the University of North Carolina were reviewed. Inclusion criteria were age 0-18 years and dates January 2016–November 2022. Outcomes included volume of fluid administered, hypotension incidence, vasopressor use, invasive monitoring and analgesic methods. Hypotension was defined as >30% drop in mean arterial pressure.

Results and Discussion: Results are summarized in Table 1. 68% required vasopressors. 89% experienced hypotensive events. Patients received a wide range of crystalloid (19.2-126.4 ml/kg) and 5% albumin (0-31.3 ml/kg). Central venous catheters were inserted in 34% and arterial catheters in 53%. 36% received regional anesthesia.

	N = 47
Central Venous Catheter	16 (34%)
Arterial Line	25 (53%)
Hypotension (>30% MAP reduction for 2 consecutive readings)	42 (89%)
Crystalloid Volume (ml/kg)*	55.4 (43.3-71.8)
Albumin Volume (ml/kg)*	7.5 (1.3-13.5)
Vasopressor Administration	32 (68%)

***** *Median followed by interquartile range*

Our review confirmed the hypothesis that there was significant variation in management between anesthesiologists in terms of fluids, hemodynamics and analgesic choice. The incidence of significant hypotension was high. The data revealed the need for a more standardized approach. There are efforts in Europe to address this issue (Anaesthesia Network for Kidney Transplantation in Children)[2].

Conclusion(s): We propose that anesthesia organizations in the US recognize the importance of this issue, and develop an evidence-based consensus-driven approach to intraoperative management of pediatric renal transplants.

References:

1. https://optn.transplant.hrsa.gov/data/view-data-reports/state-data/#
2. https://www.ankitc.eu/

05AP06-05
Does the exaggerated Magill curvature affect the first pass of ETT in paediatrics, a single-centre cross-sectional observational study?

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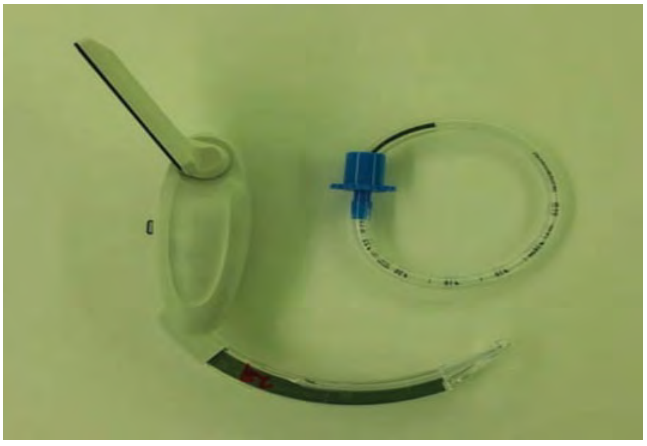
Background and Goal of Study: Airway management in children is a significant challenge for paediatric anaesthetists. Video laryngoscopy, including McGrath, is gaining popularity among anaesthetists because of better glottic views.
However, there are some limitations to their use. Several techniques to increase endotracheal tube insertion success rate using McGrath include using Stylet, Bougie and exaggerating the already present Magill curvature.



Materials and Methods: This cross-sectional study enrolled 197 patients between August and November 2020. Anaesthetists were allowed to use their usual technique for airway management using McGrath. The primary outcome was a first-pass success (FPS) during endotracheal intubation using different techniques. FPS is defined as the placement of the ETT on the first attempt by the anaesthetist. The secondary outcome was reports of complications like desaturation or trauma. Statistical analysis was done using SPSS.
Results and Discussion: All included children were divided into four groups, first group intubation with plain ETT without any modification, second group intubation with Stylet, third group intubation with Bougie and fourth group intubation with exaggerated Magill curvature. One patient was intubated using Stylet ETT, and none with Bougie. The majority of cases were in the plain and exaggerated Magill curvature group. Regarding the primary outcome, there was no statistical difference between the plain and the exaggerated Magill curvature groups (p value=0.336).
Conclusion(s): In our institute, using airway adjuvants (Stylet and Bougie) during airway intubation is not common. The airway can be secured by simple manoeuvring of the ETT by exaggerated Magill curvature, and there was no statistical difference between intubation with plain ETT or exaggerated Magill curvature (p value=0.336).
References:
Fiadjoe JE, Kovatsis P. Videolaryngoscopes in pediatric anaesthesia: What's new? Minerva Anestesiol. 2014;80(1):76–82.
Morgan GE Murray MJ MMS. Clinical Anesthesiology. 4th ed. New York, NY: McGraw-Hill,114;

05AP06-06
Oxidative stress during total intravenous anaesthesia in children: effects of UGT1A9, CYP2B6, and CYP2C9 gene polymorphisms

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Background and Goal of Study: Propofol can inhibit lipid peroxidation in various experimental models in order to protect the cell against oxidative stress and increase the antioxidant capacity of plasma. The goal of this study was to determine the influence of gene polymorphisms CYP2C9 430C> T, CYP2B6 516G> T and UGT1A9 98T> C on oxidative stress in ninety children of different sexes and ages undergoing total intravenous anaesthesia.
Materials and Methods: The study was approved by the Ethics Committee of the Faculty of Medicine in Nis no. 12-8765/9 as well as by the Ethics Committee of the University Children's Clinic in Belgrade no. 26/340 and Ethics Committee of the Clinical Canter in Nis no. 27771/11. Anaesthesia was induced by a bolus dose of propofol from 2.5 to 3.5 mg/kg body weight, after which it was maintained by continuous infusion of propofol via an infusion syringe pump (3-15 mg/kg/h). Five blood samples were taken from each patient included in the study: before propofol administration to determine the presence of gene mutations in propofol degrading enzymes, 10 minutes after induction of anaesthesia, immediately before the end of the propofol infusion, and 10 and 20 minutes after the end of the infusion. HPLC analytical technique was used to measure plasma propofol concentration. Genomic DNA was isolated from whole blood using the commercial QIAamp DNA Blood Mini kit. The presence of polymorphisms was analysed using polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP). The concentration of malondialdehyde (MDA) and advanced oxidation protein products (AOPP) in plasma (μmoL/L) was determined by the spectrophotometric method. The SPSS V 21.0 for statistical data processing was used.
Results and Discussion: No statistically significant influence of CYP2C9, CYP2B6 and UGT1A9 polymorphisms on AOPP concentration was noticed. A trend of lower MDA values, especially 10 and 20 minutes after the end of the infusion, was observed in children with a polymorphic UGT1A9 allele. A negative correlation was found between the concentration of propofol and the concentration of MDA 10 minutes after the intravenous induction and immediately before the end of the continuous propofol infusion.
Conclusion(s): The potential influence of UGT1A9 gene variants on the oxidative stress during surgical interventions in children indicates that further studies on a larger number of patients and genes are necessary.

05AP06-07
Perioperative predictive factors of developing severe morbidity or death in pediatric cardiac surgery: a retrospective study

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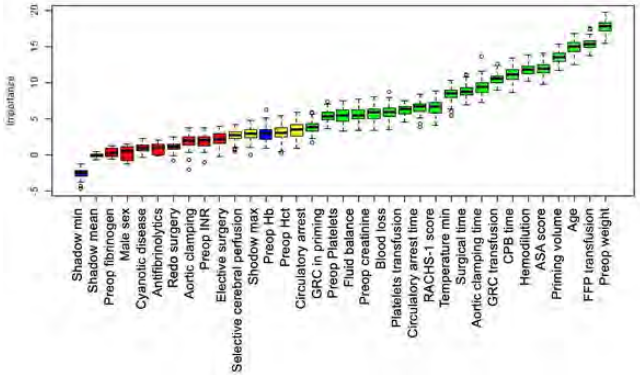
Background and Goal of Study: Despite medical and surgical progresses, pediatric cardiac surgery remains associated with significant postoperative morbidity and mortality. This study aimed at identifying perioperative factors predisposing a child to an unfavorable outcome when undergoing cardiac surgery under cardiopulmonary bypass (CPB). Our primary outcome (MODS2) was a composite measure including hospital death and/or the presence of at least 2 of the following events: pulmonary failure, prolonged inotropic support and acute kidney injury, as defined previously (1).
Materials and Methods: Retrospective, monocentric study including 1,364 consecutive children undergoing cardiac surgery with CPB between 2008 and 2018. We performed 5 multiple imputations via the **mice** R package, and then took the mean of the imputed datasets in order to start the data mining models on a single dataset (33 independent variables). Using the **Boruta** R package, we determined the most important features for prediction of MODS2 using a Random Forest model. Based on a training set (N=1024) and a test set (N=340), 9 data mining models were tested. For all of them, we used a 10-fold cross-validation method on the training set before to apply the retained model on the test set.
Results and Discussion: The **Boruta** R package indicated the variables that are the features most likely to be useful for a data mining algorithm (green on the Figure). We select these data as variables to be entered in a data mining model.Among the models tested, the random forest (RF) and the eXtreme Gradient boosting models had the best overall fitting values. The Youden index indicated that the optimum between sensitivity (0.793) and specificity (0.710) was best for the RF model.



Conclusion(s): Using a data mining approach, our study reported several risk factors that might be modified to improve outcome in this population. Reducing CPB priming volume, adoption of a more restrictive on bypass transfusion strategy and avoiding hypothermia whenever possible could be measures whose effectiveness should be evaluated in future studies.
Reference:
1. Willems A et al..Eur J Cardiothorac Surg. 2014 45:1050–7.

05AP06-08
Simultaneous assessment of regional cerebral oxygen saturation and mean arterial pressure during general anesthesia in neonates

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Background and Goal of Study: Perioperative hemodynamic instability is a common finding during neonatal general anaesthesia (GA). Widening monitored parameters, such as following cerebral tissue oxygenation (rSO_2) changes may help preventing adverse events. NIRS (near-infrared spectroscopy) provides real time information about rSO_2, non-invasively. rSO_2 is influenced by mean arterial pressure (MAP), peripheral oxygen saturation (SpO_2), heart rate (HR) and partial CO_2 tension (pCO_2). HR and SpO_2 are continuous, high frequency and highly reliable parameters, MAP is an intermittent measurement.
Regarding pCO_2, end tidal CO_2 is a proxy, often unreliable measurement. In this study we wanted to assess the incidence rate of episodes of low cerebral oxygenation during neonatal GA.
Materials and Methods: In a tertiary neonatal surgical centre, 62 infants (33 premature- and 29 term neonates) undergoing GA for surgery with continuous rSO_2 registration were enrolled between June 2021 and October 2022. Decreased rSO_2 levels were defined by mildly (60-69%), moderately (50-59%), or severely (<50%) low rSO_2. For hypotension for <7 days old preterm infants MAP was defined less than their gestational age in weeks, in infants >7 days old MAP was adjusted to data by de Graaff et al[1]. Data are in median [IQR] or number (%).
Results and Discussion: Median bodyweight of premature patients was 2 [1.4;3.2] kg and term neonates were 3.3 [2.8;3.8] kg. A total of 6426 mins were recorded. Median length of GA was 97 [60;133] mins. The incidences of mild, moderate, and severe rSO_2 decrease were 28%, 16% and 10% (total: 54%) in premature- and 17%, 9% and 6% (total: 32%) in term neonates. RSO_2 decrease was a more common event during preterm GA ($p<0.001$). Synchronized MAP and rSO_2 decrease were observed in 31%, while 'isolated' rSO_2 decrease, without following MAP or SpO_2 changes occurred in 20% of the premature cases. In term neonates these ratios were presented in 13% and 19% of the cases. Episodes of decreased rSO_2 occurred median 2 [1;4] times and lasted for 42,5 [7.8;79] mins in preterm and 21 [0;55] mins in term neonates. Data shows that 20% of cases rSO_2 decrease was not followed by MAP or SpO_2 changes, which reinforces the necessity of using NIRS monitor during neonatal GA.
Conclusion(s): ‚Isolated' NIRS decrease require further investigation. Presumably, the reactivity of PCO_2 on cerebral vasculature would explain cerebral rSO_2 changes.
Reference:
1: de Graaff JC et al : Anesthesiology 2016;125 :904-13.

05AP06-09
Interest of a spine team for pediatric scoliosis surgery

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Background and Goal of Study: Enhanced rehabilitation after surgery allows to optimize the management of patients by decreasing complications and length of stay. Blood sparing and multimodal analgesia for pain management have been developed for several years for AIS surgery(1). The identification of dedicated teams, associating surgeons, anesthetists and operating room nurses specialized in spine surgery has demonstrated its interest in improving the quality of care in adolescents(2). The objective of this study was to evaluate the efficiency of a "spine team" on the perioperative management of scoliosis in the pediatric population.

Materials and Methods: This is a prospective, descriptive, monocentric study for the year 2021. The "spine team"(ST) was defined as the presence of a senior anaesthetist specialized in spinal anaesthesia and a senior surgeon (more than 10 years of experience) which corresponds, in our center, to 3 anaesthetists among 25 and 1 surgeon of 2.

Results and Discussion: During the year 2021, 157 children underwent spinal arthrodesis, 106 adolescent idiopathic scoliosis (AIS) and 51 secondary scoliosis. ST was present in 49% of procedures, 45% of AIS and 67% % of secondary scoliosis. For AIS surgery and anesthesia times were statistically reduced in ST group (260 (243-292) versus 297.5 (260-344.5) minutes $p<0.001$ and 334.5 (308.8-361.5) versus 371 minutes (341-430) $p<0.001$)). Concerning the secondary scoliosis, surgery and anesthesia times were also reduced in ST group (338 (280-410) versus 416.3 minutes (300-627) $p=0.002$ and 443 (350-520) versus 530.4 (361-770) $p=0.019$). In the ST group, the hospital length of stay was reduced regardless of the type of scoliosis, 5 days (4-7) versus 7.1 days (5- 10) $p=0.03$ for the ST group for AIS and 6.9 days (5-10) versus 9 (6-23) $p=0.07$ for secondary scoliosis.

Conclusion(s): A spine team with anethesiologist and surgeon dedicated to spine surgery allows to optimize the perioperative management of scoliosis (either idiopathic or secondary) in the pediatric population.

Reference:

1. Enhanced recovery after surgical correction of adolescent idiopathic scoliosis. Julien-Marsollier and al , pediatric Anesthesia 20202-Operating Room Personnel Determine Efficiency of Pediatric Spinal Fusions for Scoliosis Jacob Hartline, Spine Deformity 2019.

05AP06-10
Peroperative transfusion incidence and related complication in craniostenosis surgery – a single center observational retrospective study

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Background and Goal of Study: Craniosynostosis is a condition in which premature fusion of one or more cranial sutures lead to abnormal head and growth restriction of the brain. Craniosynostosis can involve one or multiple sutures and can be syndromic or not. Surgery is recommended to expand and reshape the skull, to prevent increased intracranial pressure and providing sufficient space for brain growth. The incidence of all types of craniosynostosis, ranges from 4 to 16 per 10,000 live births.

Craniostenosis surgery is a complicated procedure and may be associated with high rate of transfusion. The aim of this study is to assess our rate of transfusion and evaluated associated complications.

Materials and Methods: We conducted a retrospective single-center study to analyzed the incidence of transfusion. We review medical record of craniostenosis surgery from 2015 to 2022. Patient consent was not required according to national law and retrospective study protocol. Data were totally anonymized. We collected patient characteristics, perioperative data and transfusion information or complication.

Results and Discussion: 70 patients were included but 4 were excluded due to missing data.

Our group is composed of 68.2% of male. Median age is 4.5 months [IC 95% : 4.14-6.66] and median weight of 7.6kg [IC 95% : 7.2-8.0]. We have 10% of premature infants. The mean hospital length of stay is 6.6 days.

Our cohort represent 87.9% of idiopathic craniostanosis; 12.1% of syndromic craniostenosis. The main types of surgery were : scaphocephalia 57.6% and trigonocephalia 25.8%.

In 18.2% of cases we proceeded in ≥ 2 sutures reconstruction. Mean haemoglobin are 11.2g/dL (preoperative) and 9.1g/dL (postoperative) ($p<005$).

About intraoperative data : the mean time of surgery is 172.5 minutes, tranexamic acid was used in 98.5% of cases and albumin in 86.3% of cases.

No platelet was transfused. Fresh frozen plasma was used in 2 cases (3%).

Intraoperative transfusion rate is about 69.6% and vasopressor are used in 43.9% of surgery.

Transfusion rate tend to be associated with low preoperative haemoglobin and surgery length *($p > 0.05$).* We have no reported severe complication related to transfusion.

Conclusion(s): Our transfusion rate is high about 69.6%. It may be related to our young group and small weight of patients. We have no complication reported with transfusion.

Limitation may be related with small sample size. Future development may be oriented with preoperative haemoglobin increase to limit transfusion help.

05AP06-11
IPI monitorization during pediatric endoscopic procedures under sedation: a randomized controlled trial

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Background and Goal of Study: The Integrated Pulmonary Index (IPI™) is a recently developed device that uses fuzzy logic model derived from measured oxygen saturation (SpO_2), respiratory rate (RR), pulse rate (PR), and end-tidal carbon dioxide ($ETCO_2$). It provides a single index value ranging from 1 to 10; where 8-10 points are considered within normal range, 5-7 require attention, and 1-4 require intervention. Its use has been validated in clinical studies [1-3]. In this study we aimed to compare periprocedural IPI values of the pediatric patients having sedation with propofol or ketamine.
Materials and Methods: A total of 60 pediatric patients undergoing elective gastrointestinal endoscopy under sedation and monitored anesthesia care in our hospital between March and November 2021 were randomly allocated into two groups (n=30):
(i) propofol used group (group P),
(ii) ketamine used group (group K).
A body weight-based standard dose of midazolam and remifentanil were also administered. IPI was measured by Capnostream 20 monitor (Oridion Medical, Needham, MA, USA). Primary outcome measure was IPI values. Secondary outcome measures were recovery time, need for jaw-thrust maneuver and mask ventilation. Investigational Review Board approval was obtained (07.05.2021/No: 09.2021.511). The study was registered in https://clinicaltrials.gov/ (No: NCT05137574). Written informed consent was obtained. SPSS was used for statistical analysis. $P < 0.05$ was considered statistically significant.
Results and Discussion: Demographic and anthropometric variables, patient and surgical characteristics were comparable between the groups. The primary outcome measure, IPI values were comparable between the groups (P=0.082). Need for jaw-thrust maneuver was also significantly different between the groups (P=0.023). Recovery time was significantly shorter in the group P, compared to the group K (15.0 vs 28.5 minutes, respectively, $P < 0.001$).
Conclusion(s): Propofol and ketamine-based sedations in pediatric patients undergoing endoscopic procedures result in comparable IPI scores. Ketamine based-sedation resulted in less need for periprocedural jaw-thrust maneuvers, but longer postprocedural recovery periods.
References:
1. Berkenstadt H et al. J Clin Monit Comput (2012) 26:177–181.
2. Garah J et al. J Clin Monit Comput (2015) 29:773–778.
3. Riphaus A et al. Digestive and Liver Disease 49 (2017) 45–49.

Neuroanaesthesiology

06AP01-01
Application of neuronavigation guided scalp nerve block for pain control of craniotomy in two patients

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Background: Scalp nerve block (SNB) is an anatomical landmark-based block, which is used for pain control both during and after craniotomy (1). We believe that; with the guidance of advances such as neuronavigation (2), the accuracy of blocks based on landmark techniques can be increased.
Case report: Two patients, ages of 46 and 52, who are scheduled for elective craniotomy due to frontal lobe tumor with no additional diseases were taken to operation room. After routine anesthesia induction, under general anesthesia, anatomical landmarks described by Pinosky et al (1) for SNB were marked with neuronavigation according to 3-dimensional (3D) MRI and CT images. After SNB was performed, pinned head holder was placed and surgical incision was allowed. Vital signs were recorded before and after the placement. After surgeries, patients were extubated and transferred to post anesthesia care unit. Visual analog scale (VAS) scores were recorded for 24 hours. After 24 hours follow up, patients were transferred to service. No complications were observed.

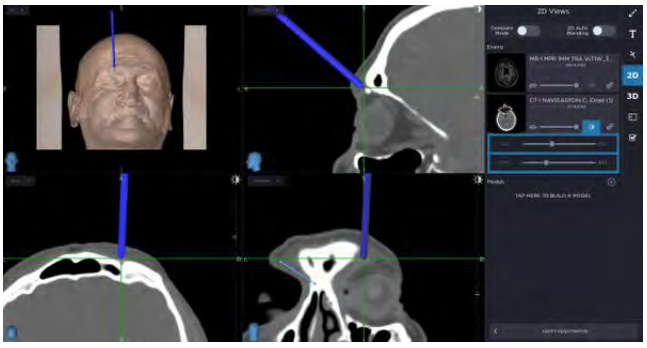

Figure 1. Image of Supraorbital Foramen with Neuronavigation

	Blood Pressure before pinned head holder (mmHg)	Blood Pressure after Pinned head holder (mmHg)	Pulse before pinned head holder (bpm)	Pulse after pinned head holder (bpm)	VAS score 1st hour	VAS score 4th hour	VAS score 12th hour	VAS score 24th hour
Patient 1	107/64	118/71	62	69	3	3	2	4
Patient 2	114/73	121/78	68	71	3	3	2	3

Table 1: Vitals and VAS scores of patients

Discussion: SNB is performed according to anatomical landmarks (1). With thin section MRI, if requested priorly, the related nerves in addition to anatomical landmarks can be identified and neuronavigation guidance allows these to be marked within 0,2-millimeter margin of error. In this case report, we aimed to attract attention to possible benefits of combining technological advances with such nerve blocks.
References:
1. Pinosky et al. The effect of bupivacaine skull block on the hemodynamic response to craniotomy. Anesth Analg 1996;83:1256–61.
2. Ganslandt et al. Neuronavigation: concept, techniques and applications. *Neurol India*. 2002;50(3):244-255.
Learning Points: Although clinical trials are required; we think, neuronavigation guidance can be beneficial especially for patients, who are sensitive to hemodynamic changes and for whom awake craniotomy is vital.

06AP01-04
Sitting position for the approach to posterior fossa tumors

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Background: The sitting position (SP) offers better access and surgical exposure in some neurosurgery cases. It is associated with greater comorbidities due to its physiological implications. We present two patients with brain tumors with this approach and the monitoring we used to prevent and diagnose severe complications. Monitoring of cardiac and brain function must be included as basic standard of care. No intra- or postoperarive complications were present and both patients were discharged with no neurological deficits (1).
Case report: We report two clinical cases of brain tumors where the SP was necessary(tumor in talamus and posterior medial tumor in temporal lobe). In both cases we used transesophageal ecocardiography(TEE) for detection of air embolism (bicaval view), cardiac output (CO) monitoring by pulse contour analysis, brain oxygenation (INVOS), anesthesia depth(BIS) and basic monitoring as in any general anesthesia. No intra- or postoperative complications were observed. Both were extubated in the ICU with no neurological deficits. Only one patient had pneumoencephalus in the postop CT scan with no clinical relevance.
Discussion: The following physiological changes happen in the sitting position: decrease in preload, mean arterial pressure (MAP) and cerebral perfusion pressure (CPP), increase in functional residual capacity and lung compliance, narrowing of the oropharynx causing macroglossia, and even tetraplegia due to the flexion of the neck.
There is an increased risk of venous air embolism (VAE) and supratentorial pneumoencephalus compared to other positions for craniotomy. We need a very strict monitoring of physiological funcions to mantain body homeostasis. The incidence of EAV in seated craniotomy varies depending on the method of detection. TEE is the most sensible method. CO must be enough to keep an optimum CPP, which we controlled with pulse contour analysis. INVOS monitoring is a non-invasive option to monitor brain oxygenation which can be altered when its haemodynamics gets affected (2).
References:
1. Ronald D.Miller.Miller Anestesia.8 ed.Elsevier Spain;2016.387-422p.
2. SloanT.The incidence, volume, absorption, and timing of supratentorial pneumocephalus during posterior fossa neurosurgery conducted in the sitting position.J Neurosurg Anesthesio2010;22:59.

Learning points: SP presents greater comorbidities. We must include cardiac and brain monitorining to detect severe complications. TEE has greater sensitivity detecting EAV.

06AP01-05
Stroke with haemodynamic instability as a debut of infective endocarditis: a case report

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Background: Stroke is the second most common cause of mortality and disability worldwide and its incidence is increasing. Acute Ischemic Stroke (AIS) is defined as sudden neurologic dysfunction caused by focal brain ischemia lasting more than 24 hours or with evidence of acute infarction on brain imaging. It has been estimated that 25-30% of all ischemic strokes are cardioembolic. The standard diagnostic approach in a stroke is a computed tomography (CT) brain scan, ECG and routine blood test with coagulation and metabolic profile.
Case report: A 51-year-old man, transferred to our hospital with activation of stroke code because of low level of consciousness and haemodynamic instability. Due to mucocutaneous pallor, marked hypotension despite noradrenaline and asymmetries in distal pulses, CT angiography is carried out ruling out aortic dissection. After detecting a pansystolic murmur, an urgent echocardiogram was performed, with diagnosis of acute mitral regurgitation secondary to infective endocarditis. It was decided to place an intra-aortic balloon pump for haemodynamic control and, subsequently, to perform a mechanical thrombectomy.
Discussion: Brain-heart interaction has become a key factor for AIS management. Cardiovascular disease is the main predisposing factor for AIS, specially the new onset of atrial fibrillation. Diagnosing infective endocarditis can be hugely challenging and an acute stroke could be the first symptom of a subacute endocarditis. Neurological complications occur in up to 55% of patients with infective endocarditis, often before the diagnosis is made, and include stroke, brain abscess and meningoencephalitis[1]. When confronting a patient with AIS and severe hypotension, a wide differential diagnosis and thorough examination must be performed.
Reference:
1. Jiad E, Gill SK, Krutikov M, Turner D, Parkinson MH, Curtis C, et al. When the heart rules the head: Ischaemic stroke and intracerebral haemorrhage complicating infective endocarditis. Pract Neurol. 2017;17(1):28–34
Learning Points: In the initial evaluation of a brain stroke, it is essential to perform a wide differential diagnosis due to the unspecific clinical onset. The optimal management of patients with AIS and valvopathies after infective endocarditis needs the participation of a multidisciplinary team, including cardiothoracic surgeons, neuroradiologists and anaesthesiologists.

06AP01-06
Anaesthetic management of sequential cesarean section and craniotomy, excision of tumour in a term pregnant patient with a symptomatic meningioma

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Background: The management of intracranial tumours occurring in pregnancy poses a challenge due to the mode of delivery, optimal timing of treatment while considering the condition of both the mother and foetus, and the choice of anaesthetic technique. Moreover, the low incidence of these cases results in a lack of clinical practice guidelines.
Case report: This paper presents the anaesthetic management of a 36 year-old G2P1 (1001), newly diagnosed with meningioma during the course of her pregnancy. On her 35th week of gestation, she was admitted for loss of consciousness and a right frontal lobe mass was revealed upon workup. A multidisciplinary team meeting was called. It was deemed appropriate to wait for foetal maturity and delivery before surgical intervention for the tumour should her neurologic status remain stable, with no progression nor recurrence of her symptoms. Because tumour resection was inevitable, a sequential cesarean section and craniotomy, excision of tumour was contemplated. This would allow the patient to bond with her baby and reduce hospital stay and financial cost.
With no absolute contraindication for the sequential procedures, the patient was scheduled for surgery on her 37th week of gestation. Spinal anaesthesia was done for the cesarean section, and then the patient was put under general anaesthesia supplemented with a scalp block for the craniotomy, excision of tumour. There were no untoward intra-operative events and the post-operative stay of the patient was unremarkable.
Discussion: Generally, the clinical features of these patients are attributed to increased intracranial pressure, which brings about the risk of herniation after dural puncture[1]. Cerebral oedema was successfully managed upon her first admission as manifested by the resolution of her symptoms and the absence of new onset neurologic deficits. Neurologic status remained stable pre-operatively which allowed for the safe use of spinal anaesthesia followed by general anaesthesia for the sequential procedures, contrary to existing algorithm.
Reference:
1. Leffert, L. and Schwamm, L. (2013). Neuraxial anesthesia in parturients with intracranial pathology: A comprehensive review and reassessment of risk. *Anesthesiology, 119*(3), 703–718.
Learning Points: With prudent assessment and a multidisciplinary approach, spinal and general anaesthesia were successfully used for the sequential cesarean section and craniotomy, excision of tumor, respectively.

06AP01-07
Anesthesia management of brain tumor excision with awake craniotomy in pregnant patient: a case report

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Background: Awake craniotomy stands out as a reliable method to minimize the risk of permanent sequelae during low-grade glioma operation [1]. Waking up the patient during the operation becomes a special issue for anesthesiologists. In addition to the lack of a guideline on this issue, the fact that the patient being pregnant created a challenge in terms of anesthesia management.

Case report: A 30-year-old, 50kg, right-handed primigravida 15-week pregnant patient who was investigated due to generalized tonic-clonic seizure was evaluated by the neurosurgery department. A 64x45 mm expansile tumor in right hemisphere, thought to be a low-grade glial tumor, was detected. Because of the tumor was close to supplementary motor and premotor areas, tumor excision with awake craniotomy and cortical mapping was planned.

Monitored Anesthesia Care (MAC) technique was performed in a 17-weeks gestation. Propofol and dexmedetomidine were chosen as sedative agents at all stages in addition to scalp block. During the cortical mapping phase, the sedation of the patient was interrupted and she was awakened. After the excision margins were determined and the tumor was removed, sedation was started again. Spontaneous breathing of the patient was preserved during the operation, and no intervention on the airway was required. No complications occurred either in the intraoperative or postoperative period. Pregnancy is currently going well.

Discussion: Anesthesia management in awake craniotomy can be classified as two different methods: Asleep-Awake-Asleep (SAS) and Monitored Anesthesia Care (MAC). Neither technique is superior to the other and both methods are considered safe [2].

Although the methods do not differ in the pregnant patient, it is important to avoid agents that cause fetal bradycardia such as opioids. In addition it should be kept in mind that maternal blood pressure should be kept at ±15% of the basal blood pressure level.

References:

1. De Benedictis, A.,S. Moritz-Gasser, and H. Duffau, *Awake mapping optimizes the extent of resection for low-grade gliomas in eloquent areas.*Neurosurgery, 2010. **66**(6): p.1074-84; discussion 1084.

2. Stevanovic A, Rossaint R, Veldeman M, Bilotta F, Coburn M (2016) Anaesthesia management for awake craniotomy: systematic review and meta-analysis.PLoS One 11(5):e0156448

Learning points: Awake craniotomy success is possible with a multidisciplinary study by anesthesiologists, neurosurgeons, perinatologists and speech therapists.

06AP01-08
Retroperitoneal hematoma in patient after stent assisted coil embolization of non-ruptured intracranial aneurysm

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Background: Retroperitoneal hematoma as a consequence of puncture of femoral artery after intracranial aneurysms embolization is rare complication, but it can be life threatening. Its incidence is increasing because of increased number of interventional procedures.

Case report: A 73-years old female patient was admitted to our clinic for embolisation of non-ruptured intracranial aneurysm of the cavernous segment of the left carotid artery. Embolization was done in general endotracheal anesthesia. After intervetion, the manual compression of the local site of the puncture was done. Because of previously administerd antiaggregant therapy, the time of femoral artery compression was prolonged for achieving appropriate hemostasis. She was admitted in intensive care unit awake and hemodinamically stable. During next few hours the systolic blood pressure was started to fall. The patient became somnolent and bradypsichic, the vasoactive therapy with Noradrenalin was initiated.

Abdominal computed tomography (CT) scan showed retroperitoneal hematoma of the left side. The patient was immediately transferred to the operating theater and introduced into general anesthesia. The vascular surgical intervention of suture of the superficialis femoral artery wall was done. Three doses of red packed cells was administered, as well as solutions of crystalloids.

After surgery, the patient was mechanically ventilated, analgosedated and Noradrenalin infusion was continued. The next day, sedation was discontinued and the patient was weaned from mechanical ventilation and extubated fully awake.

Discussion: Retroperitoneal hematoma is a serious complication after femoral artery puncture, especially in patients underwent to embolization. This complication can lead to hemodynamic instability and hemorrhagic shock. Additional antiaggregant therapy is contributing factor for its development.

References:

1. Young Kim H, Kim MH, Jungh SH, et al. Retroperitoneal hematoma after coil embolization of cerebral aneurysm - a case report. Korean J Anesthesiol. 2010;59(Suppl):S187-S190.

2. Murai J, Adachi K, Yoshida Y, Takei M, Teramoto A. Retroperitoneal hematoma as a serious complication of endovascular aneurysmal coiling. J Korean Neurosurgical Soc. 2010;48:88-90.

Learning points: Awareness of occurrence of retroperitoneal hematoma in patients undergoing cerebral aneurysm coil embolization is necessary for early recognition and treatment of this potentially fatal complication.

06AP02-01
Emergence EEG and Sleep Paralysis in the Post Anaesthesia Care Unit (PACU)

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Background: An awake but unresponsive patient in the PACU poses a diagnostic dilemma for an anaesthetist. Case reports exploring incomplete neurological awakening due to aberrant patterns of EEG at emergence are very rare.
Case report: A 78 year old female enrolled in our AlphaMax study underwent laminar decompression under general anaesthesia. Anaesthesia was performed as per the Alphamax protocol, which included maintenance with desflurane and fentanyl. The intraoperative course was uneventful, following which she was extubated and shifted to the PACU. Here she failed to respond to vocal commands, however her vital signs remained stable, her neuromuscular function and her neurological examination was normal (apart from unresponsiveness), and effect of residual anaesthesia medication was ruled out. Her level of arousal improved gradually and after 90 minutes she was considered fit to be shifted to the ward.
On following up the next day she recalled the entire episode in the PACU, claiming to have been awake and aware but unable to move or speak. Retrospective analysis of her intraoperative EEG revealed low alpha power, intermittent burst suppression followed by a very sudden arousal from a deep delta pattern just prior to extubation. We explored the possibility of her presentation having a mechanism akin to disorders of diminished motivation (Abulia, Akinetic Mutism) at the cerebral cortical level, or sleep paralysis secondary to increased sensitivity to anaesthesia drugs causing a dissociation at the brain stem level.

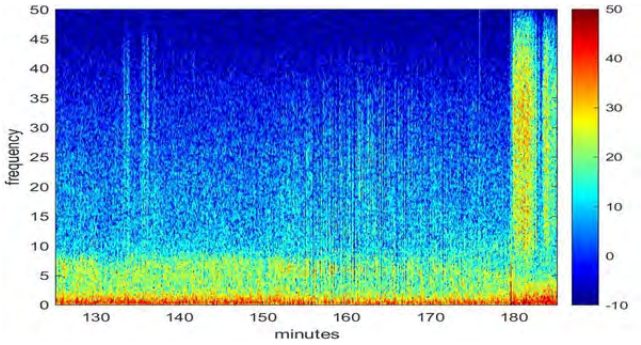

Figure 1. Spectogram of the last 60 minutes before extubation.

Discussion: Case reports of delayed emergence following anaesthesia rarely consider the role of the emergence patterns in being responsible for an abnormal awakening. We believe the general anaesthetic drugs caused a disproportionate inhibition of volitional motor responses for at least an hour after the return of consciousness and memory during the emergence period – similar to that seen in sleep paralysis but chemically prolonged.
Learning Points: An sudden emergence pattern similar to that seen in our patient may be associated with subsequent aberrant motor responses similar to sleep paralysis.

06AP02-02
A case report of seizures during general anaesthesia for cervical spine surgery: undetected cerebrospinal fluid leak leading to intracranial haemorrhage and status epilepticus

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Background: Cerebrospinal fluid (CSF) leak is a known complication of spine surgery, with an incidence of 0.3-1.3% in cervical spine surgery[1]. Symptoms range from mild (headache, vertigo) to potentially life-threatening (meningitis, intracranial haemorrhage[ICH]). Most publications[2]report intracranial events after emergence of general anesthesia(GA), hours-days post-procedure.We report a case of seizure during GA with status epilepticus secondary to ICH due to CSF leak,contributed by active drain suction.
Case report: 78-year-old underwent C1-T2 posterior decompression for cervical myelopathy.After resuming supine position,he developed tonic-clonic seizures. Blood gas sampling ruled out metabolic causes. Surgical drain was found to be on active suction, with 400ml haemoserous fluid drained. Urgent CT brain showed acute bilateral ICH with decreased ventricles size. He developed status epilepticus requiring urgent co-management by Intensive Care,Neurosurgery and Neurology.
Discussion: Most reports describe intracranial events due to CSF leak hours-days post-procedure; we report a case of seizures during GA. Inadvertent creation of active drain suction likely contributed to CSF leak & intracranial hypotension, resulting in significant ICH and status epilepticus.Seizure activity may have been suppressed by higher doses of anaesthetics prior to turning supine. Observation of patient was obscured by drapes and body straps which restricted movement. High index of suspicion is required for intracranial events during spine surgery which can cause life threatening complications.
References:
1. Baird E. National trends in surgical treatment of degenerative C-spine disease. Global Spine J.2014;4:143-150
2. Lee HY. Seizure&delayed emergence resulting from remote cerebellar hemorrhage after spine surgery. Korean J Anes.2012;63:270–3
3. Sporns PB. Undetected Dural Leaks Complicated by Accidental Drainage CSF Lead to Severe Neurological Deficits. Rofo 2016;188(5):451-8
Learning Points: Initial signs of seizure were subtle and attributed to common causes: shivering,movement from decreased anaesthetic depth. Suspicions were only raised when seizures became more apparent. Careful monitoring of brain function waveforms may aid in more prompt diagnosis. Early diagnosis and management of intra-operative seizures is needed to prevent life-threatening neurological injury. Increased use of negative pressure drainage devices makes knowledge of potential harms crucial perioperatively[3]

06AP02-03
Assessment of quality of life after spine surgery under spinal or general anaesthesia using the Euroqol Health Questionnaire

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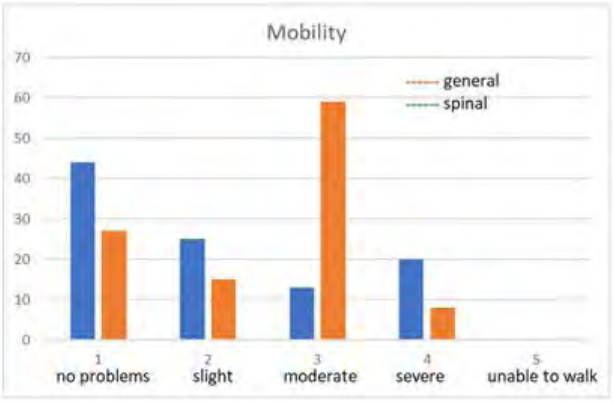
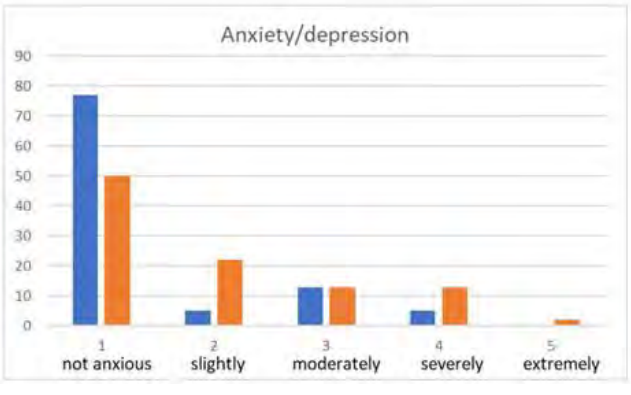
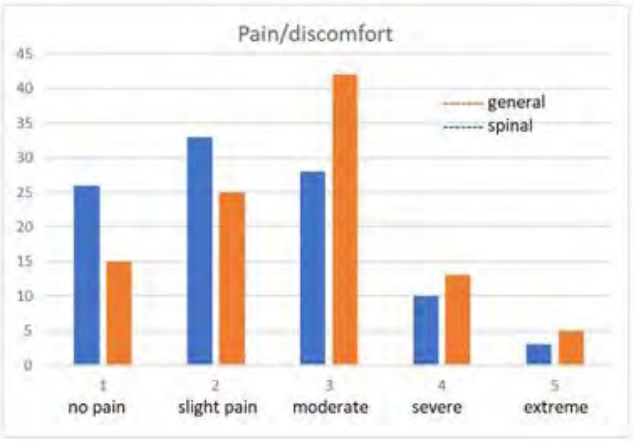
Background and Goal of Study: Degenerative spine diseases are the most frequent cause of disability and work incapacity, representing large social and economic problem in developing countries. There are surgical and non-surgical treatments and concurrently growing demand for outcome measurement and quality assurance.
The aim of this study is to determine whether the type of anaesthesia, spinal or general, affects the quality of life after spine surgery. We used EQ-5D-5L (Euroqol Health Questionnaire) in telephone survey interview.
Materiala and Methods: A total of 79 patients participated in a telephone interview one month after lumbar spine surgery performed under spinal or general anaesthesia (GA). EQ-5D-5L is a standardized measure of health status developed by the EuroQol Group in order to provide a simple, generic measure of health for clinical and economic appraisal. The EQ-5D-5L descriptive system comprises the following 5 dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression.
Results and Discussion: There were 39 patients in spinal and 40 in GA group, similar age and gender. We found a difference between the groups. Figure 1, 2, and 3. Patients underwent GA had moderate difficulties with mobility, pain/discomfort and anxiety/depression.







Conclusion(s): Despite a small sample size of patients the results show complex connections between health and functional and social status. The use of EQ-5D-5L could contribute to better assessment of spine and any pain related problems which require operative or conservative treatment.

06AP02-04
BIS alternative placement in patients in which classic method is impossible, a case report

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Background: The Bispectral index (BIS) is a non-invasive method for the hypnosis depth monitoring, translating cortex waves into numbers from 0-100 expressing from isoelectric to fully awake, below 60 conscience is assumed to be diminished by the anesthesia, using this measurement and monitoring reduces intraoperative awakening.
In the traditional neurosurgery there are several procedures that require to leave the forehead free, the BIS is a highly regarded tool to measure the anesthetic depth, but due to the classic position used on the forehead of the patients it is usually replaced by less precise instruments on those cases that impede the traditional positioning, in this case we show an alternative position of the BIS that mantains its benefits without risking precision.
Case Report: A 55 years old woman, arrived to the emergency room with progressive moderate to severe headache of 4 months of evolution as well as progressive loss of strenght on both inferior limbs, loss of sphincter control and apathy. Brain CT scan showed a hyperdense, homogeneous lesion in the convexity of the frontal region.
It was scheduled for resection, during the anesthesia monitoring the BIS was placed in the mandibular region, the procedure was performed without any complication. The patient was observed for two days after the procedure without any further complication or worsening before being discharged home.
Discussion: BIS is used in neurosurgery and needs its installation to be modified due to the way in which some interventions are made. Traditionaly the BIS is placed in the forehead, but in recent years other sites had been tested, several have been found to be reliable but not yet approved. In this case the mandibular position was tested, there are sudies that compare the mandibular disposition with the traditional one showing bias during emersion but mantainig

its utility during induction and maintenance; in this case we show that the adecuate placement of the BIS on a mandibular fashion can eliminate most of the drawbacks previously reported.

Reference:

Lee, E. (2018) "The effectiveness of BISPECTRAL index monitoring on intraoperative awareness in adult surgical patients undergoing general anesthesia."

Learning Points:

- Monitoring the anesthetic depth is basic to perform a TIVA technic and avoid early awakening.
- An alternative placement of the BIS in neurosurgery is a viable option to keep the specificity of the anesthetic depth.

06AP02-05
Point-of-care viscoelastic testing to guide haemostatic treatment in elective neurosurgery: a case report

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Background: Viscoelastic tests (VETs) are implemented to guide haemostatic management in different acute settings. Yet they are rarely used in elective neurosurgery. We present a case of patient with brain tumour and multifactorial coagulopathy treated in ROTEM-guided manner.

Case report: 62-year-old female with hemangiopericytoma (78x63x64mm) was admitted for neurosurgery due to progressive neurological deficits. Metastatic liver disease also persisted. Borderline platelet count and prolonged prothrombin time was observed initially. Factor VII (FVII) deficiency was found. Despite preoperative treatment with FVII concentrate, there was profuse intraoperative bleeding (blood loss of 1500 ml). ROTEM showed high CT, CFT, low A10, MCF as well as low-normal FIBTEM values. Transfusion of pooled platelets and fresh frozen plasma led to successful haemostasis. Postoperative period was uneventful and patient was discharged.

Discussion: It is one of a few cases reporting the use of VETs in brain tumour surgery. ROTEM in our patient demonstrated a complex coagulopathy. Prolongation of CT in EXTEM was probably multifactorial as FVII deficiency was already treated. FIBTEM values were at lower end of the normal range which in the presence of ongoing surgery could be suboptimal. None of the concentrates could address all the issues. In addition to platelets, we chose FFP as the agent of choice. Successful use of VETs in neurosurgery has been reported: TEG and ROTEM aided to identify hyperfibrinolysis in adult [1] and paediatric neurosurgery [2]. There is scientific evidence that patients with brain tumours can be in a hypercoagulable state due to procoagulant tumour-derived substances, such as tissue factor. VETs in neuro-oncology patients seems to have a big potential not only for guiding blood transfusions, but also for early detection of hypercoagulability [3].

We believe ROTEM aided us to identify the demand of blood products in the high risk of bleeding more accurately, avoid excessive transfusions and succeed in the best possible outcome for the patient.

References:

1. https://pubmed.ncbi.nlm.nih.gov/21242833/
2. https://pubmed.ncbi.nlm.nih.gov/22562643/
3. https://pubmed.ncbi.nlm.nih.gov/28362128/

Learning Points: VETs should be used in urgent neurosurgical situations and considered for elective neurosurgery patients with compromised preoperative standard coagulation tests and complicated anamnesis.

06AP02-06
Unusual case of posterior circulation stroke- saved by anesthesiologist

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Background: Posterior circulation stroke (PCS) is a life-threatening condition, difficult to diagnose because of the large area supplied by posterior circulation. Symptoms are nonspecific, and when attributed to other causes can delay treatment with severe consequences. Effective approach to PCS remains controversial. Lack of guidelines requires a decision based on physician experience. Endovascular treatment (EVT) remains the standard treatment in selected patients[1].

Case report: A 44yo healthy male with symptoms of acute GI infection and no neurological signs. Due to severe vomiting, abdominal pain and diarrhea, he was immediately hospitalized due to the urging of his wife, a neuroanesthesiologist. Laboratory results were normal, except for elevated CRP and low K^+. Next morning the patient was increasingly dysphatic. CT angiography showed thrombi in the posterior cerebral and superior cerebellar artery. Despite low NIHSS score, urgent EVT was performed. TEE and bubble test proved patent foramen ovale (PFO). After one month, the patient fully recovered, returned to his daily activities and active sports. A shunt occlusion is planned.

Discussion: The issues in this case were leading symptoms of concommitent GI infection, with hidden neurological signs. Proinflammatory conditions (acute GI infection and patient's post-covid status) were the risk factors for thrombus formation. Vasalva maneuver and PFO opening due to vomiting were likely the mechanism in PCS. With no symptoms of PCS, just due to his wife's suspicion of the severity of his condition, he was hospitalized on time. Despite low NIHSS score, a neuroradiologist decided to perform early EVT due to the patient's age, previous excellent physical status and a high risk of the stroke symptoms becoming more severe. Recent studies determined that EVT can benefit selected patients with PCS, but usually with severe symptoms and a high NIHSS score.

Reference:

1. Adusumilli G,t al Endovascular thrombectomy after acute ischemic stroke of the basilar artery: a meta-analysis of four randomized controlled trials Journal of NeuroInterventional Surgery Published Online First: 08 December 2022

Learning points: In younger patients with Covid-19 infection in their history, one should be extra carefull with unclear symptoms or sometimes just have a good "hunch". Although there are no clear protocols in treatement of PCS, experience and courage of the neuroradiologist can be life-saving.

06AP02-07
Anesthetic management in Moya-Moya disease: report of a case

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Background: Moya-Moya disease (MMD) , is a unique neurovascular entity characterized by the specific angiographic finding of unilateral or bilateral stenosis, progressive cerebral arterial narrowing leading to the development of heterogeneous collateral vessels, which appear smoky on angiographic images, giving the name to Moya- Moya which means smoke in Japanese. The prevalence varies both by age and by geography, being more common in East Asia, with an incidence of 0.35 to 0.54 per 100,000 inhabitants.
Case report: A 58-year-old male, eutrophic, with a medical history of arterial hypertension. Results of an axial tomography without contrast of the brain shows no associated hemorrhagic or ischemic event, as in the brain magnetic resonance. Lumbar puncture with no evident alterations. Initiate therapy with acetylsalicylic acid 100 mg, atorvastatin 80 mg both orally daily, enoxaparin 60 mg subcutaneously daily and paracetamol 1 g. While hospitalized laboratory tests Anti-ANA anti-ENA antibodies were taken and were both negative. The 3 day of hospitalization, cerebral angiography showed: distal stenosis of the carotid siphon and severe stenosis of median cerebral atresia on the right side, with abundant development of lenticulostriate collateral circulation consistent with MMD.
A Bypass from the temporal artery to the middle cerebral artery was performed under general anesthesia with sevoflurane
Discussion: MMS is a rare condition, so there are no randomized clinical trials regarding anesthetic management. In context, the discussion of the literature is focused on cross-sectional studies and bibliographic reviews.
Monitoring should include invasive arterial monitoring was performed. Cerebral ischemia is monitored with electroencephalogram. Strict postoperative surveillance in the ICU to maintain the bases of cerebral neuroprotection that consider normothermia, normotension, normocapnia, adequate level of anesthetic depth, maintaining CMRO2 and cerebral FSC with anesthetic drugs suitable.
References:
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Lang SS, Vollmer E, et al. A Retrospective Study of Neurological Complications in Pediatric Patients With Moyamoya Disease Undergoing General Anesthesia. Anesth Analg. 2021
Nijasri Charnnarong Suwanwela. Moyamoya disease: Etiology, clinical features, and diagnosis, UpToDate 2020.

06AP03-01
Cerebrospinal fluid and plasma concentrations of the inflammatory marker sCD27 in a large neurological healthy surgical population

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Background and Goal of Study: Soluble CD27 (sCD27) has the potential to serve as biomarker for diseases involving peripheral and central immune dysfunction. So far, analysis of cerebrospinal fluid (CSF) sCD27 has mostly been performed in a small number of patients with neuroinflammatory disorders and general control data is missing.
This study aimed to determine factors correlating with sCD27 concentration such as age, comorbidity, the CSF/plasma albumin quotient (Qalb) as indicator of blood-CSF-barrier function and inflammatory markers as an important step toward establishing reference values for interpreting sCD27 levels. We therefore analysed sCD27 concentrations in CSF and plasma of a large relatively neurological healthy surgical population and determined preliminary reference intervals in a selected healthy subpopulation.
Materials and Methods: CSF and blood were collected from 486 patients undergoing spinal anaesthesia for elective surgery. Patient demographics, clinical data and routine laboratory analysis were analysed for associations with sCD27 levels in CSF and plasma using a univariable and multivariable model.
Lastly, the total study group was divided into healthy controls and general controls in order to determine healthy control reference intervals (central 95% of data).
Results and Discussion: In the total study group (age range 18 – 92 years, 57% male, 87% ASA I or II), sCD27 ranged from <50 to 7474 pg/ml and 1830 to >400,000 pg/ml in CSF and plasma, respectively. In a multivariable model, plasma sCD27 concentration, age and Qalb were identified as most important for explaining the variability of CSF sCD27 levels. These findings were surprising, as these results are contrary to what has been reported in literature. This may be due to the fact that the influence of various factors has mostly been studied in a small group of diseased patients (neuroinflammatory) and not a large group reflecting a broad selection from the general population. Preliminary reference intervals in the healthy controls were < 50 pg/mL – 647 pg/mL (n=153) for CSF sCD27 and 2,341 – 104,230 pg/mL (n=191) for plasma sCD27.
Conclusions: These findings provide a solid foundation for interpreting sCD27 as clinical biomarker against a background of multiple socio-demographic and physiological aspects that may influence levels. Further studies to establish clinical CSF sCD27 cut-offs for central nervous system diseases should also account for the influence of age and blood-CSF-barrier function.

06AP03-02
Remimazolam, a benzodiazepine intravenous anesthetic, promotes water transfer in astrocytes

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Background and Goal of Study: Prevention of cerebral edema is essential in the perioperative period, since cerebral edema can lead to increased intracranial pressure and, in extreme cases, death. Aquaporin 4 (AQP4), an astrocyte water channel, is vital in maintaining brain water function. This study aimed to determine the relationship between remimazolam, a new intravenous anesthetic, and cerebral edema.

Materials and Methods: This study utilized astrocyte-derived cultured cells from rats. The level of cell swelling induced by dilution was measured. Remimazolam or propofol at various concentrations were administered to the cell culture 2 hours prior to exposure to half osmolality. The short-axis length of the cells was measured with a phase contrast microscope before and 10 minutes after dilution with distilled water. The ratio of changes in the short-axis length was compared among five groups (control, remimazolam at concentrations of 1×10^{-7}, 3×10^{-7}, 1×10^{-6}, and 3×10^{-6} mol/dm^3).

Similarly, the ratio of changes in the short-axis length was compared for propofol. Remimazolam or propofol at a concentration of 1×10^{-6} mol/dm^3 was administered to the cultured astrocytes for 2 hours, and AQP4 protein expression was examined using Western blot analysis and compared to that in the non-administered group. P values <0.05 were considered statistically significant.

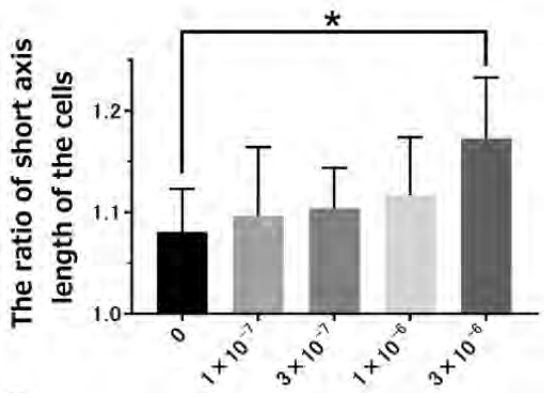

Figure 1A. Concentration of Remimazolam (mol/dm³)

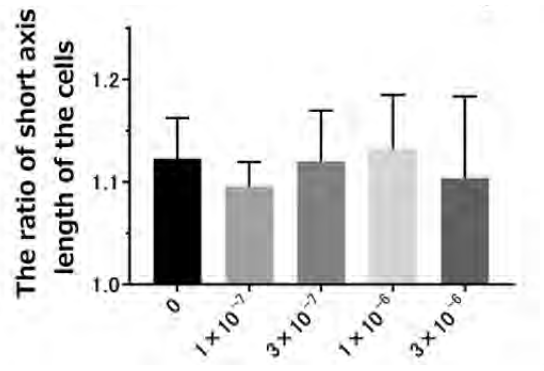

Figure 1B. Concentration of Propofol (mol/dm³)

Results and Discussion: A significant difference in the ratios of the short axis-length of the cells between control cells vs. those exposed to remimazolam at a concentration of 3×10^{-6} mol/dm^3 ($P = 0.0284$, $n = 7$ or 8; Figure 1A) was observed.

Additionally, exposure to propofol did not alter the short-axis length of the cells (Figure 1B). The amount of protein in AQP4 was not different from that in the non-administered group for both drugs.

Conclusions: This study highlights that the administration of remimazolam promotes the swelling of rat astrocyte cells. Unlike propofol, a benzodiazepine intravenous anesthetic, remimazolam promotes water migration of astrocyte cells and causes cerebral edema. The use of remimazolam in neurosurgery necessitates caution.

06AP03-03
A comparison of remifentanil/propofol and fentanyl/propofol anaesthesia in patients undergoing neurosurgery for intracranial mass lesions and postoperative analgesic requirements

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Background and Goal of Study: After major intracranial surgery 80% of patients experience moderate to severe acute postoperative pain in first 48h.

The quality of postoperative analgesia significant depends on the opioid used during the surgery. Fentanyl and remifentanil have two different pharmacokinetic profiles.

The aim of our study is to compare remifentanil (TIVA/TCI) and fentanyl (TIVA/constant flow) respect to post-operative analgesics consumption and the extubating time.

Materials and Methods: In this survey of dataset from all adult patients who were admitted to neurosurgical ICU neurosurgical procedures. Patients were scheduled for elective intracranial surgery.

In “fentanyl TIVA/constant flow” group anaesthesia was induced with fentanyl, propofol and rocuronium, and maintained with constant flow infusion of propofol/fentanyl.

In “remifentanil TIVA/TCI” group propofol and remifentanil were administrated by the pump automatically, for induction and maintenance of anaesthesia. Analgesic requirements were recorded first 24 hours in ICU.

Results and Discussion: There were 140 patients, in remifentanil group (56%, n=79) and the fentanyl group (44%, n=61). Between the groups there was no difference in demographic values.

Mean extubating time in remifentanil group was 228±213 min, and in fentanyl group 252±197. Comparing both groups of patients, no significant difference in time to extubating (p=0,6) was found.

Analgesics were administrated according VAS, or hemodynamic values in unconscious patients. Figure 1. shows analgesic consumption. In remifentanil group 42% (n=33) received two or more analgesics, while in fentanyl group only 21% (n=13).

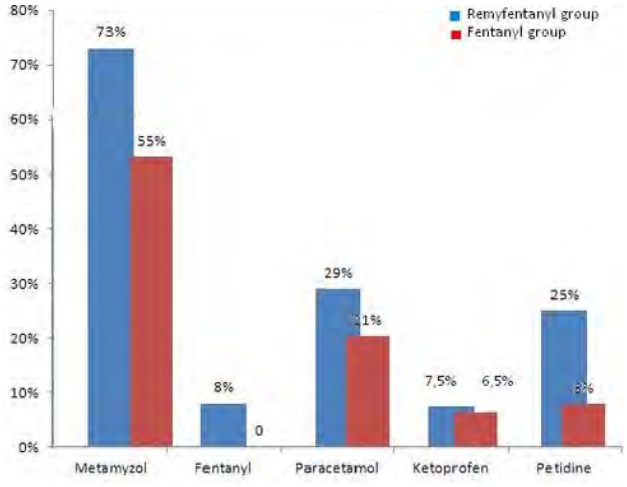

Figure 1.

Conclusion(s): Despite the significant advantages of TCI anaesthesia, the analgesic potential of remifentanil is weaker than that of fentanyl, and it does not affect extubating time either. The question is whether or not remifentanil should be used in more painful procedures. The residual concentration of fentanyl by the end of surgery provides better post-operative analgesia than remifentanil (TIVA/TCI), and has no influence on extubating time.

06AP03-08
The influence of norepinephrine induced arterial blood pressure elevation on the Bispectral index

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Background and Goal of Study: Vasoactive drugs used during general anaesthesia may have subtle side effects. For example, bolus administration of ephedrine increases the Bispectral index values (BIS). Even though norepinephrine (NE) is widely used to correct hypotension, its effect on BIS has never been investigated. This study aimed to investigate the effect of NE induced mean arterial pressure (MAP) elevation on BIS.
Materials and Methods: After IRB approval, 14 patients undergoing spinal surgery were included. After induction but before incision, NE infusion was infused continuously to increase MAP from ±60mmHg to ±80mmHg and ±100mmHg in 30 minutes while propofol effect site concentration was kept stable. Propofol plasma concentrations were determined at these points. BIS values and norepinephrine infusion rates (NIR) were collected. Mixed model analysis was used to investigate the influence of NIR and MAP on BIS, adjusted for propofol plasma concentrations.
Results and Discussion: In **figure** 1, BIS values and measured propofol plasma concentrations are shown per MAP and NIR category. Mixed model analysis showed that NIR was not associated with BIS (p=0.064), while increasing the MAP from 60mmHg increased the BIS by 1.50 (95%CI -1.42, 4.43; p=0.324) at a MAP of 80, and by 4.74 (95%CI 1.78, 7.71; **p=0.004**) at a MAP of 100. When including both NIR and MAP in the mixed model analysis, NIR was not associated with BIS (p=0.132), while increasing the MAP from 60mmHg increased the BIS by 4.11 (95%CI -0.05, 8.27; p=0.067) at a MAP of 80, and by 10.62 (95%CI 2.12, 19.13; **p=0.024**) at a MAP of 100. The increased positive association between MAP and BIS might be due to collinearity between MAP and NIR. Our results suggest that MAP better explains the BIS variance than NIR.

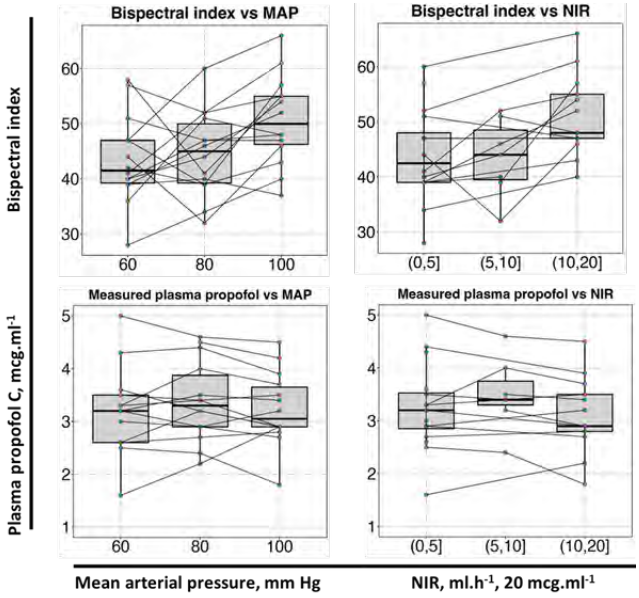

Figure 1. Bispectral index, norepinephrine infusion rate and measured propofol plasma concentrations, per patient, per mean arterial pressure category.

Conclusions: MAP augmentation using NE infusion increases BIS. This increase might be due to direct or indirect effects of increased MAP. The underlying physiology remains to be elucidated.

06AP03-09
Repetitive nebulization of lipopolysaccharide provokes severe pulmonary inflammation but does not affect secondary brain damage in a murine model of experimental traumatic brain injury

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Background and Goal of Study: Patients suffering from traumatic brain injury (TBI) often develop pulmonary infections during their recovery. This study examines the brain-lung crosstalk in a murine model of TBI and lipopolysaccharide (LPS)-induced pulmonary inflammation(1).
Materials and Methods: After approval by the responsible animal welfare committee (Landesuntersuchungsamt Rheinland-Pfalz, Germany, TVA 23177-07/G20-1-120) 46 female C57/Bl6 mice were randomized in four groups and subjected to controlled cortical impact (CCI) versus sham procedure (sham/vehicle n=10, sham/LPS n=10; CCI/veh n=13, CCI/LPS n=13). Afterwards half of the population was exposed to inhalation of nebulized LPS 1, 3 and 5 days post injury (dpi) while the other half was vehicle-treated (NaCl 0,9%).

Neuromotor impairment was repetitively assessed by neurological severity score (NSS), rotarod test and open field test. 7dpi mice were euthanized and, after cryosectioning and Nissl-staining of the *in toto* removed brains, cerebral lesion was quantified by volumetry. Lung tissue was processed in paraffin sections and histologically analysed. qPCR analysis was performed for inflammatory marker genes in brain and lung tissues, complemented by plasma ELISA for LPS-binding protein (LBP). Statistics: Rout Outlier, Shapiro-Wilk, t-/Mann-Whitney-test, One-way-/Two-way-ANOVA, $p<0.05$.

Results and Discussion: Gas exchange area in lungs of LPS-treated animals was significantly reduced compared to vehicle groups, mainly caused by thickening of interalveolar tissue ($p<0.001$). Lung mRNA-expression of IL-6, TNF and TLR4 was increased in LPS groups ($p<0.05$) regardless of concomitant TBI. Mice of the CCI/LPS group lacked remission of neuromotor impairment compared to CCI/veh but the cerebral lesion volume remained unaffected. mRNA expression of IL-1, GFAP, TNF and TLR4 in the perilesional brain tissue was increased in CCI mice compared to sham but not aggravated by LPS exposition.

Conclusion(s): Repetitive nebulization of LPS leads to severe inflammatory response and histological damage in lung tissue. Although recovery from TBI was impaired in mice with LPS-exposition, histological brain damage and gene expression remained unaffected, suggesting potential auto-protective mechanisms in the brain which require further investigations.

Reference:

1. Matute-Bello G, Frevert CW, Martin TR. Animal models of acute lung injury. Am J Physiol Lung Cell Mol Physiol. 2008;295(3):L379-L399.

06AP03-10
Effects of antibiotic long-term treatment and intestinal dysbiosis on secondary brain damage after experimental traumatic brain injury

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Background and Goal of Study: Antibiotic therapies for various indications are common during the recovery process of patients suffering from traumatic brain injury (TBI). Disturbances of the intestinal microbiome can occur as a side effect and may affect the outcome of TBI (1). Here, we tested this hypothesis in a murine model of antibiotic-induced dysbiosis and TBI.

Materials and Methods: After approval of the responsible animal welfare committee (Landesuntersuchungsamt Rheinland-Pfalz, TVA G19-1-027) 80 male C57/BL6 mice were subjected to controlled cortical impact (CCI) or sham procedure, followed by combined treatment of amoxicillin/clavulanic acid, vancomycin and nystatin delivered via drinking water. Vehicle treatment served as a control (CCI/AB n=24, CCI/veh n=24; sham/AB n=16, sham/veh n=16). Neuromotor impairment was assessed repetitively by neurological severity score (NSS), rotarod test and open field test. Half of the population of each group was euthanized at either 5 days post injury (dpi) or 30dpi, with continuous antibiotic/vehicle treatment. Brains were processed by cryosectioning, Nissl-staining and cerebral lesion volumetry. Perilesional brain tissue was analysed by qPCR, Western Blot and immunohistochemistry. Faecal samples were analysed by MALDI-TOF pre-trauma and at 5dpi. Statistics: Grubb's outlier, Shapiro-Wilk, t-/Mann-Whitney-test, One-way-/Two-way-ANOVA, $p<0.05$)

Results and Discussion: Faecal samples revealed severe disruption of microbial colonization 5dpi in mice with antibiotic treatment compared to pretraumatic findings. Animals of CCI/AB group showed decreased neuromotor impairment until 5dpi compared to CCI/vehicle, while lesion volume remained unaffected. mRNA expression of IL-1, GFAP, Serpina3n and MHCII was reduced in perilesional brain tissue of antibiotic-treated mice at 30dpi compared to vehicle ($p<0.05$).

Conclusion (s): Combined antibiotic treatment leads to early severe disruption of the intestinal microbiome. Transiently improved neuromotor recovery after TBI was noted in antibiotic treated groups but histopathology was indistinguishable from vehicle treated TBI mice. However, gene expression analyses suggest mild anti-inflammatory effects of antibiotics therapy after TBI, which requires further studies to distinguish between microbial effects and possible cerebral off-target effects.

Reference:

Sharon G et al.: The Central Nervous System and the Gut Microbiome. Cell. 2016 Nov 3;167(4):915-932

06AP03-11
Incidence of BIS above 60 during propofol/remifentanil anesthesia for cervical spine surgery and possible awareness comparing standard versus deep neuromuscular blockade with sugammadex reversal

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Background and Goal of Study: In a randomized controlled trial[1] where 62 cervical spine surgery patients were subjected to BIS guided general anesthesia with TCI of Remifentanil and Propofol and to either Standard (n=32) or Deep Neuro-Muscular blockade (NMB) PTC<2 and reversal with Sugammadex, we showed that Deep NMB with Rocuronium infusion and Sugammadex reversal reduced both anesthetics requirements and halved time required to extubation. The present study is a sub-analysis of BIS data from that study, conducted to compare the incidence of BIS above 60 in both groups and to investigate the incidence of BIS>60 in relation to awareness. **Materials and Methods:** Patients received propofol/remifentanil TCI anesthesia. Rocuronium either by bolus and neostigmine reversal if TOF>90 or infusion until wound closure and sugammadex reversal. No benzodiazepines were used. Paracetamol and parecoxib were given at the end of surgery. Recorded BIS data (Rugloop™) was analyzed to extract every occurrence of BIS>60 lasting for at least 5 seconds. BIS readings were grouped according to BIS intervals (60 to 65; >65 to 70 and >70 to 75) and according to the duration (in seconds) of any continuous sequence of BIS>60 (0 to 30; 35 to 85; 90 to 145; 150 to 295 and >300 seconds). Patients were contacted by phone at home to assess for possible awareness using the Brice questionaire. Statistics used *Chi-square* independence test.

Results and Discussion: Results are presented in figure1. BIS was never above 75 for 5 seconds. Average procedure time (min) was 146 in the Standard vs 131 in the Deep NMB group. BIS above 60 occurred 1158 times, but in 939 (81%), for less than 30 seconds. There were no differences in the occurrence of BIS>60 or duration time of BIS>60 between groups. There was not a single report of awareness.

	BIS intervals						
	60-65		>65-70		>70-75		Total
Duration (secs)	Standard	Deep NMB	Standard	Deep NMB	Standard	Deep NMB	
0-30	283	532	39	72	6	7	939
35-85	47	65	16	36	3	5	172
90-145	6	10	6	11	2	2	37
150-295	2	1	2	3	0	0	8
>=300	0	0	1	0	1	0	2
Total	338	608	64	122	12	14	1158

Conclusions: BIS>60 for longer than 90 seconds occurred only 47 times, of which only 10 over 150 seconds. Periods of BIS above 60 shorter than 300 seconds and below 70 in patients receiving remifentanil/propofol did not result in awareness. These results suggest that Deep NMB blockade that reduced Propofol/Remifentanil requirements was not associated with higher incidence of BIS>60, nor awareness. Still, careful monitoring of anesthesia depth with alarms is mandatory when performing deep NMB.

Reference:

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06AP03-12
In vitro evaluation of the effects of intravenous anesthetics on glioblastoma cells with or without chemo- and radiotherapy

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Background and Goal of Study: Glioblastomas (GB) are the most aggressive and common primary brain tumors in adults. The evolution of this pathology is rapid and fatal (median survival less than 15 months). Therapeutic management combines surgery, radiotherapy (RT) and chemotherapy (CT). During tumor excision, patients are exposed to intravenous anesthetic agents.The objective of this work is to evaluate the influence of propofol and remifentanil on tumor cells treated or not with CT and RT.

Materials and Methods: GB cells lines (C6) were exposed to propofol (50 $\mu g.ml^{-1}$) and remifentanil (3.75 $\mu g.ml^{-1}$). Impact on cell survival was assessed by counting the number of Hoechst 33342 positive cells and by clonogenic assays. Effects of anesthetics on cell migration were studied by the wound healing test. Effect of propofol was also studied on GB cells lines GL261 and U251. Effects of anesthetics on the response to CT (temozolomide, 350 μM) or RT (4 Gy, 2Gy/min, X-RAD225 Cx irradiator) treatments were studied with clonogenic assays.

Results and Discussion: At 72 h post-exposure, propofol tends to reduce the number of C6 cells (p=0,34). Remifentanil does not modify cell survival. There is no effect of propofol or remifentanil on the migration of C6 cells. Cell survival measured 7 days after treatment by propofol is reduced in GL261 46 ± 4 % and in U251 58 ± 18 % (p<0.01) but not in C6. Propofol further decrease cell survival induced by CT alone. Remifentanil or propofol/remifentanil combination does not modify the response of C6 cells to CT. RT effects on C6 cell survival are potentiated by propofol (RT+propofol = 29 ± 10 % vs RT = 60 ± 19 % with 100% for Control, p<0.01) while no effect is observed with remifentanil. Propofol/remifentanil combined treatment reduced cell survival after RT (35 ±16% vs RT alone 61 ±14%, p<0.05). RT effects on survival of GL261 are potentiated by propofol (20±7% for RT+propofol vs 46±5% for RT, p<0.01). However, RT effects on survival of U251 are not modified by propofol (22±7% for RT+propofol vs 39±19% for RT, p=0.11).

Conclusion(s): This first work underlines that propofol reduces GB cell survival *in vitro*. Interestingly, this work demonstrates a radiosensitizing effect of propofol on C6 and GL261 cells. These results have to be confirmed *in vivo*.

Acknowledgements: CNRS, UNICAEN, Archade, ANR-10-EQPX1401, Région Normandie et Etat dans le cadre du CPIER « Vallée de la Seine » 2015-2020 (HABIONOR),Fondation Caen Normandie Santé.

06AP04-01
The influence of vasopressor-induced arterial blood pressure elevation on muscle-recorded motor evoked potentials

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Background and Goal of Study: Muscle transcranial electrical stimulation motor evoked potentials (mTc-MEPs) are used to monitor the motor tracts during spinal surgery. The aim was to investigate the effects of noradrenaline (NE) induced mean arterial pressure (MAP) elevation on mTc-MEPs.

Materials and Methods: 25 patients undergoing spinal surgery were included in this prospective observational study. After induction, before incision, a NE infusion was used to increase the MAP from ±60mmHg to 100mmHg in 30 minutes. mTc-MEP amplitudes and area under the curves (AUC) were recorded from the tibialis anterior (TA) and abductor hallucis (AH) muscles every two minutes. Voltage thresholds were determined at MAPs of 60, 80 and 100mmHg. Mixed model analysis was used to adjust for the repeated mTc-MEP measurements.

Additional analyses were performed to adjust for propofol concentration, BIS, NE infusion rate and use of ephedrine. Moreover, the effects of increasing MAP on H-reflex and compound muscle action potential (CMAP) amplitudes were analysed.

Results and Discussion: A 10mmHg increase of the MAP was associated with a 14.4% increase (CI 11.4%, 17.9%; p<0.001) in amplitude and a 13.0% (CI 6.0%, 20.8%; p<0.001) increase in AUC. Increasing MAP from 60mmHg decreased the voltage thresholds by 2.27V (CI-7.29V, 2.74V; p=0.375) at a MAP of 80mmHg, and by 6.3V (CI -11.4V, -1.3V; p=0.016) at a MAP of 100mmHg. When adjusted for BIS and propofol concentration, we found a weaker association between MAP and mTc-MEP amplitude (p<0.001); and no association between MAP and AUC (p=0.070) and voltage threshold (p=0.621). Adjusting for NE and ephedrine increased the positive association between MAP and mTc-MEP amplitude. There was no association between MAP and H-reflex/CMAP amplitude (*Figure 1*).

Conclusions: MAP elevation is associated with higher mTc-MEP amplitudes, AUCs, and lower voltage thresholds. This might be due to increased cortical neuronal activity caused by either direct and/or

indirect effects of blood pressure elevation. Underlying physiological mechanisms remain to be elucidated.

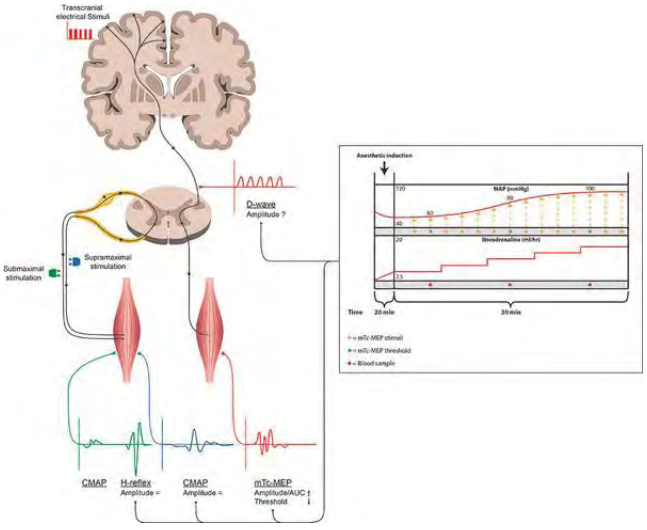

Figure 1. Schematic overview of effects of increasing MAP on the mTc-MEP, H-reflex and CMAP.

06AP04-02
Evaluation of the effect of CSF drainage on optic nerve sheath diameter in patients installed external ventricular drainage catheter due to intracranial pathology in the intensive care unit

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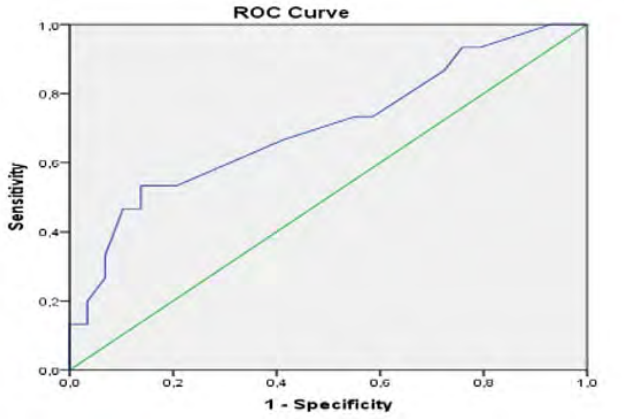
Background and Goal of Study: Determination of high ICP is necessary for the treatment of patients with raised ICP to improve long-term neurological outcomes. Ultrasonographic optic nerve sheath diameter (ONSD) measurement is a noninvasive, easily performed and cost effective technique for detecting high ICP. However, ICP measurements via ventricular catheters provide CSF drainage and ICP reduction. The normal ICP value is less than 15 mmHg in adults. In the literature the correlation of ONSD and invasive ICP measurements were determined. The aim of present study is to evaluate the correlation of ONSD and direct ICP measurements and to determine cut off ONSD value to detect ICP ≥15 mmHg.

Materials and Methods: In this prospective, single-center and single operator study, 44 patients older than 18 years of age, who were admitted to the ICU, had an external ventricular drainage catheter due to raised ICP, and had no eye pathology, were included. ICP and ONSD were measured before and after CSF drainage than changes and their correlations were investigated.

Results and Discussion: A statistically significant correlation was found between ICP and ONSD measurements before and after CSF drainage ($p<0.001$). A statistically significant decrease was found in ICP and ONSD with CSF drainage ($p<0.001$, table 1). Additionally, this reduction is associated with an increase in cerebral perfusion pressure ($p<0.001$). The area under the ROC curve was 0.701 (95% [CI] = 0.530 to 0.872)(Figure). The ONSD cut-off value was determined as 5,35 mm when ICP≥15 mmHg (Sensitivity of 53%, specificity of 86%, Youden index of 0,395)(Table 2).

	ICP (mmHg)		CPP		R-ONSD (mm)		L-ONSD (mm)	
	mean ± SD	*p*	mean ± SD	*p*	mean ±SD	*p*	mean ±SD	*p*
Before Drainage	14,68 ±9,31	*0,001**	77,82 ±19,05	*0,038**	5,12 ±0,55	*0,001**	5,18 ±0,53	*0,001**
After Drainage	9,89 ±7,86		80,32 ±16,50		4,52 ±0,53		4,54 ±0,53	

Variable	Area (AUC)	Std. Error	*p*	Cut-off	Specifi-city	Sensiti-vity	Youden İndex	Asymptotic 95% Confidence Interval	
								Upper Bound	Lower Bound
R-ONSD-1	,701	,087	**0,030***	5,35	0,862	0,533	0,395	,530	,872



Conclusion(s): In the present study, the ONSD and ICP correlation was found similar to the literature. We also determined the cut-off ONSD value as 5.35 mm when ICP more than 15 mmHg.

06AP04-04
The influence of depth of anaesthesia on motor evoked potentials monitoring during scoliosis surgery in children and adolescents (SCOL study): pilot data from a prospective observational study

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Background and Goal of Study: Intraoperative neurophysiological monitoring (IONM) represents a commonly used method in high-risk surgeries to detect potentially reversible neurological injury. The most frequent types of IONM used in scoliosis surgery are motor evoked potentials (MEPs) and somato-sensory evoked potentials.

Anaesthetic management can affect the IONM reproducibility during scoliosis surgery in paediatric patients. The goal of this study is to evaluate the influence of the depth of total intravenous anaesthesia (TIVA) on transcranial MEPs reproducibility. Our hypothesis is that depth of anaesthesia can affect MEP reproducibility.

Materials and Methods: Patients scheduled for elective scoliosis surgery in TIVA, with MEPs monitoring, were enrolled in a prospective, observational SCOL study. The anaesthesia was induced and maintained following local protocol. We titrated TIVA to the bispectral index (BIS) level 60±5 after the pronation and monitored MEPs. We deepened the anaesthesia before the skin incision to the BIS level 40±5 and repeated MEPs measurement. MEPs monitoring followed local protocol. Standard descriptive statistics were applied in the analysis: absolute frequencies for categorical variables and mean, median, minimum, and maximum for continuous variables. We used the software Statistica 13.5 (STATISTICA software TIBCO Software, Tulsa, OK, USA).

Results and Discussion: We enrolled 50 patients from September 2020 to July 2022. The inclusion was reduced by limited surgeries during the COVID-19 pandemic. MEPs were successfully monitored in all patients. The initial MEP latency and amplitudes on BIS level 60 ± 5 were baselines, resp. 100 %. The MEP parameters at BIS level 40 ± 5 were proportionally compared with the baseline. The MEPs latency was 104 % (97 – 110), and the MEPs amplitude was 84.5 % (51 – 109) at BIS level 40 ± 5. However, the declination in BIS level 40 ± 5 is not clinically significant, and it does not interfere with MEPs monitoring.

Conclusion(s): MEPs latencies are prolonged, and amplitudes are decreased at BIS level 40 ± 5 compared to BIS level 60 ± 5. However, this is not clinically significant. Based on pilot data, we assume no clinically significant change in MEPs affected by anaesthesia depth in the recommended BIS range of 40 - 60.

Acknowledgements: This work was supported by the Specific University in Research provided by MŠMT under Grant (MUNI/A/1178/2021); and MH CZ - DRO under Grant (FNBr, 65269705).

06AP04-05
Risk of perioperative stroke after Pediatric Moyamoya indirect bypass surgery

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Background and Goal of Study: Moyamoya is a progressive cerebral vasculopathy which presents with ischemic events in children and often as haemorrhage from abnormal collateral vessels in adults. Surgical intervention by direct or indirect bypass to augment perfusion is the mainstay of treatment. This population is at risk of peri-operative brain ischemia. Several risk factors have been described, including baseline characteristics and intra-operative hemodynamic parameters.

Our study aims to characterize the experience and practice of a single referral centre in peri-operative treatment of paediatric moyamoya patients undergoing indirect bypass.

Materials and Methods: A single center, retrospective observational study, approved by the institutional Helsinki Committee who also waived the need for patient consent. Patients who underwent indirect bypass surgery between 1/2014 and 6/2021 were studied to determine incidence and risk factors associated with stroke within 30 days.

Standardized protocol included continued aspirin therapy, administration of 1.5 times maintenance intravenous fluid starting one day preoperatively; pre-operative anxiolysis, intra-operative maintenance of blood pressure within 20% of baseline; end tidal CO2 between 35 and 45mmHg, SpO2 >95%, anti-epileptics; postoperative pain management with multimodal analgesia, anti-emetics around the clock.

Unified surgical technique was used by a single surgeon. Descriptive statistics were used to present baseline characteristics, as well as clinical outcome of stroke within 30 days.

Results and Discussion: 21 patients underwent 32 operations. Mean age at surgery was 7 years (± 4.66). Bilateral disease was present in 26 (81%) operations. Posterior circulation involvement was present in 7 (22%) cases; 11 (34%) had more than 1 surgery. 26 (81%) pre-op strokes were identified by imaging. 4 (12.5%) patients had a post-operative stroke at 1-30 days.

Blood pressure, fluid balance, ventilatory parameters and length of procedure were similar between those who did and did not have a postoperative stroke.

Conclusion(s): Our population of mostly young children with prior stroke, have a high risk for early post-operative brain ischemia.

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06AP04-06
Impact of COVID-19 infection on the incidence of cerebral thromboembolic events undergoing endovascular thrombectomy at the UHC Zagreb: anesthesiologist point of view

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Background and Goal of Study: The aim of the study is to investigate whether COVID-19 has increased in the need for mechanical endovascular thrombectomy (MET) after ischemic stroke. MET is the standard of care for patients admitted within 24 hours from the onset of the symptoms. Preprocedural anesthetic considerations should be rapid and the objective of anesthetic care is maintaining hemodynamic stability to achieve blood pressure goals.

Materials and Methods: The survey of data included all the patients with an acute cerebral thromboembolic event who underwent mechanical endovascular thrombectomy during 2019 and 2021 in UHC Zagreb. In our institution, the anesthesiologic approach is based on conscious sedation (CS), and general anesthesia (GA) is recommended for all patients with agitation, reduced Glasgow Coma Score (GCS), nausea and vomiting, and posterior circulation stroke. Often, the type of anesthesia depends on the localization of the insult, that is anterior or posterior cerebral circulation.

Results and Discussion: Total of 282 patients were included in the study. The mean age was 74.5 years, and 124 (43.9%) were women and 158 (56.0%) were men. In 2019. was total 133 patients with ACS 99 (74%), and PCS 19 (14%). During pandemic 2021. was total 149 patients with ACS 112 (75%), and PCS (13%).

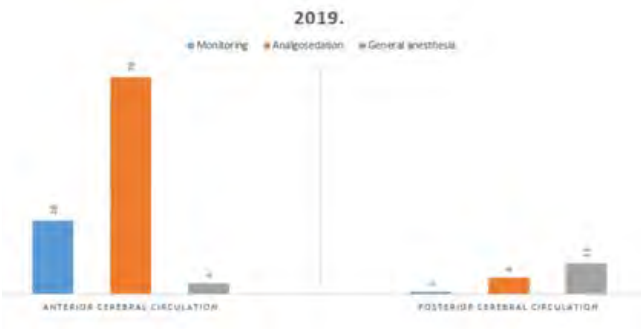

Figure 1. Analgosedation vs. general anesthesia

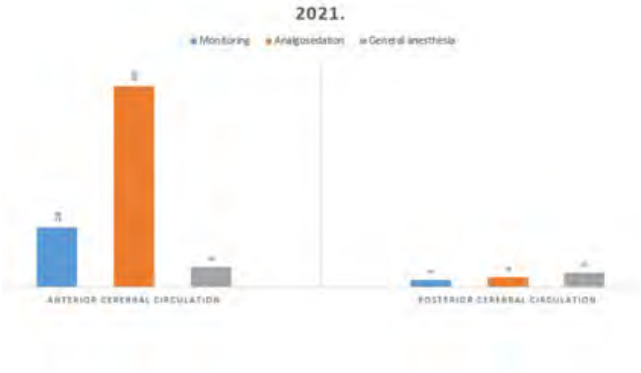

Figure 2. Analgosedation vs. general anesthesia

The Figures 1. and 2. shows show the type of anesthesia in 2019. and 2021.There was no significant rise in number of patients who needed MET. In patients with ACS, thrombectomy was mostly performed under CS while preferred anesthetic technique in patients with PCS was GA.

Conclusion(s): There is no anesthesia guidelines for stroke endovascular therapy. Most studies have focused on anterior circulation strokes; therefore, the future studies should also focus on the type of insult, not just a type of anesthesia.

06AP04-07
Routine management of perioperative bleeding in craniotomies: results of a national survey in Spain among neuroanaesthesiologists

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Background and Goal of Study: The objective of this survey was to explore transfusion practice and patient blood management in neurosurgery.

Materials and Methods: Haemostatic & Transfusion Subcommittee of Spanish Society of Anaesthesiology-endorsed online survey.

Results and Discussion: One hundred forty-seven responses were obtained from 65 hospitals. 82% of patients were evaluated only 3 weeks or less before surgery. Specific questions about the risk of bleeding are asked during the pre-anesthetic visit only in 55 (37%) respondents. In 134 (91%) responses, red blood cell concentrates are reserved for scheduled craniotomies. 75 (65%) reported that there is no preoperative anemia correction program prior to craniotomy. All respondents discontinued antiplatelet medication according to the half life without checking platelet functionality with a specific test prior scheduled craniotomy. In patients taking anti-inflammatories, just 30 respondents discontinued them (20.4%). The lower platelet limit acceptable for a planned craniotomy was 100000/mcl in 113 responses (76%). In case of a patient who takes antiplatelet drugs and requires an urgent craniotomy, 18 (12%) respondents would administer platelets; 48 (32%) would only administer them in case of count less than 100000/mcl; 15 (10%) according to platelet function tests; 11 (7%) administer platelets and desmopressin; 18 (12%) platelets and tranexamic acid; 5 (3%) would administer desmopressin and 8 (5%) tranexamic acid. The level of fibrinogen prior to surgery was not taken into account in 107 (72%) of respondents. During the intraoperative period, the availability of viscoelastic tests was: 84 (57%) in the surgical area, 39 (26%) outside the surgical area and 24 (16%) did not have them

The transfusion threshold of haemoglobin during surgical bleeding among respondents was: <10 g/dL in 27 (18%); <9 g/dL 56 (38%); <8 g/dL 57 (38%); <7 g/dL 7 (4%)

Temperature is routinely monitored in 104 (70%). One hundred and nine (74%) use permissive hypotension in case of uncontrolled bleeding; 92 participants (67%) responded that they adapt the lower limit of pressure to each patient

Conclusion(s): Preoperative optimization of haemoglobin before craniotomy is not usually performed. Most continue to discontinue antiplatelet drugs according to their half-life without checking platelet functionality. Thromboelastographic tests are becoming increasingly available

06AP04-08
A single-centre retrospective observational study comparing patients under airborne isolation precautions (for suspected or confirmed COVID-19) to non-isolated patients undergoing Mechanical Thrombectomy (MT) for Acute Ischemic Stroke (AIS) in a Tan Tock Seng Hospital (TTSH); a tertiary centre

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Background: TTSH receives patients with AIS for MT. Once Neurology review and a Computed Tomography of the Head (CT) Scan are done, suitable patients are sent to the Interventional Radiology (IR) Suite. At IR, the anaesthesia team reviews them before administering either General Anaesthesia (GA) or Conscious Sedation (CS). During the COVID-19 pandemic, patients suspected or diagnosed with COVID-19 required airborne isolation, with changes in workflow:

	Standard patient	Isolated patient: Diagnosed with COVID-19 or fulfilling criteria for a suspected COVID-19 case. Criteria for a „suspect" case took reference from national guidelines promulgated by the Ministry of Health, which were revised as the pandemic progressed.
CT scan location	CT Scanner at TTSH (not equipped to handle patients requiring airborne isolation)	CT scanner at National Centre for Infectious Diseases, NCID (in adjacent building connected by link bridge, equipped to handle patients requiring airborne isolation)
Mode of Anaesthesia for MT	CS or GA, discretion of anaesthetist, all anaesthesia procedures done at IR including intubation if necessary.	GA with Intubation to prevent risk of aerosol generation by coughing or conversion from CS to GA with need for intubation in IR suite.
Location of GA induction	Interventional Radiology Suite (not equipped for Aerosol Generating Procedures for patients requiring airborne isolation)	Airborne Infection Isolation Operating Theatre (AIIOT) in TTSH Main Operating Theatre complex, which is equipped with ventilation system capable of handling Aerosol Generating Procedures in patients requiring airborne isolation.

Goyal et al[1] showed that reducing time to recanalisation improves outcomes for patients who undergo MT.
This study aims to show differences in door to groin puncture time (DTG) as well as post-stroke disability outcomes between patients under isolation and those receiving standard care during the first year of the COVID-19 pandemic.
Materials and Methods: We included all patients undergoing GA for MT between October 2019 and December 2020 at TTSH. Local Institutional Review Board approved the study, consent was waived. Primary outcome was DTG (mean DTG was compared using Mann-Whitney U-Test), secondary outcomes were modified Rankin Scale (mRS) on discharge and at 3 months, grouped into Good (mRS≤**2**) or Poor (mRS≥**3**) and compared using Fisher's exact test. Data was collected by review of patient charts, as well as a form filled by anaesthetists during MT.
Results and Discussion: Of 97 cases, 18 required isolation. Mean DTG for these was significantly longer (147 vs 129 mins, p=0.007). There were also trends to poorer outcomes (poor mRS on discharge 88.9% vs 62.8%, p=0.09; poor mRS at 3 months 61.1% vs 41.9%, p=0.228) compared to standard cases which were not statistically significant, likely due to the number of cases being under-powered.
Conclusions: Patients requiring Airborne Isolation precautions had longer DTG timings. There was a trend towards poorer functional outcomes. When the IR suite was renovated, a ventilation system capable of airborne isolation was included, enabling reduction in patient movement and DTG time.
Reference:
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06AP04-09
The influence of physiological and pharmacological anaesthetic parameters on motor evoked potentials. A multivariable longitudinal mixed model analysis

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Background and Goal of Study: During spinal surgery, the motor tracts can be monitored using muscle transcranial electrical stimulation motor evoked potentials (mTc-MEPs). As anaesthesia-related factors may impair mTc-MEP signals and cause false positive alarms, we aimed to investigate the influence of pharmacological and physiological parameters on mTc-MEPs.
Materials and Methods: mTc-MEP amplitudes and area under the curves (AUC), and anaesthetic data were collected retrospectively from the records of all consecutive patients undergoing spinal (intradural and extradural) procedures with intraoperative neuromonitoring included between July 2019 and October. Pharmacological parameters of interest were effect site propofol and opioid concentrations and ketamine and noradrenaline infusion rates. Physiological parameters recorded included mean arterial pressure (MAP), bispectral index (BIS), heart rate, haemoglobin oxygen saturation, temperature, and end-tidal CO_2. A forward selection procedure was performed using multivariable mixed model analyses with mTc-MEP amplitudes and AUCs as outcome variables.
Results and Discussion: Data from 75 (69.44%) out of 108 consecutive patients were included. After multivariable mixed model analysis, MAP and BIS were significantly associated with mTc-MEP amplitude (p<0.001). For every 10 mmHg increase in MAP, the amplitude increased by 6.6% (CI 2.7%, 10.4%) and for every unit increase in BIS, the amplitude increased by 2.79% (CI 2.26%, 3.32%). MAP (p<0.001), BIS (p<0.001), heart rate (p=0.01) and temperature (p=0.02) were significantly associated with mTc-MEP AUC. Per 10mmHg increase of MAP, the AUC increased by 7.5% (CI 3.3%, 11.7%) and for every unit increase in BIS by 2.98% (CI 2.41%, 3.54%). For every beat per minute increase in heart rate, the AUC increased by 0.68% (CI 0.13%, 1.23%). mTc-MEP AUC decreased by 21.4% (CI-38.11%, -3.98%) per degree increase in temperature.
Conclusions: MAP, BIS, heart rate, and temperature were significantly associated with mTc-MEP amplitude and/or AUC. Our findings also suggest that close interdisciplinary cooperation and attention

to physiological and pharmacological parameters by experienced anaesthesiologists may attenuate the influence of anaesthetic parameters on mTc-MEPs and might thereby decrease the number of false positive mTc-MEP monitoring results.

06AP04-10
Conscious sedation or analgosedation with spontaneous breathing vs general anaesthesia in patients with acute ischemic stroke undergoing thrombectomy. Nine years of a single center experience

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Background: Acute ischemic stroke (AIS) is a neurological emergency that prompts urgent evaluation and treatment to limit disability and mortality. Management of a patient with acute ischemic stroke requires a multidisciplinary approach. Endovascular treatment is a standard of care therapy for severe acute ischemic stroke caused by large vessel occlusion, recommended by international guidelines[1]. There is no evidence for a superior anaesthetic choice for all different Interventional neuroradiology procedures.
Materials and Methods: We have conducted a single center observational retrospective study on patients undergoing endovascular treatment (EVT) in the extended window (>6 hours from AIS onset) at University Hospital of Messina.
We have included 1082 patients admitted to our center from 14/02/2014 to 30/06/2022 with diagnosis of AIS.
We compared functional and safety outcomes, perioperative hemodynamic management and procedure time between conscious sedation (CS) with spontaneous breathing (ASB) local anesthesia (LA) and general anesthesia (GA).
Results: A total of 1082 patients were included: 808 (75%) received GA, 166 (15%) received CS and 108 (10%) received LA.
The 3 groups did not significantly differ in age and gender as well as in the prevalence of AKI, Hypertension, Obesity, Copd and Diabetes.
The data show that there aren't statistically significantly variation of the secondary endpoints: hospital mortality, length of stay in ICU and 30, 60, 90 days survival.
The main goals to improve outcome are haemodynamic stability, maintenance of adequate Cerebral Perfusion Pressure (CPP), avoidance of secondary insults, patient immobility, rapid management of complications and smooth rapid recovery. Literature also shows that the choice of anesthesia should be tailored according to the patient's clinical condition1.
Conclusions: From one point of view our experience suggests that in emergency setting general anesthesia results in significantly higher rates of safety than CS in patients with AIS undergoing endovascular therapy. From another point of view the results suggest that the choice will be "tailored" on patient's clinical condition. Anaesthetic regimen is chosen in relation to the disease, patient condition and procedure.
Reference:
1. Powers WJ et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke. 2018

06AP04-12
Concentration of purine metabolites, indicators of gas composition and blood acid-base state in short-term dosed cerebral ischemia-reperfusion

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Background and Goal of Study: We study the features of purine metabolism during short-term dosed cerebral ischemia-reperfusion.
Materials and Methods: In 10 adult patients during angiosurgical operations on cerebral vessels (performed under regional anesthesia) in blood samples from the carotid artery and the jugular vein of the same name, taken before the clamps were applied and the blood flow was stopped, immediately before the clamps were removed, at the 1st, 5th minute after restoration of blood flow, the content of adenine, guanine, hypoxanthine, xanthine, uric acid, malonic dialdehyde, xanthine oxidase activity, gas, electrolyte composition and parameters of acid-base balance were studied.
Results and Discussion: In case of short-term dosed cerebral ischemia-reperfusion, the content of purine metabolites depends on the time of sampling and reflects the severity of the reperfusion syndrome. The activity of xanthine oxidase in arterial and venous blood correlates with the indicators of blood gas composition and acid-base balance.
Conclusion(s): Changes in the gas, electrolyte composition and acid-base balance of arterial, mixed venous blood. The values of the studied parameters in arterial, venous blood and their ratio depend more on the severity than on the nature of the cerebral pathology.

06AP05-01
Development of an EEG-based analgesia monitoring method during anaesthesia

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Background and Goal of Study: EEG bicoherence, standardized parameter of bispectrum, quantifies quadratic phase-coupling among frequency components of an EEG signal. We previously reported that EEG bicoherence showed two peaks in bi-frequency space during anesthesia, and their peak heights decreased after incision and restored by fentanyl administration. We defined two peak heights as pBIC-low and pBIC-high. Here, we investigated whether we can use these parameters as the indicator of adequate analgesia during surgery under general anesthesia.
Materials and Methods: After approval of our local IRB (#2020187), we enrolled 50 patients aged 27-65 years with an ASA-PS I or II who scheduled elective surgery under general anaesthesia. Besides the standard monitors, we used BIS monitor (BIS-VISTA) and all raw EEG packet as well as EEG derived parameters were recorded on a computer using our original software "BSA for BIS".

Anesthesia was maintained by sevoflurane and fentanyl. Fentanyl 3 μg/kg was administered at induction of general anaesthesia and 2 μg/kg was added before the start of surgery. As protocol 1, fentanyl 1 μg/kg (minimum dose 50 μg) was administered when the peak EEG bicoherence fell by more than 10 over a 5-minute period. As protocol 2, fentanyl 1 μg/kg (minimum dose 50 μg) was administered when the peak EEG bicoherence fell below 20. EEG bicoherence and general monitoring parameters were recorded and evaluated before, during and 5 min after fentanyl administration.

Results and Discussion: The total number of fentanyl doses was 150, of which 78 were administered in protocol 1 and 68 in protocol 2. Table1 showed the changes of two parameters, before, at fentanyl administration, and 5 minutes after fentanyl administration with protocol 1 and 2. Two parameters were restored after fentanyl administration. Whereas, systolic blood pressure and heart rate did not show significant changes among these 3 points.

Conclusion(s): EEG bicoherence was altered without the circulatory fluctuations that would be considered inadequate analgesia in normal clinical practice, suggesting that it is a more perceptive and better indicator of analgesic control than these.

06AP05-02
Effect of different positive end expiratory pressure levels on optic nerve sheath diameter in patients with or without midline shift who are undergoing supratentorial craniotomy

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Background and Goal of Study: The optic nerve sheath is in direct continuity with the dura mater and CSF, because optic nerve sheath is a distensible rise in ICP that influences the volume of optic nerve sheath diameter (ONSD). The cut-off value for normal ICP assessed ONSD ranges from 4.8-6.0 mm. In general, high levels of PEEP application is avoided in patients are undergoing craniotomy to prevent rise in ICP.

We aimed to evaluate the effect of different PEEP levels on ONSD and compare the effect of different PEEP levels in patients with and without intracranial midline shift.

Materials and Methods: This prospective observational study was performed in aged 18-70 years, ASA class I-III, total 80 patients who are undergoing supratentorial craniotomy. After the induction of general anaesthesia the ONSD's were measured by the linear transducer from 3 mm below the globe at PEEP values of 0-5 and 10 cmH_2O (Figure).

Subgroup analysis was performed in patients with midline shift (n=7) and ONSD were compered between patients with (n= 7) and without midline shift (n=73) at different PEEP values.

Statistical analysis was performed using SPSS for Windows26. Repeated measures of ANOVA with the post-hoc Bonferroni correction was used in group and independent t-test was used between the groups comparisons. $p < 0.05$ was considered to be statistically significant.

Results and Discussion: A statistical significant increase was observed in the ONSD due to increase in PEEP levels in the study population ($p<0.001$, Table 1). No statistically significant difference was found in the comparison of ONSD between patients with and without midline shift in different PEEP values ($p=0.329$, 0.535, 0.410 respectively, Table 2). Up to 10 cm H_2O PEEP application, measured mean ONSD values less than 6 mm in all patients even in patients with midline shift.

	Mean±SD	Minimum	Maximum	*p
ONSD when PEEP 0 cmH_2O (mm)	4.77±0.49	3.70	6.10	0.001
ONSD when PEEP 5 cmH_2O (mm)	5.10±0.58	3.90	7.00	
ONSD when PEEP 10 cmH_2O (mm)	5.44±0.71	4.00	7.70	

	With Midline Shift (n=7) Mean±SD	Without Midline Shift (n=73) Mean±SD	*p
ONSD when PEEP 0 cmH_2O (mm)	5.00±0.14	4.76±0.49	0.329
ONSD when PEEP 5 cmH_2O (mm)	5.28±0.15	5.09±0.60	0.535
ONSD when PEEP 10 cmH_2O (mm)	5.73±0.25	5.42±0.72	0.410

Conclusion(s): Statistically significant increases in ONSD due to increase in PEEP level were not found clinically significant. PEEP levels up to 10 cmH_2O have been found to be safe even in patients with a midline shift.

06AP05-03
Body Mass Index (BMI) and postoperative delirium in older adult patients

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Background and Goal of the Study: Postoperative delirium (POD) is part of postoperative neurocognitive disorders, and is associated with increased morbidity and mortality. Multiple non-modifiable risk factors of POD are known, e.g. increased age and male sex. It is of interest to investigate if Body Mass Index (BMI) could be a modifiable risk factor. Results regarding the association of obesity on POD are inconclusive, mostly due to small studies and heterogeneous groups. We hypothesized that obesity is a protective factor for POD and being underweighted might be a risk factor for POD.

Materials and Methods: This study is a sub-analysis of the RAPID study (n=160 patients), a prospective cohort study which investigated the possible relationship between preoperative intra-individual reaction time variability and incidence of POD in older adult patients (≥70 years) undergoing major elective surgery. Presence of POD was screened for up to five days postoperative using the Confusion Assessment Method. For the first hypothesis, BMI was categorized as obese (BMI ≥30 kg/m²) and not obese (BMI <30 kg/m²). For the second hypothesis, we assessed the weight categories for older adults: underweight (BMI ≤22 kg/m²), normal weight (BMI 22-28 kg/m²), overweight (BMI 28-30 kg/m²), and obese (BMI ≥30 kg/m²).

Results and Discussion: A total of 24 (15%) out of 160 patients developed POD. We found a difference between the occurrence of POD in obese (0% of 20 patients developed POD) and non-

obese older adult patients (17% (n=24) of 140 developed POD) (p=<0.046). Assessing the weight categories for older adults, we did not find a difference: POD was present in 11% (3 out of 27) of the underweight, in 15% (14 out of 90) of the healthy weight, in 30% (7 out of 23) of the overweight, and in 0% (0 out of 20) of the obese older adult patients.

Conclusions: Obese older adult patients had lower POD occurrence than non-obese older adult patients, which is supportive of the stated hypothesis that obesity might be a protective factor of POD in older adult surgical patients ("the obesity paradox"). Being underweight was not a risk factor for POD in our population. Our study was however limited by a relative small sample size and our findings therefore await confirmation in larger prospective studies.

Disclosure of Interest: None Declared

Trail registration: ClinicalTrials.gov, number NCT03988179

06AP05-04
Local anaesthesia vs general anaesthesia for surgical drainage of chronic subdural haematoma

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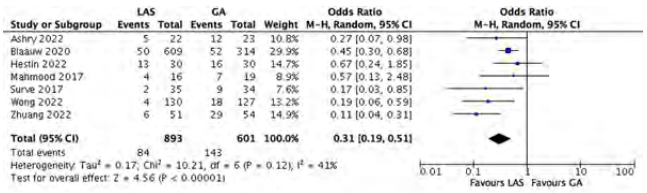
Background and Goal of Study: Surgery is advocated for symptomatic chronic subdural haematoma (CSDH) but the choice of local anaesthesia with/without sedation (LAS) vs general anaesthesia (GA) remains debatable. While LAS offers the benefits of avoiding airway manipulation and thereby a potentially more expedient procedure, GA may be preferable in uncooperative patients and affords a secure airway from the outset. The goal of our study was to systematically compare the use of LAS vs GA for surgical drainage of CSDH.

Materials and Methods: A literature search was conducted in PubMed, EMBASE, Scopus, Cochrane Central Register of Controlled Trials and ClinicalTrials.gov for studies that directly compared the use of LAS vs GA for surgical drainage of CSDH. Primary outcomes included duration of surgery (including anaesthesia time), post-operative recurrence rates and length of hospital stay (LOS). Secondary outcomes included intra-operative adverse events, post-operative complications and mortality.

Results and Discussion: A total of 8 studies were eventually included in our analysis, comprising 926 patients in the LAS arm and 616 patients in the GA arm. We found that LAS resulted in a shorter duration of surgery (including anaesthesia time) (MD -27.73min, 95% CI -43.56, -11.89), shorter LOS (MD -2.14, 95% CI -3.34, -0.94) and a lower risk of post-operative complications (OR 0.31, 95% CI 0.19, 0.51). There was however no significant difference in terms of post-operative recurrence rates, intra-operative adverse outcomes or mortality. These results have to be interpreted in the context of a significant degree of heterogeneity and possible risk of bias amongst the included studies.



Forest plot of comparison: LAS vs GA, Post-operative complications

Conclusion: Our study provides evidence that performing surgical drainage of CSDH under LAS results in shorter surgical duration, length of hospital stay and post-operative complications. However, GA may still be necessary in certain clinical contexts. More research should be done to evaluate long-term outcomes as well as patient reported experience measures, which can help individualise the choice of anaesthesia.

06AP05-05
Influence of signal amplitude and frequency on EEG-based anaesthesia monitoring systems

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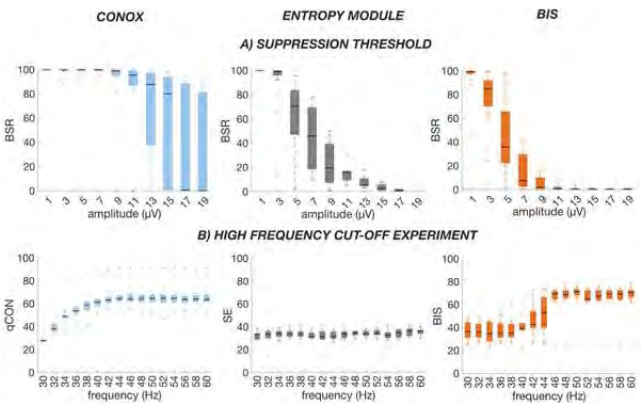
Background and Goal of Study: Electroencephalogram (EEG)-based monitors are used to assess a patient's level of anaesthesia and to detect burst suppression (BSupp) periods. Detection and prevention of BSupp patterns seems important to improve post-operative neurocognitive outcomes. However, monitor algorithms may underestimate the occurrence of BSupp.[1] Fleischmann et al. identified high suppression amplitudes as a possible factor for unrecognized BSupp.[2] Muscle activity (EMG) can also influence the EEG. Monitors apply low-pass filtering before signal processing to reduce the EMG content of the signal. The filter settings are mainly unknown.

We assessed the amplitude thresholds for BSupp detection and the upper cut-off frequencies to reduce EMG for BIS, Entropy Module and Conox.

Materials and Methods: We used simulated brown noise signals created with MATLAB because they resemble an EEG during anaesthesia. For the suppression threshold, they were played back to the monitors in different amplitudes (1 μV-19 μV). For the cut-off frequency experiment, they were low-pass filtered in the frequency domain at different steps from 30-60 Hz and played back to the monitors to analyse the influence of high frequency noise.

Results and Discussion: Conox and Entropy Module detected signal suppressions with amplitudes up to 15 μV and BIS with up to 9 μV.(Fig.A) For Conox BSupp Ratio (BSR) was significantly higher at higher amplitudes (BSR ±80 at 15 μV) than for Entropy Module and BIS, where BSR decreased rapidly after 5 μV for Entropy Module (BSR ± 45 at 7 μV) and after 3 μV for BIS (BSR ±35 at 5 μV). For Conox and Entropy Module higher frequencies did not influence indices. However, BIS-values increased with higher noise frequencies. (Fig.B)



Conclusion(s): BSR detection thresholds are different for each monitor. BSupp may not be detected by every monitor in the same fashion because of different amplitude thresholds. Based on these findings, anaesthesiologists should additionally assess the raw EEG signal. For BIS, high frequency noise seems to increase indices, indicating a strong influence of EMG.

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1. DOI:10.1093/bja/aex054
2. DOI:10.1213/ane.0000000000006098

06AP05-06
Decompressive craniectomy and brain death after traumatic brain injury, intracerebral haemorrhage or other cerebral diseases – a study on mortality and outcomes

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Background and Goal of Study: Decompressive hemicraniectomy (DHC) is a surgery used as last resort after severe brain damages with raised, refractory intracranial pressure (ICP). Mortality rates and long-term outcomes after DHC remain unclear for middle- and advanced-aged patients with traumatic brain injury (TBI), intracerebral haemorrhage (ICH), tumour or infection. The aim of this study was to investigate mortality and outcome of DHC, to identify predictors of poor outcome, and to find out whether DHC patients could fulfil the criteria for irreversible loss of brain function (brain death).

Materials and Methods: With ethics approval we retrospectively analysed the medical records from patients who underwent DHC because of TBI, ICH, tumour or infection during the last three years. In addition, we evaluated outcomes by interviewing patients and relatives over the phone using standard questionnaires for modified Rankin Scale (mRS) and extended Glasgow Outcome scale (GOSE). The health-related quality of life was evaluated on the EuroQol (EQ-5D-5L) scale.

Results and Discussion: One hundred fifty patients with a median age of 58 years (range: 10 to 85 years) were evaluated. Seventy-two patients suffered from TBI, 54 from ICH, and 25 from other cerebral diseases. A mortality rate of 65% was obtained, and patients died a median of 5.7 days (IQR [1.7 - 37.4]) after DHC. Favourable outcomes were seen in 11,3% and 7,3% of patients as assessed by mRS and GOSE evaluation, respectively. Eight (11%) of the deceased patients suffered a brain death after DHC. Cox regression revealed an increase in mortality risk of 2,3% for every year of age increase (HR = 1.023; 95% CI [1.01 – 1.04]; $p < 0.001$). Uni- and bilateral fixed pupils raised the mortality risk by a factor of 1.75 (95% CI [1.05 – 2.92]; $p = 0.03$) and 4.22 (95% CI [2.6 – 6.9]; $p < 0.001$), respectively. ROC-analysis yielded that age and pupillary reactivity predicted mortality at 6 months with an AUC = 0.78 (95% CI [0.70 – 0.85]). The only parameter associated with statistically significant favourable outcomes and better quality of life was younger age.

Conclusions: Mortality remains considerable after DHC (65%), and favourable outcome is limited to 7-11% of patients. Especially in elderly patients and in the presence of clinical signs of herniation, mortality is high, so that the indication for DHC should be made critically. DHC does not prevent patients from developing a brain death.

06AP05-07
Anesthesia gives rise to unique electrophysiological whole-brain signatures distinct from sleep or coma

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Background: Anesthesia shares behavioral and neurophysiological traits with sleep and coma, thus, implying that it is either 'artificial sleep' or 'reversible coma'. To date, it remains unclear if unique brain patterns exist under anesthesia.

Materials and Methods: We recorded whole-head scalp EEG during (I) general anesthesia with propofol (n = 28), (II) eyes closed resting wakefulness (n = 14), and (III) whole night sleep (n = 20) and (IV) from coma patients (n = 40). EEG data was preprocessed analogously and normalized. Spectral power was calculated in 10 second segments using the multitaper method. Individual topographies of spectral power under anesthesia were compared to the average state maps of wake, sleep and coma in a spectrally- (1 – 45 Hz) and time-resolved manner. Non-oscillatory power was estimated from the spectral slope (30 – 45 Hz). Unsupervised state identifications were obtained by EEG microstate analysis as well as Hidden Markov Modelling. Significance was estimated using permutation cluster tests (Monte Carlo, 1000 iterations) after z-transformation.

Results and Discussion: Spatiotemporal neural pattern similarity of anesthesia depended on the time-point and frequency band analyzed. In the slow frequency range (< 2 Hz), anesthesia resembled coma ($p_{Cluster} = 0.003$, $R^2 = 0.3$) but only 22 % of time. In contrast, N3 sleep and anesthesia shared a high degree of similarity in the alpha range (8 – 12 Hz: $p_{Cluster} < 0.001$, $R^2 = 0.17$) close to 50 % of the maintenance period (48 %). Above 30 Hz, neural patterns under anesthesia became more diverse, resembling coma (only up to 35 Hz, $p_{Cluster} < 0.001$, $R^2 = 0.13$) as well as N1 ($p_{Cluster} < 0.001$, $R^2 = 0.26$), N3 ($p_{Cluster} < 0.001$, $R^2 = 0.09$) and REM ($p_{Cluster} < 0.001$, $R^2 = 0.14$) in similar amounts of time (N1 - 24 %, N3 -15 %, REM - 15 %, coma - 24 %). The spectral slope decreased from wakefulness (-2.2 ± 0.5) over sleep (N3: -2.77 ± 0.14) to anesthesia (-3.3 ± 0.16; mean ± SEM), but showed a significant paradoxical increase in coma (-1.57 ± 0.3; Welch ANOVA: $p < 0.001$, $F_5 = 6.79$).

Conclusion: Taken together, variance explained by similarity to sleep or coma failed to explain the full neural repertoire under propofol, thus, revealing unique neural activity patterns of anesthesia. Our results demonstrate that spectral comparison between states of unconsciousness should not be limited to single frequency bands but must encompass the full electrophysiological information available.

06AP05-08
Use of the Hypotension Prediction Index algorithm (HPI) for the prevention of intraoperative hypotension (IOH) in adult patients undergoing spinal surgery: preliminary data from a single blinded randomized clinical trial

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Background and Goal of Study: IOH (MAP <65mmHg) during non-cardiac surgery has been proven to correlate with postoperative complications and increased mortality. Aim of this study is to investigate the hypothesis that the use of the HPI algorithm can reduce IOH in *patients undergoing spinal surgery in the prone position under general anesthesia*, as well as to explore its effect on in-hospital postoperative morbidity and mortality.
Materials and Methods: We present our first 20 patients included. Total intravenous anesthesia via target controlled infusion (TIVA-TCI) and the use of Patient State Index (PSI-target 25-50) for depth-of-anesthesia monitoring was provided to all the participating patients. A radial arterial catheter was inserted and connected to both the standard monitor and the platform which includes the HPI software.
Intervention group A: The HPI algorithm was used in order to prevent hypotensive episodes.
Control group B: Standard anesthetic care was provided. The HPI algorithm recordings were blinded to the anesthesiologist.
Results and Discussion: Baseline characteristics of the patients were similar as shown in Table 1.

	Group A(10 patients)	Group B(10 patients)
Gender	30 % (male), 70 % (female)	40 % (male), 60 % (female)
Age	64.6 ± 10.25	61.4 ± 14.45
ASA score	80%(II), 20%(III)	80%(II), 20%(III)
Monitoring time per patient	401.73 ± 83.14	351.37 ± 126.79

Table 1: Baseline charaacteristics

Use of the HPI algorithm reduced TWA of MAP<65mmHg in group A as shown in Table 2. There were no renal or major cardiovascular complications in Group A. 2 cases of AKI stage 1(AKIN classification) and one in hospital cardiac arrest were recorded in Group B.

	Group A (10 patients)	Group B (10 patients)
Primary outcomes		
TWA of AUT (MAP < 65mmHg) per patient	0.16 ± 0.18	0.34 ± 0.48
Number of patients with hypotension	60%	90%
Average number of hypotensive events per patient	2.7 ± 2.67	5.9 ± 7.55
Average Time in Hypotension per Procedure	9,1 (2.26%)	19,9 (5.65%)
Secondary outcomes		
Adverse Cardiac Events	3/10 mild elevation of hs-TnI	2/10 mild elevation of hs-TnI 1/10 significant rise and fall of hs-TnI - in hospital cardiac arrest
Acute kidney injury (AKIN classification)	no patients	2/10 classified as stage 1

*TWA (time weighted average) = (depth of hypotension*time spent in hypotension)/total surgery time, AUT (area under the curve)*

Table 2: Outcomes

Conclusion(s): Use of HPI algorithm reduced IOH but we are not able to draw safe conclusions about the clinical significance of this finding postoperatively due to the small sample size.

06AP05-09
EEG changes after cortico-subcortical decoupling during propofol-induced loss of consciousness. The importance of signal filtering

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Background and Goal of Study: Cortico-subcortical decoupling has been observed during propofol-induced loss of consciousness (LOC)[1].
We aimed to correlate this decoupling LOC with changes in electroencephalogram (EEG), a difficult process due to functional magnetic resonance imaging (fMRI) induced artifacts[2].
Materials and Methods: Bilateral frontal EEG (Conox™ monitor) was acquired simultaneously with fMRI in healthy volunteers receiving propofol gradually increased. qCON index, burst suppression and SQI were stored. EEG gradient and cardioballistic artifacts were detected using the Artifind toolbox and removed from the EEG signals using canonical approaches. Decoupling LOC[i] were identified, and 20 s EEG segments pre and post decoupling LOC were analysed. For qCON replay, the value of qCON was calculated from the EEG data. Wilcoxon paired test was used to evaluate differences between pre and post decoupling LOC.
Results and Discussion: EEG was successfully filtered in 17 subjects. Pre and post LOC qCON were significantly different (mean±SD) (84±12 vs 63±10, p=0.001) (Figure 1) Also, alpha band frequency power increased from pre- to post LOC EEG (Figure 2).

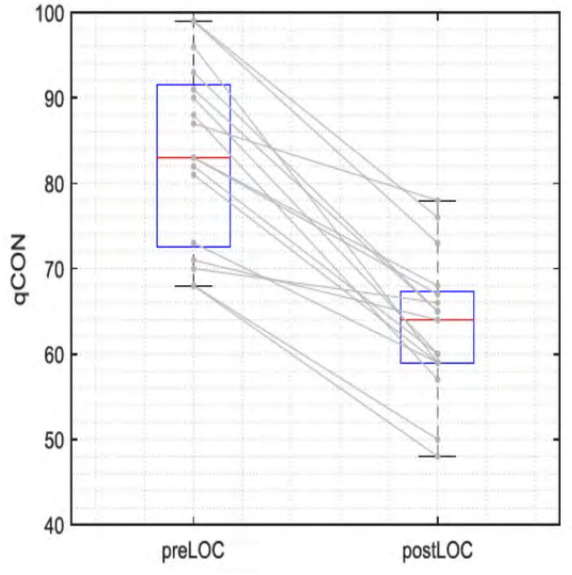

Figure 1.

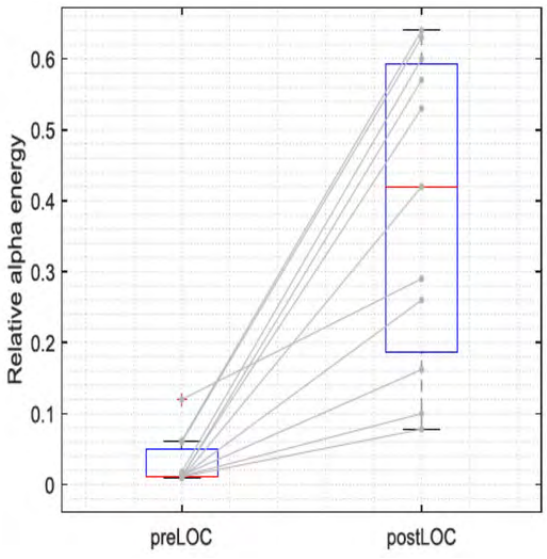

Figure 2.

Our results show how qCON index changed from a preLOC value, close to unconsciousness, to a post LOC value where unconsciousness is achieved. Unconsciousness was assessed by clinical signs and confirmed by cortico-subcortical decoupling, reinforcing the validity of qCON index measurements.

Conclusions: Cortico-subcortical decoupling induced by propofol is associated with a decrease in qCON index and an increase in alpha band frequency power. Specific artefact reduction algorithms were useful to evaluate these changes. These results are encouraging for future monitoring of sedation.

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06AP05-10
ESP block and ANI monitoring in spine surgery for a multimodal analgesic strategy

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Background and Goal of Study: Spine surgery requires a multimodal analgesia approach including different drugs and locoregional anesthesia in order to minimized opioid use and obtain an early recovery. The Analgesia Nociception-Index (ANI) provides noninvasive monitoring of intraoperative nociception by assessing the parasympathetic tone through the ECG signal.The study aims to assess the effect of the Erector Spinae Plane Block (ESPB) and the ANI monitoring in perioperative opioid consumption and pain control.

Materials and Methods: In this observational prospective single-centre cohort study we planned to include 33 patients who underwent laminectomy under general anesthesia divided into 3 groups: ESPB/ANI-monitoring, no-ESPB/ANI-monitoring, and no-ESPB/ANI-blinded. Remifentanil was administered using target controlled infusion pump with Minto model. We collected demographic data, comorbidities, type of surgery, ANI values during surgery, hypertensive events, duration of anesthesia, the total amount of remifentanil and morphine, numeric rating scale (NRS) at the end of surgery, and NRS and Quality of Recovery Score (QoR-15) after 24 hours.

Results and Discussion: Preliminary data (*Table 1*) from 9 patients reveal no statistically significant differences in remifentanil consumption between the groups (0.13 mcg/kg/min [0.01-0.14] vs 0.12 mcg/kg/min [0.1-0.15] vs 0.1 mcg/kg/min [0.05-0.13], $p=0.12$). We observed a reduction in the amount of postoperative morphine and improved haemodynamic stability and pain control with ANI-guidance and ESPB, albeit the difference is not statistically significant.

Conclusion(s): In our experience, these techniques could be promising for a multimodal analgesia in spine surgery, although this partial data are not statistically significant due to the small sample size.

	ESPB/ANI monitoring (n=3)	no-ESPB/ANI monitoring (n=3)	no-ESPB/ANI blinded (n=3)	p-value*
Age (years)	66 [46 – 76]	52 [31 - 58]	74 [68 - 80]	0.11
N° hypertensive events	0 [0 - 0]	0 [0 -1]	1 [1 -1]	0.12
NRS awakening	1 [0 - 3]	3 [0 - 8]	2 [2 - 8]	0.56
NRS 24h	2 [0 - 5]	6 [5 - 7]	6 [3 - 6]	0.12
QoR15 24h	135 [120 - 141]	115 [63 - 134]	118 [102 - 121]	0.19
Remifentanil (mcg/kg/min)	0.13 [0.01 - 0.14]	0.12 [0.10 - 0.15]	0.1 [0.05 - 0.13]	0.67
Morphine (mg)	0 [0 - 0]	0 [0 - 0]	2 [0 - 5]	0.10

Table 1 Demographic and clinical characteristics of the three groups of patients. Data are presented as median [interquartile range]. Kruskall-Wallis's test.*

06AP05-11
Influence of body position on noninvasive intracranial pressure real-time waveform analysis monitor during radical prostatectomies under general anesthesia

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Background and Goal of Study: Video laparoscopic and robotic surgeries represent progress because they are less invasive and allow faster recovery of patients. However, the Trendelenburg position, and pneumoperitoneum are associated with hemodynamic changes and, presumably, increased intracranial pressure.

The objective was to evaluate the accuracy of using a non-invasive intracranial pressure intraoperative monitoring system (PICNI - Brain4Care® 1) in detecting changes in intracranial compliance and compare with the measurement of the optic nerve sheath diameter, cerebral oximetry and processed eletroencephalogram, which may correlate with intracranial pressure and postoperative cognitive status.

Materials and Methods: After approval by the Institutional Ethics Committee, a prospective and observational study was carried out with the preliminary inclusion of 33 patients who underwent videolaparoscopic or robotic prostatectomies in the head-down position. A preoperative cognitive assessment was performed (MiniMental and MOCA) and, intraoperatively, the patients were monitored with continuous cardioscopy, pulse oximetry, arterial pressure, mea-

surements of the optic nerve sheath by ultrasound and the new PICNI equipment Brain4Care for noninvasive assessment of the P2/P1 ratio of the cranial compliance curves. Neurocognitive tests were repeated postoperatively.

Results and Discussion: In the preoperative and first-day postoperative cognitive assessment, there was no variation in the Mini-mental test (median 28 points), although the minimum score decreased from 17 to 15 points, while the Median in the MOCA ranged from 27 points to 26. There was an increase in the mean optic nerve diameters obtained by USG throughout the surgery from 47mm to 60mm, and this increase was even maintained after returning to horizontal dorsal decubitus. Head-down positioning increased the P2/P1 ratio. There was no significant difference between the P2/P1 ratios in video laparoscopic or robotic procedures. There was a difference in the P2/P1 ratios between patients over 70 years of age compared to patients under 70 years of age.

Conclusion(s): Surgeries in the head-down position cause changes in cranial compliance and non-invasive monitoring allows the detection of these changes, which were more important in older patients. It was not possible to assess whether such changes are correlated with postoperative cognitive changes.

Reference:

1. https://doi.org/10.3390/jpm11121302

06AP05-12
Surgery time in spine surgery: Is it a risk factor for intraoperative and postoperative complications? A preliminary approach

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Background and Goal of Study: Spine surgery (SS) is often a complex surgery with non- negligible incidence of intraoperative and postoperative complications. There are factors that may contribute to this, such as patient's comorbidity, surgical indication, location of the surgery, surgical approach, past surgical history in the operated area as well as the surgery time (ST). Our hypothesis is that ST is a risk factor for the development of intraoperative and postoperative complications.

Materials and Methods: Retrospective preliminary observational single institution study was performed between January 2019 and December 2020. All patients who underwent SS were included. 490 patients were enrolled. A descriptive study of demographic and clinical variables was done including relevant intraoperative and postoperative complications. Primary endpoint (PE) was ST. Secondary endpoints (SE) were postoperative complications such as bleeding, readmission to postoperative anesthesia care unit (PACU), pain, renal failure, PONV, delirium, respiratory failure, surgical wound infection or incidental durotomy (ID). We classified patients into 2 groups according to the ST: GROUP1 (< or = 180 min) and GROUP2 (>180 min).

Results and Discussion: Bivariate analysis was done to determine the relationship between PE and SE. Student's t-test was performed for continuous variables and Chi-square for categorical variables. P values < 0.05 were considered statistically significant. GROUP1=74.3% (N=364), GROUP2=25.7% (N=126). Statistical significance between ST and PACU length of stay, transfusion rate, days of hospital admission (HA), urinary infection, anemia (Hb < 12 g/dL) during HA, poor pain control in PACU and during HA, inability to walk after 48h of the SS, critical intraoperative or postoperative bleeding and ID was found. The mean PACU length of stay in GROUP1 was 8h and GROUP2 18.7h. GROUP1 had 5.1 days of HA and GROUP2 11.6. 8 patients had critical bleeding; 2 were GROUP1 and 6 GROUP2. GROUP1 had more cases of ID than GROUP2 (5% and 13.5% respectively).

Conclusions: This preliminary study aims to describe ST in our center, intraoperative and postoperative complications during SS and risk factors. Some variables suggest that both groups are similar. From our data, we aim to perform a multivariate statistical analysis to obtain more accurate results.

06AP05-13
Effect of hypertonic saline versus mannitol on brain relaxation and brain oxygenation during supratenorial craniotomy

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Background and Goal of Study: Hyperosmolar solutions have been used in neurosurgery to modify brain edema and prevent neurological deterioration. Mannitol has been the osmotic agent of choice in clinical practice in many countries for nearly five decades but there are increasing number of authors claiming that hypertonic saline might be more efficient agent delivering better brain condition overall.

The goal of the study was to compare the short-term effects of equivolemic and equiosmolar solutions of mannitol and hypertonic saline (HTS) on brain relaxation and brain oxygenation in patients undergoing supratentorial craniotomy.

Materials and Methods: A prospective randomized interventional clinical study included 87 patients with diagnosed supratentorial tumor masses scheduled for craniotomy between June 2016 and July 2017 was performed after approval from Ethics Committee (IEC). Patients were divided in two groups depending whether they receive equiosmolar dose 3ml/kg of 3 % hypertonic saline (HTS group) or 20% mannitol. The primary outcome was to evaluate tissue cerebral oxygenation measured with NIRS and brain relaxation comparing HTS and mannitol. Secondary outcomes were to evaluate the correlation with bispectral index (BIS) value, hemodynamic parameters, osmolality, diuresis and electrolyte status. serum lactate and C-reactive protein. The parameters were followed during several time intervals.

Results and Discussion: Both agents, HTS and mannitol produce equally good brain relaxation. Results for cerebral oxygenation after 30 min of osmotherapy showed increased oxygenation in HTS group comparing to mannitol group especially in left hemisphere (P<0.05). Values of C-reactive protein (CRP) and diuresis were consistently increased in mannitol group noticeable after 6 hours(P<0.005) for

CRP and 30 min, 120 min and 6 hours for diuresis (P<0.005). MAP was higher in HTN group 30 min and consistently higher in all other time intervals (P<0.005).

Conclusion(s): In elective neurosurgical supratentorial craniotomies 3% of hypertonic saline comparing to 20% mannitol demonstrate increased regional cerebral oxygenation, more stable hemodynamics without effect on diuresis and osmolarity. Cerebral relaxation in HTS group was equally good as in mannitol group.

Cardiac, Thoracic and Vascular Anaesthesiology

07AP01-01
Jet ventilation reduces coronary sinus movement in patients undergoing atrial fibrillation ablation under general anesthesia: an observational crossover study

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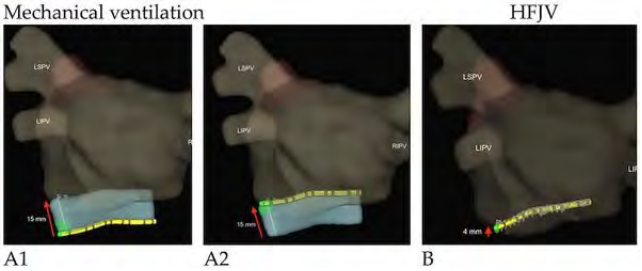
Background and Goal of Study: Use of high-frequency jet ventilation (HFJV) is advocated by some authors due to the near immobility of thoracic, as well as abdominal structures. (1) Some studies showed that ventilation with HFJV during atrial fibrillation ablation is associated with a reduction in operating and fluoroscopic times and arrythmia recurrence rate. (2) However, no study has quantified the movements of cardiac structures during HFJV compared to normal mechanical ventilation.
Materials and Methods: After ethical approval and written informed consent, we included 21 patients scheduled for atrial fibrillation ablation in this prospective crossover study. Each patient was ventilated by normal mechanical ventilation and by HFJV. During each ventilation mode displacement of cardiac structures were measured by the EnSite Precision mapping system using a catheter placed in the coronary sinus (HD grid and Abbott Inquiry, Abbott Cardiovascular, Plymouth, MN, USA).
Results and Discussion: The median [Q1 – Q4] displacement was 2.0 [0.6 – 2.8] mm during HFJV and 10.5 [9.3 – 13.0] mm during conventional ventilation (P <0.000001). The figure shows the catheter displacement during mechanical ventilation (A1 and A2), as well during HFJV (B) for a typical patient. This reduction of movement can potentially lead to a greater contact force between the ablation catheter and cardiac structures. (3) Better contact force may lead to a better result, and this could be an explanation for the association between HFJV and lower recurrence rates of atrial fibrillation.



Conclusion: This study quantifies for the first time the minimal movement of cardiac structures during HFJV compared to standard mechanical ventilation.
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07AP01-02
Study of the safety and efficacy of remimazolam during one lung ventilation

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Background and Goal of Study: Remimazolam is a novel intravenous anesthetic that has been increasingly used in thoracic surgery due to its low risk of circulatory depression. However, its influence on hypoxic pulmonary vasoconstriction (HPV) and oxygenation during one lung ventilation (OLV), a common issue in thoracic surgery, remains unclear due to the lack of previous studies.
The study aimed to compare the effects of remimazolam on respiratory function during OLV, with those of propofol, which is known to be less likely to suppress HPV, to provide safer anesthetic management and improved patient outcomes.
Materials and Methods: In this prospective randomized controlled trial, 70 adult patients undergoing pulmonary surgery scheduled for OLV under general anesthesia combined with epidural analgesia, in our institution, were divided into propofol and remimazolam groups. Anesthesia techniques and intraoperative ventilator settings were performed according to the predetermined protocol, and values of arterial blood oxygen partial pressure/ fraction of inspiratory oxygen ratio and arterial blood oxygen saturation were compared at three time points: immediately before OLV initiation, and 30 and 60 minutes OLV initiation. Surgical information, intraoperative drug use, patient background and respiratory function, and the presence of adverse events were compared. Statistical processing was performed using Student's Unpaired t-test, chi-square test, or Fisher's exact probability test; a P-value of <0.05 was considered significant.
Results and Discussion: No significant differences in patient background, respiratory function, surgical information, or adverse events were observed between the two groups. Neither oxygenation capacity nor arterial blood oxygen saturation at each time point was significant. However, ephedrine use was significantly lower in the remimazolam group (7.0mg) than in the propofol group (14.9mg). These results suggest that remimazolam use during OLV does not suppress HPV as well as propofol, therefore, does not affect oxygenation. Further, it has less of an effect on circulation. Thus, remimazolam is equally safe during OLV as propofol. Additionally, its use in thoracic surgery, which is prone to circulatory fluctuations, is also considered effective.
Conclusions: The study suggests that remimazolam has no adverse effect on OLV and has less circulatory effect compared to propofol.

07AP01-03
Effects of inhaled nitric oxide on gas exchange and hemodynamics during one-lung ventilation in pigs in supine position

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Background and Goal of Study: One-lung ventilation (OLV) impairs gas exchange and hemodynamics due to ventilation-perfusion mismatching (1). This impairment could be attenuated by inhaled nitric oxide (iNO), but studies have shown conflicting results. Moreover, these effects have not been investigated during supine position. We hypothesised that, during OLV in supine position, iNO dose-dependently improves gas exchange and lowers mean pulmonary arterial pressure.

Materials and Methods: After regulatory approval (DD25-5131/496/33), eight pigs were anaesthetized in supine position and submitted to OLV. Then, animals were randomly assigned to one of four Latin-square sequences of iNO 0 (iNO0), 5 (iNO5), 10 (iNO10), and 20 ppm (iNO20), for 30 minutes each. Between interventions, a 30-minute washout period with iNO=0 ppm was applied. To mimic thoracic surgery and the associated inflammatory response, a thoracotomy was performed, and lipopolysaccharide was administered intravenously at a rate of 0.5 μg/kg/h. We examined changes gas exchange and haemodynamics at iNO0, iNO5, iNO10, and iNO20 relative to pre-examination time point. Statistical analyses were performed using SPSS by paired t-tests and a general linear model for repeated measures. Statistical significance was accepted at a $P \leq 0.05$.

Results and Discussion: Relative to pre-examination time point, PaO_2/F_IO_2 increased during iNO5 (102±102 mmHg, P=0.025) and iNO10 (95±81 mmHg; P=0.013) but not iNO20 (60±102 mmHg, P=0.138). iNO had no significant effect on $PaCO_2$ and arterial pH. Mean pulmonary arterial pressure was significantly lower at iNO5 (26±6 mmHg, P=0.031), iNO10 (24±3 mmHg, P=0.004), and iNO20 (24±5 mmHg, P=0.032), as compared to iNO0 (31±6 mmHg). iNO had no significant effect on cardiac output, heart rate, mean arterial blood pressure, pulmonary capillary occlusion pressure, or systemic vascular resistance.

Conclusion: During OLV in pigs in supine position, iNO showed a dose-dependent, inversed U-shape effect on oxygenation, while a ceiling effect was observed in the reduction of mean pulmonary arterial pressure, suggesting that concentrations of 5 and 10ppm might represent an optimum for improvement of gas exchange and haemodynamics.

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07AP01-04
Regional renal oxygen saturation correlation to central venous and regional cerebral oxygen saturation in patients undergoing off-pump coronary artery bypass graft surgery

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Background and Goal of Study: Displacement of heart during off-pump coronary artery bypass graft surgery (OPCAB) lead to hemodynamic instability and global hypoperfusion. Global hypoperfusion can be estimated by central venous oxygen saturation (ScvO2) whereas regional hypoperfusion can be estimated by measuring cerebral (SrcO2) and somatic (renal; SrrO2) oxygen saturation using near-infrared spectroscopy (NIRS) during surgery. Recent studies has shown SrrO2 is significantly correlated with development of postoperative acute kidney injury(AKI). This study was aimed to investigate SrrO2 correlation to ScvO2 and SrcO2 in patients undergoing OPCAB.

Materials and Methods: This prospective, observational study was conducted in 46 adult patients undergoing OPCAB for 3-vessel disease. Patients with depth from skin to kidney ≥ 4 cm, renal vascular stenosis, previous renal disease, carotid artery stenosis, combined cardiac procedure, urgent CPB conversion were excluded. In addition to standard monitoring, Bilateral SrcO2 and SrrO2 were measured using NIRS sensors (INVOS 5100C) and ScvO2 was measured using PreSep oximetry catheter (Edwards life sciences) at 16 time points. The primary point was the correlation of SrrO2 change with ScvO2 and SrcO2 during OPCAB. Pearson's correlation analysis was performed.

Results and Discussion: Forty-two patients were included in final analysis. Postoperative AKI occurred in 9 patients(21%). SrrO2 change was significantly correlated with SrcO2 change (r= 0.296, p<0.001) but not ScvO2 change (r=-0.028, p=0.464). The incidence of postoperative AKI was higher in patient with higher age (69.9 vs 61.6), emergency surgery, and low albumin(3.7 vs 4.0) and hematocrit(37.4 vs 42.4) before surgery, norepinephrine requirement (77.8% vs 33.3%) and RBC transfusion (88.9% vs 42.4%) during surgery, epinephrine requirement(33.3% vs 3.0%) and colloid use (44.4% vs 3.0%) after surgery. SrrO2 were lower at the end of surgery in patients with AKI compared to those without AKI.

Conclusion(s): SrrO2 was poorly correlated with SrcO2 and was not associated with ScvO2. Therefore, separate measurement of SrrO2 targeting kidney may required to detect and prevent postoperative AKI rather than global or cerebral oxygen saturation in OPCAB patients.

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07AP01-05
Sex and height do not predict left bronchial diameter for DLT selection – a 3D-reconstruction study

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Background and Goal of Study: Determination of the left bronchial diameter (BD) is key in the correct selection of left double lumen tube (DLT) for one lung ventilation[1]. To avert damage to the left bronchus while minimizing the risk of cuff overblocking and high airway resistance the largest DLT adhering to a safety margin of ≥1mm between the BD and DLT diameter is suggested[2].
In the absence of accurate radiographic measurement several demographic methods to approximate BD for DLT size selection have been proposed[2]. Here, we analyze the predictability of BD by sex and height using 3D-reconstruction of CT scans[3].
Materials and Methods: 100 patients were included. Sample size calculation for a linear regression model with two independent predictors determined at least n ≥ 50 to meet an R^2 of 20% (1-β = 0.8, α = 0.05). The precision of BD prediction was measured using cross-validated R^2 and difference between measured BD and predicted BD in absolute value (prediction error). P-values are Bonferroni corrected.
Results and Discussion: Men (57%) had mean height of 178 ± 8 cm and women of 163 ± 7 cm ($p<0.001$). Mean BD was significantly different between the sexes (men: 14.8±1.2 mm; women: 11.9±1.1 mm, $p<0.001$) and significantly depended on body height ($p<0.001$). However, sex and height only explained 46% of BD variability (Fig.). 95% of individually predicted BDs differed by up to ± 3.5 mm from the measured BD. The mean individual prediction error was 1.24 mm.

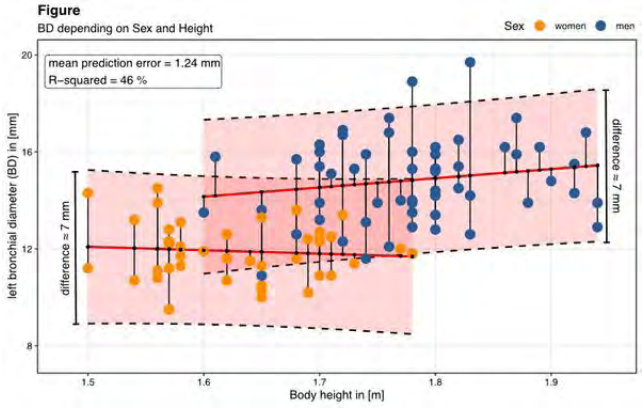

Figure: Measured BD is shown depending on sex and height. Predicted BD is shown as black dots on the red regression line. Vertical black lines show the prediction error. 95%-prediction intervals cover 95% of measured BDs for men and women (red areas).

Conclusion(s): Observed variability of BD is too large for individual prediction of BD by sex and height. Thus, these selection criteria cannot assure a safety margin of ≥1 mm between BD and DLT. 3D-reconstruction may proof advantageous for individualization of DLT selection.[3]

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07AP01-06
Oxygen transport and hypoxic-hyperoxic preconditioning in coronary surgery with a cardiopulmonary bypass: a randomized clinical trial

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Background and Goal of Study: A recent study has pointed out an important role of hypoxia and hyperoxia signaling in the organ protection [1-2]. The hypothesis is that a HHP is associated with a beneficial effect on postoperative outcome in patients undergoing coronary surgery with cardiopulmonary bypass (CPB).
Materials and Methods: Patients (n=120) were randomly assigned to an equal groups: a HHP and a control. Perioperative data, oxygen transport characteristics were collected. The HHP was administered to anesthetized, catheterized, and mechanically ventilated patients before CPB.
An anaerobic threshold was determined to establish a safe oxygen concentration in the respiratory gas mixture during the hypoxic phase (10-14% oxygen fraction for 10 minutes), followed by a hyperoxic gas mixture (75-80% oxygen fraction for 30 minutes).
Results and Discussion: The frequency of postoperative complications was 14 (23.3%) in the HHP vs 23 (41.1%) in the control group, spontaneous sinus rhythm recovery was registered in 34 (56.7%) vs 18 (32.1%); the vasoactive-inotropic score (VIS) after CPB was 6 [IQR 5; 7] h vs 9.5 [IQR 6.3; 15] h; the length of mechanical ventilation was 10 [IQR 8; 22] h vs 17 [IQR 11.3; 24] h (respectfully), $p<0.05$. «Vessel training» in the form of intermittent vasodilation and vasoconstriction as a result of hypoxic and hyperoxic influences may constitute a possible mechanism of protection.
According to ROC analysis the ΔPCO2/C(a-v)O2 after 10 minutes of hyperoxia more than 0.90 could predict postoperative complications in chronic heart failure patients (area under curve 0.85 (95% CI 0.682; 1.000), $p=0.010$, sensitivity 88%, specificity 64%). This may be a kind of «stress-test» for the adaptive capacity of the vessels.

Conclusions: The HHP with individual parameters based on the anaerobic threshold exerted a cardioprotective effect and associated with shorter duration of mechanical ventilation, lower levels of VIS, a lower number of postoperative complications, and contributed to a more frequent sinus rhythm recovery. The ΔPCO2/C(a-v)O2 as a response to hyperoxia in a test-like mode may predict complications.

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07AP01-07
Analysis of pressure- and strain-volume-loops from perioperative images and radial artery blood pressure data with a new app

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Background and Goal of the Study: Transoesophageal echocardiography (TOE) is routinely used during cardiac surgery to monitor cardiac function. However, because these imaging measurements do not account for blood pressure, they do not provide a full account of cardiomechanics. The University Hospital of Basel is designing an application for anaesthetists, which only requires a trace of the ventricular function curve (i.e. volumetry or strain) obtained from the TOE images and the arterial blood pressure curve from the monitor to generate pressure-volume-loops (PVL) and strain-volume-loops (SVL). We investigated if these app-generated parameters of cardiomechanics are related to traditional TOE assessments in patients under general anaesthesia.

Materials and Methods: In 53 anaesthetized patients (66±8 years) undergoing coronary-artery-bypass-graft surgery, TOE images have been collected prior to revascularization. Snapshots of the radial arterial blood pressure curve and both global longitudinal strain and volume curves of the left ventricle acquired from 3D TOE data sets were analyzed using the app to create PVL and SVL. The new parameters were correlated to traditional 2D TEE measurements of left ventricular emptying and filling rates.

Results: From the PVL, a mean ventricular elastance of 1.97±1.02 mmHg/ml was computed. A higher ventricular elastance indicating stiffer ventricles correlated to a slower left ventricular systolic emptying rate (r=0.332, p=0.021). SVL slopes (0.30±0.08 %/ml) further correlated to poor early (r=-0.291 p=0.049) and late diastolic filling rates (r=-0.472 p= 0.001).

Conclusions: Novel "apps" can generate peri-operative pressure- and strain-volume-loops from data available in the typical cardiovascular anaesthesia setting without requiring intraventricular catheters. These new measurements describe diastolic and systolic function and correlate with traditional echocardiography. Continuing development of the app should improve real-time assessments and user-friendliness so that in the future this imaging-based app has the potential to provide anaesthetists with a comprehensive picture of changes in peri-operative cardiac function.

07AP01-08
Does disulfide/thiol homeostasis predict postoperative neurocognitive dysfunction in near-infrared spectroscopy-guided coronary artery bypass surgery patients: a prospective study

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Background and Goal of Study: Profound exposure to ischemia-reperfusion (IR) injury during cardiopulmonary bypass (CPB) plays an essential role in the pathophysiology of postoperative neurocognitive disorders. Following prolonged ischemia, when oxygen is reintroduced during reperfusion, toxic reactive oxygen species (ROS) are formed. Antioxidants and particularly thiol groups attempting to prevent the devastating effects of ROS may not preserve their plasma and tissue levels. However, formed disulfide bonds may again be reduced to thiol groups, and thiol /disulfide homeostasis (TDH) is maintained.

Near-infrared spectroscopy (NIRS) is a method for non-invasive monitoring of cerebral oxygenation. Given the possible link among CPB, cerebral oxygenation, and cognitive functions, we conducted this prospective study to hypothesize that during CPB, impaired TDH could predict the deterioration of NIRS values intraoperatively and cognitive functions postoperatively.

Materials and Methods: Seventy-one ASA III-IV patients between 40-80 years of age (79 % men) undergoing elective coronary artery bypass graft (CABG) surgery were prospectively studied after approval from Baskent University Medical Faculty, Ethics Committee (KA20/22). They were assessed with Mini-Mental State Examination (MMSE) test pre and postoperatively. In the operating room, a NIRS sensor was placed on the forehead of patients for continuous measurement of regional oxygen saturation (rSO_2). After standard monitorization and anesthesia induction, blood samples were obtained for thiol-disulfide homeostasis (TDH) status at five stages of the operation as T_1: before anesthesia; T_2: 20 min after anesthesia, T_3: 20 min after aortic cross-clamp; T_4: 20 min after the removal of aortic cross-clamp; and T_5: 24 h after the operation.

Results and Discussion: Postoperative MMSE scores of the patients were significantly lower than the preoperative scores (p<0,001). Total and native thiol measurements were significantly higher at T_5 compared to T_2, T_3, and T_4 (p<0,001). Both disulfide/total thiol and disulfide/native thiol ratios decreased considerably at T5 (p=0.024, p=0.028, respectively). rSO_2 value changes were insignificant but increased at T_5.

Conclusion(s): This study revealed that TDH correlates not with cognitive cerebral oxygenation but with MMSE. Since this is the first study using TDH as a predictor of IR injury in CPB, our study will enlighten the current literature.

07AP01-09
Extracorporeal cytokine hemadsorption during prolonged cardiopulmonary bypass

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Background and Goal of Study: Cardio pulmonary bypass (CPB) leads to a well-known immunological response. In some cases, may be induced excessive immune response, leading to severe systemic inflammatory response syndrome (SSR) or cytokine storm and induced organ dysfunction. Prevention and treatment of excessive immune responce urgent problem. Advances in cardiac surgery have led to a decrease in the overall mortality associated with open-heart surgery, however, it can still exceed 50% among those patients who develop a postoperative.

Materials and Methods: Single center randomized study.

Patients who were assigned a planned complex cardiac surgery with a duration of CPB > 120 minutes, were randomized into three study groups: CytoSorb -300, HA 330 and the control group. A simple method of randomization. Inclusion criteria: patients who were assigned a planned complex cardiac surgery with a CPB (> 120 min), informed consent to participate in the study, age ≥18 years.

Results and Discussion:

Group HA 330 (n=20),

Group CytoSorb300 (n=20) were compared with control group (n=20.

Baseline parameters, surgery characteristics and. complications in the postoperative period.

Mean ± standard deviation	HA 330 group (n=20)	CytoSorb 300 group (n=20)	Control group (n=20)	P value
Mean Age	53,19 ±14,44	49,15±18,15	51,68 ±12,58	0,26
Male	9 (45%)	11(55%)	13(65%)	
Female	11(55%)	9(45%)	7(35%)	
BMI	26,58 ±4,46	26,94 ±3,7	28,18 ±5,8	0,14
Apache II	16,73 ±2,55	14,32 ±6,25	12,73 ±8,29	0,10
CBP time (min)	218,14±86,92	201,85±65,39	194,45±42,42	0,5
Cross clump time	121,23 ±66,91	103,25 ±56,86	115±44,69	0,5
Circulatory arrest	4,04 ±8,08	8,45 ±9,47	3.5 ±8,31	0,14
ICU stay days	3,80±7,24	4,47±5,58	10,05±17,52	0,082
Ventilation days	3,33 ±5,24	3,42 ±5,51	7,7 ±17,39	0,178
Hospital stay days	24,05±12,24	23,31 ±14,38	28,63 ±18,39	0,475
Mortality	1(5%)	1(5%)	2(10%)	

Complications	HA 330	CytoSorb 300	Control
AKI	7 (35%)	2 (10%)	8(40%)
RRT	32	31	69
Liver injury	1(5%)	1(5%)	3 (15%)
Bleeding*	3 (15%)	1(5%)	1(5%)
VA ECMO*	5(25%)	4(20%)	2(10%)
HIT*	1 (5%)	0	1(5%)
Ischemic stroke	0	1 (5%)	0

Conclusion(s): Extracorporeal cytokine hemadsorption during prolongen CBP decrease inflammation markers, but not affected incidence of postoperative complications.

07AP01-10
Multimodal low-opioid anesthesia protocol during on-pump coronary artery bypass grafting: aprospective cohort study

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Background and Goal of Study: Despite the significant number of publications on the influence of components of anesthesia protocols on the development of post-operative complications, the question of choosing the optimal anesthesia protocol during coronary artery bypass grafting (CABG) in patients with coronary heart disease remains unclear. This study aimed to determine the effect of multimodal low-opioid protocol (MLOP) on early post-operative complications during on-pump CABG.

Materials and Methods: A single-center prospective cohort study including 120 patients undergoing on-pump CABG aged 18 to 65 years, divided into two equal groups according to undergoing MLOP or routine-opioid anesthesia protocol (ROP). The analyzed parameters were plasma IL-6 levels, complications, duration of mechanical ventilation, length of ICU stay and length of hospitalization. The study is registered in clinicaltrails.gov №NCT05514652.

Results and Discussion: In the MLOP group, the levels of IL-6 at the end of the surgery were 25.6% significantly lower compared to the ROP group (33.4 ± 9.4 vs. 44.9 ± 15.9, p<0.0001), the duration of mechanical ventilation (2.0 (2.0; 3.0) h vs. 4.0 (3.0; 5.0) h, p<0.001) significantly shorter, the incidence of low cardiac output syndrome (LCOS) (7 (11.7%) vs. 16 (26.7%), p = 0.037) almost 2,5 times lower and also the incidence of post-operative atrial fibrillation (9 (15.0%) vs. 19 (31.7%), p=0.031) significantly lower. The length of stay in the hospital did not significantly differ between both groups (11, 0 (9.25; 12.75) days vs. 12.0 (11.0; 13.0) days, p=0.056). Patients with LCOS were characterized by lower left ventricle ejection fraction before surgery, higher use of a routine opioid protocol of anesthesia, longer duration of cardiopulmonary bypass (CPB) and aortic cross-clamping, and higher levels of IL-6 at the end of surgery (all p < 0.05). Logistic regression analyses identified the following two independent predictors of LCOS: duration of CPB and level of IL-6 at the end of surgery.

Conclusion(s): Our study confirms that using an MLOP was characterized by significantly lower levels of IL-6 at the end of surgery and a lower incidence of low cardiac output syndrome and post-operative atrial fibrillation compared to ROP.

07AP01-11
The choice of respiratory support tactics during cardiopulmonary bypass in cardiac surgery patients

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Background and Goal of Study: Postoperative pulmonary complications represent a large part of cardiac surgery complications. No consensus exists regarding the effects of maintaining mechanical ventilation during CPB to decrease these complications [1]. The study aimed to evaluate the effectiveness of three different tactics of respiratory support during CPB for the prevention of postoperative pulmonary complications.

Materials and Methods: In a prospective, randomized, controlled study included 90 patients scheduled for different cardiac procedures (CABG, Mitral or Aortic valve replacement), devided into 3 equal groups: CPAP group (constant positive airway pressure +5 cm H2O); VC group (mechanical ventilation with a low tidal volume of 3 ml/kg, a respiratory rate 6 per minute, positive end-expiratory pressure +5 cm H2O); apnea group (no ventilation during CPB). Primary outcome was the PaO2/FiO2 ratio at the end of the CPB. Secondary composite outcome combining the rate of pulmonary postoperative complications, reintubation, respiratory support more than 24 hours. The paO_2/FiO_2 ratio was measured as follows: T1 (after the beginning of mechanical ventilation, T2 (1 minute before the CPB), T3 (1 minute after CPB), T4 (at the end of the surgery), T5 (1 hour after surgery), T6 and T7 (6 and 12 hours after surgery, respectively).

Results and Discussion: In both the CPAP and apnea groups, there was a decrease of PaO2/FiO2 ratio at the end of the CPB compared with baseline values. In the CPAP group, the PaO2/FiO2 dropped from 319±80 to 223±152, while in the apnea group it decreased from 316±82 to 230±102 ($P<0.001$, Wilcocson test). No significant changes in this parameter were observed in the VC group (331±55 and 290±100). The frequency of postoperative pulmonary complications were 47% in apnea group, 37% in CPAP, and 10% in VC group ($P=0.006$, Kruskal-Wallis test).

Conclusion: Low-tidal ventilation during cardiopulmonary bypass was associated with fewer pulmonary postoperative complications compared to a CPAP or no-ventilation tactics in cardiac surgery patients.

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07AP02-01
Predicting mortality after minimally invasive cardiac surgery with machine learning: model development and validation

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Background and Goal of Study: The European System for Cardiac Operative Risk Evaluation (EuroSCORE) estimates the risk of cardiac surgery by patient-related, cardiac-related, and operation-related factors. The lastest version, EuroSCORE II was published in 2012 and provides good discrimination in predicting the mortality after cardiac surgeries. While minimally invasive cardiac surgeries (MICS) increased, the EuroSCORE II overestimated its mortality. This study aims to develop and validate machine learning models in predicting the mortality after MICS.

Materials and Methods: We retrospectively collected electronic health record of adults undergoing MICS in Far Eastern Memorial Hospital from 2016 to 2020. Input features included demographics (A), surgery types (A), vital signs (A), laboratory values (A), co-morbidities (B), ASA classes (B), and variables of EuroSCORE II (C). Data were split by 4:1 into training and validation set randomly. Machine learning algorithm including random forest classifier, XGBoost classifier, and logistic regression were used to trained models using feature set 1 (A), 2 (A+B) and 3 (A+B+C), which included 38, 57, and 71 features, respectively. The area under the receiver operating characteristics curve (AUROC) and area under the precision-recall curve (AUPRC) of models were compared. The AUPRC is better than the AUROC for evaluating rare event prediction.

Results and Discussion: In our cohort, 22.8% (214/940) of patients received coronary artery bypass surgery. Mortality rate was 5.5% (52/940) and the mean EuroSCORE II was 7.3 ± 8.9. The EuroSCORE II overestimated the mortality. The random forest had the highest AUROC of 0.880 using feature set 3 and the highest AUPRC of 0.398 using feature set 1. EuroSCORE II had an AUROC of 0.706 and an AUPRC of 0.172. The random forest and logistic regression using feature set 1, which only contained objective values, had higher AUROCs than those using feature set 2. The AUROC increased when XGBoost used more features.

Model	Feature set	AUROC	AUPRC
Random forest classifier	1	0.868 (0.798 - 0.917)	0.418 (0.244 - 0.574)
	2	0.852 (0.763 - 0.923)	0.414 (0.254 - 0.582)
	3	0.880 (0.820 - 0.921)	0.398 (0.233 - 0.547)
XGBoost classifier	1	0.803 (0.712 - 0.876)	0.321 (0.174 - 0.468)
	2	0.810 (0.711 - 0.893)	0.393 (0.230 - 0.546)
	3	0.843 (0.781 - 0.893)	0.352 (0.194 - 0.502)
Logistic regression	1	0.807 (0.703 - 0.891)	0.309 (0.124 - 0.462)
	2	0.763 (0.646 - 0.864)	0.343 (0.173 - 0.492)
	3	0.778 (0.655 - 0.882)	0.316 (0.177 - 0.470
EuroSCORE II		0.706 (0.612 - 0.804)	0.172 (0.097 - 0.280)
ASA		0.758 (0.671 - 0.854)	0.186 (0.104 - 0.279)

Conclusion: Machine learning algorithm had a higher AUROC and AUPRC than EuroSCORE II in predicting mortality after MICS.

07AP02-02
A retrospective study of preoperative risk factors and perioperative complications in patients that underwent surgical removal of intracardiac thrombus

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Background and Goal of Study: Two common treatments for intracardiac thrombi are anticoagulation therapy and surgical removal. Anticoagulation therapy is associated with bleeding complications, while surgical treatment is associated with various perioperative complications.
The goal of this study is to examine the cause of the thrombus, preoperative risk factors, and intra-operative complications, by reviewing the anesthesia records of the patients who underwent surgical removal of an intracardiac thrombus.
Materials and Methods: Following IRB approval (No. B21-141), this study was conducted retrospectively in patients who underwent intracardiac thrombectomy. Data are expressed as median values. Statistics were performed using Mann-Whitney U test or Chi square test, and $p<0.05$ was considered significant.
Results and Discussion: We recruited 20 patients in this study. In 18 and 2 patients, thrombus removal was performed with and without cardiopulmonary bypass (CPB), respectively. The cause of the thrombus in 11 (55%), 6 (30%), 2 (10%), and 1 (5%) patient was atrial fibrillation (Af), heart failure, left ventricular dysfunction, and pacemaker lead thrombus, respectively. Nine (45%) and 11 (55%) patients received and did not receive preoperative anticoagulation therapy, respectively. In 18 patients, durations of CPB, anesthesia, and operative procedure were 106 min (no preoperative anticoagulation) vs. 164 min (with preoperative anticoagulation), 320 min vs. 426 min, and 228 min vs. 319 min, respectively; blood loss and transfusion volumes were 343 ml vs. 281 ml, and 795 ml vs. 840 ml, respectively, all of which were independent of the preoperative anticoagulation therapy.
No major perioperative complications such as stroke, heart failure, or myocardial infarction were noted; however, one patient died due to delayed wound infection.
Conclusion(s): In patients undergoing surgical removal of an intracardiac thrombus, Af is a major cause of the thrombus. Surgical bleeding is not affected by the preoperative anticoagulation therapy. Surgical thrombectomy can be performed safely with fewer perioperative complications.

07AP02-03
Oral carbohydrate loading in cardiac surgical patients with type 2 diabetes as a part of ERAS

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Background and Goal of Study: Prevalence of diabetes in cardiac surgical surgical patients is 30-40%. It is well recognized that they have higher rates of complications, and longer stays in hospital compared to patients without diabetes.
The objective of this study was to explore the safety and feasibility of preoperative carbohydrate drink in diabetic patients undergoing cardiothoracic surgery.
Materials and Methods: This was a hospital-based study of 50 adult surgical patients with type 2 Diabetes Mellitus (DM) undergoing cardiothoracic surgery between January and April 2022. A carbohydrate-rich drink (400 ml, 12.5%) was given as per protocols.
The primary outcome was blood sugar levels at 2 hours (pre-induction- T1), 8 hours (arrival in ITU-T2) and 24 hours (Day1 in ITU after operation-T3) after administration. Among secondary outcomes- aspiration, new AKI, worsening of pre-existing AKI, length of stay in ITU after surgery and any wound infection till the time of discharge were assessed.
Results and Discussion: The blood sugar levels were <8 mmol/L in approximately 75% of patients till the time they arrived in ITU i.e. 8 hours after administration. There was no incidence of aspiration in any of the patient, no new AKI or any wound infection till the time of discharge from hospital. Length of stay (LOS) in ITU was 1 day in 80% of patients.
Conclusion(s): Administration of oral carbohydrate beverage 2 hr before cardiothoracic surgery in patients with type 2 DM is safe, effective and can be used for ERAS protocols as recommended for non-diabetic patients undergoing major surgery.

07AP02-04
Measuring the negative impact of oxygen and caffeine on aortic function using 4D cardiovascular magnetic resonance blood flow techniques

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Background and Goal of Study: ESAIC guidelines suggest that black coffee may be consumed up to 2h prior to the induction of general anaesthesia. Yet, little is known about the impact of caffeine on the aortic vasculature and potential interactions with other perioperative drugs, of which the most common administered agent is oxygen. It is important to understand if these factors may compromise aortic function as aortic elasticity is vital to maintain a sufficient blood pressure in diastole for coronary perfusion and to reduce the

afterload on the left ventricle. Magnetic resonance imaging (MRI) exams can non-invasively measure aortic haemodynamics and function using 4D-blood flow techniques and elasticity. We investigated the effects of caffeine on the healthy aorta and if there is any interaction with supplemental oxygen using multiparametric 2D and 4D MRI.

Materials and Methods: Healthy volunteers (<45y, n=15) underwent an MRI exam and 2D images of the ascending aorta were acquired to quantify distensibility for the calculation of theoretical vascular age. 4D-flow images were acquired to visualize blood flow and quantify total blood flow in the ascending aorta. Images were acquired first at rest and then during oxygen inhalation (10L/min) administered through a rebreathing facemask. Participants then consumed 150mg of caffeine (~3 espresso shots), and imaging was repeated two hours later with and without oxygen.

Results and Discussion: The calculated vascular age at baseline was 31.5y [25.5-37.8]. Oxygen, coffee, and their combination all reduced aortic elasticity and thus increased the calculated vascular age (Figure, $p<0.05$). Similarly, 4D-flow analysis demonstrated oxygen and coffee consumption decreased total aortic forward volume ($p<0.05$) from a baseline of 75.8ml [59.7-91.9], while a non-significant trend for a decrease was observed with the combined stimulus ($p=0.054$).

Conclusion: In healthy participants, both caffeine and oxygen have a stiffening effect on the aorta and reduce net aortic forward volume measured by 2D and 4D MRI. Since caffeine and oxygen are omnipresent agents, they may have an impact on the management of general anaesthesia.

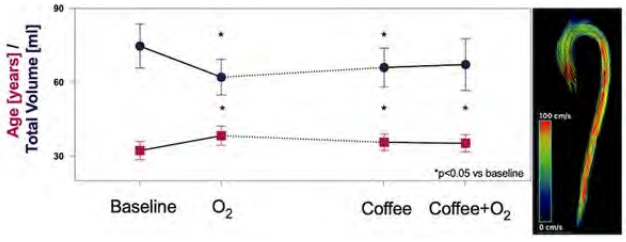

Figure. Mean and 95% confidence intervals. Total volume (blue) was measured with 4D-MRI sequences (image right). Calculated vascular age (red) was derived from 2D-MRI sequences.

07AP02-05
Using preoperative clinical markers to predict CAD patients who experience hyperoxia-induced systolic dysfunction while under general anaesthesia

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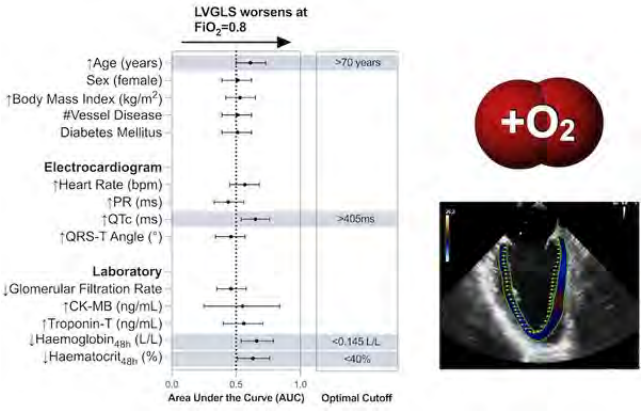
Background and Goal of Study: Patients with coronary artery disease (CAD) are at risk of perioperative complications. Hyperoxia is a known coronary vasoconstrictor, yet the literature is mixed if patients benefit or worsen from high fraction of inspired oxygen (FiO_2) concentrations during general anaesthesia. We investigated the impact of FiO_2 on left ventricular systolic function in anaesthetized CAD patients, and if routine clinical data collected preoperatively identifies the appropriate individual FiO_2.

Materials and Methods: CAD patients scheduled for elective coronary artery bypass graft surgery (n=103) were prospectively recruited. Prior to surgical incision, FiO_2 was titrated to both a normoxaemic state (FiO_2=0.3, SpO_2=95-98%) and a hyperoxic state (FiO_2=0.8, SpO_2>98%), in random order. At both states 2-, 3- and 4-chamber views were acquired with transoesophageal echocardiography (TOE), and global left-ventricular longitudinal strain (LVGLS) was quantified and compared between oxygen levels.
Preoperative markers (listed in the figure) were acquired from the clinical files and logistic regression was applied to assess their predictive value in determining which patients benefit or worsen from hyperoxia.

Results and Discussion: Images from both levels could be quantified in 99 patients, of which the change in LVGLS was heterogeneous (range: Δ6.2 to -7.2%), with 50 (51%) worsening at FiO_2=0.8, while in the remaining 49 (49%) hyperoxia was beneficial. Pre-operative predictor analysis shows LVGLS deteriorated at FiO_2=0.8 if patients were older (AUC: 0.615, p=0.049), had a longer QTc interval (AUC:0.651, p=0.010), or lower haemoglobin (AUC:0.660, p=0.014) and haematocrit (AUC:0.630, p=0.048). Other factors such as preoperative troponin, body mass index and presence of 1- vs. 2- or 3-vessel disease were not associated with hyperoxia induced changes in LVGLS.



Conclusion: In an interim analysis in CAD patients undergoing general anaesthesia, preoperative markers could predict in which individuals hyperoxia have a detrimental effect on LV systolic function. Incorporating these preoperative markers might be a tool to target oxygen levels based on individual needs.

07AP02-07
Pulse wave transit time for non-invasive monitoring of pulmonary artery pressure: respiratory gating improves correlation with gold standard in experimental pulmonary hypertension

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Background and Goal of Study: Pulse wave transit time (PWTT) shortens as pulmonary artery pressure (PAP) increases and was therefore suggested as a potential non-invasive surrogate for PAP[1]. The state of lung filling is also known to affect PWTT independently of PAP[2]. The aim of this retrospective analysis was to test whether respiratory gating improved correlation between PWTT and PAP.
Materials and Methods: In each one of five anesthetized and mechanically ventilated pigs two high-fidelity pressure catheters were placed, one directly behind the pulmonary valve, and the second one in a distal branch of the pulmonary artery. PAP was raised using the thromboxane A2 analogue U46619 and animals were pressure-controlled ventilated (I:E ratio 1:2, respiratory rate 12/min, tidal volume of 6 ml/kg). All signals were recorded using the multi-channel platform PowerLab®. The arrival of the pulse wave at each catheter tip was determined using a MATLAB-based modified hyperbolic tangent algorithm and PWTT calculated as the time interval between these arrivals.
Results and Discussion: Visualizing the respective time point of each heartbeat within the respiratory cycle blue (inspiration) and red (expiration) revealed a characteristic respiratory dependency of PWTT (Fig. 1) with a correlation coefficient for PWTT and mPAP of r = 0,712. This correlation increased dramatically when heart beats were selected (i.e. gated) at end-inspiration (r = 0, 934) or end-expiration (r = 0, 978).

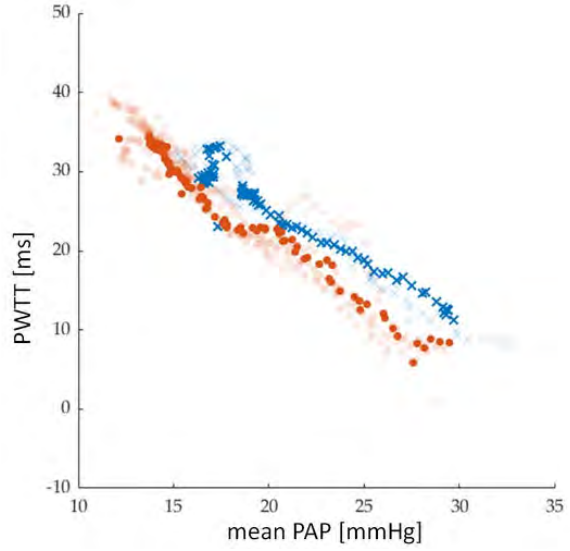

Figure 1: Scatter plot showing the relation between mean PAP and PWTT. The last heartbeat of each inspiration is highlighted in blue (X) and that of expiration in red (dots) while all others are shown faintly in the respective color.

Conclusion: The estimation of mean PAP from PWTT improved significantly when taking the respiratory cycle into account. Since expiration is typically longer, end-expiratory gating is suggested.
References:
1. Mueller-Graf F, Merz J, Bandorf T, *et al.* Correlation of Pulse Wave Transit Time with Pulmonary Artery Pressure in a Porcine Model of Pulmonary Hypertension. *Biomedicines* 2021; **9**(9).
2. ESICM LIVES 2022: part 2. *Intensive Care Med Exp* 2022; **10**(Suppl 2):40.

07AP02-09
Low bioelectrical impedance phase angle - a predictor of blood transfusion and hyperglycemia in cardiac surgical patients

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Background and Goal of Study: To analyze bioelectrical impedance analysis (BIA) derived phase angle (PA) as a predictor of blood transfusion and hyperglycemia. BIA measures fat and fat free mass, minerals, PA and the body's water. PA is considered a biological marker of cellular health.
We aimed to study whether PA can predict the requirement of blood transfusion, intra and post-operative hyperglycemia in cardiac surgical patients.
Materials and Methods: This prospective observational study was done in 109 patients with preoperative data of BIA, who underwent elective cardiac surgery on cardio pulmonary bypass(CPB) in our institute from November 2020 to October 2021 after Institutional Ethics committee approval. Based on PA angle, patients were divided into low PA (≤ 5.4°) and normal PA (>5.4°) group. To analyze the incidence of hyperglycemia (>180mg/dl), patients were divided into diabetic and non-diabetic groups based on preoperative history.
Blood glucose was managed with insulin (IU/hr) in accordance with the sliding scale, and total units given were recorded. Baseline demographic details, peri-operative lab investigations, inotropic, ventilation duration and length of ICU stay were collected. The Primary outcome comprised of blood transfusion, hyperglycemia, and insulin requirement.
Results and Discussion: The mean age was 56.3±11.1 years and 78.9% were males. 66.1% and 33.9% of patients were in normal and low PA group respectively. Among females majority were in low PA group (60.8%, p-0.005). Among low PA group 8.1% had prior preoperative stroke(p-0.04) with elevated blood sugar before surgery (133.7± 46.7 vs 115.8 ± 31.8, p-0.009) and during CPB (191±38.5vs176±38.4, p-0.05).
Non-diabetics low PA group had hyperglycemia during CPB (217.4±34.3 Vs 168.5 ±32.9, p-<0.001), day of surgery (164.5 ±32.8 Vs 179.3 ±27.8, p-0.04) and first post-operative day (176.5 ±27.6 Vs 154.3 ±23.5, p-0.001) with significant requirement of insulin (IU/hr) (18.8 ±16.4 vs 9.53 ±11.8, p-0.05) when compared with normal PA. Low PA group had increased incidence of blood transfusion (75.7%, p-0.04).
Logistic regression analysis showed low baseline hemoglobin (OR-0.57, CI-0.42-0.76, p-<0.001), systemic hypertension (OR-3.03, CI-1.2 -7.5, p-0.01) and PA <25th percentile (OR-2.93, CI-1.05-8.17, p-0.03) were independent predictors for blood transfusion.

Conclusion(s): BIA-derived PA < 25th percentile is an independent predictor for blood transfusion and perioperative hyperglycemia in non-diabetic patients.

07AP02-10
Comparison of the analgesic effects of erector spina plane block and combined serratus anterior plane block in coronary surgery: a randomized controlled study

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Background and Goal of Study: Facial plane blocks are being used with increasing frequency in the postoperative pain management of cardiac surgery because of their easy accessibility and few complications. In this study, it was aimed to compare the analgesic effects of ultrasonography guided erector spina(ESPB) and deep and superficial(combined) serratus anterior plane block(C-SAPB) in patients who underwent coronary surgery.
Materials and Methods: Adult patients who will undergo elective coronary bypass surgery were included in the study after ethics committee approval. Patients underwent bilateral ESPB or bilateral C-SAPB before induction of anesthesia. In both groups (for ESPB and SAPB), 30 ml of 0.25% bupivacaine was administered to each side, with a total of 60 ml of bupivacaine. While remifentanil was used as an intraoperative analgesic, paracetamol (4x1gr) and tramadol 1mg/kg iv were administered at the end of the operation. In case of VAS>4, fentanyl was given as a rescue analgesic. Demographic data, intraoperative data, active/passive/drain site visual analog scale (VAS) values at 1,2,4,6,12,24 hours after extubation, sleep quality, additional opioid requirement and postoperative complications were recorded.
Results and Discussion: In our study, which included 50 patients in each group, demographic characteristics of the groups, duration of cross-clamp, cardiopulmonary bypass and surgery, duration of intensive care and hospital stay were found to be similar between the groups (p>0.05). VAS pain scores, sleep quality, opioid consumption and postoperative complications did not differ between the groups after extubation (p>0.05). Active VAS values of 6th, 12th and 24th hours were >4 in four patients in the SAPB group, whereas active VAS values of 4th and 12th hours were >4 in two patients in the ESPB group. Drain VAS values of 6th and 12th hours were >4 in two patients in the SAPB group, whereas drain VAS values of 4th, 12th and 24th hours were >4 in five patients in the ESPB group.
Conclusion: The fact that ESPB and C-SAPB methods are similar in terms of active and passive pain scores, sleep quality and additional opioid consumption shows that C-SAPB can be used as an alternative analgesia method. As a result, C-SAPB provides as effective analgesia as ESPB in cardiac surgery and can also be applied in the supine position, providing an advantage in terms of patient comfort.

07AP02-11
The effects of hemoadsorption with CytoSorb® on inflammatory parameters in complex cardiac surgery: a systematic review and meta-analysis of randomised controlled trials

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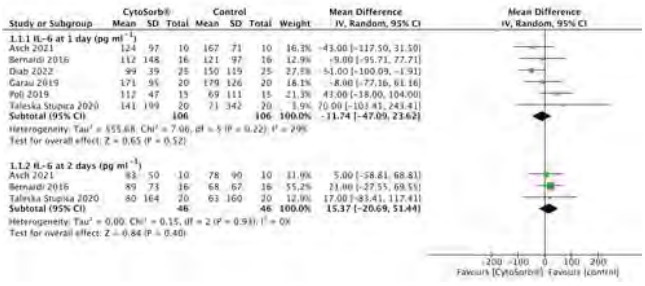
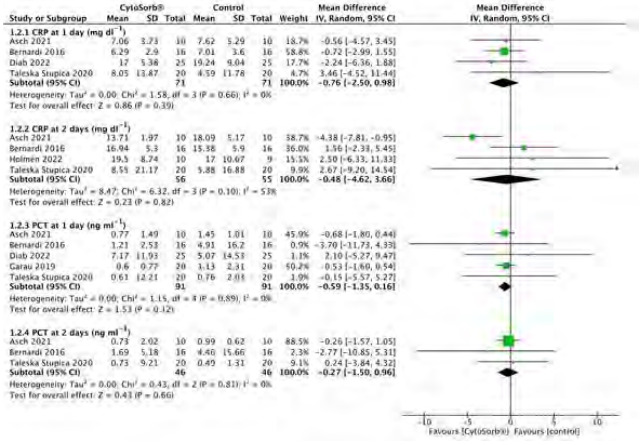
Background and Goal of Study: The effectiveness of CytoSorb® at reducing inflammation in cardiac surgery patients is controversial. We performed a systematic review with meta-analysis of randomized-controlled trials (RCTs) to assess the effects of CytoSorb® therapy on inflammatory parameters in complex cardiac surgery.
Materials and Methods: Electronic databases were searched up to December 1st 2022. We included RCTs performed in complex cardiac surgery with patients allocated to extracorporeal hemoadsorption with CytoSorb® or standard treatment only. The primary outcome was interleukin (IL)-6 at 1 day after initiation of the therapy. Secondary outcomes were IL-6, C-reactive protein (CRP), and procalcitonin (PCT) at 1 and 2 days. We calculated mean difference (MD) and 95% confidence interval (CI). A p-value smaller or equal to 0.05 was considered statistically significant. This study is part of an unpublished study (PROSPERO database, CRD42022350144).
Results and Discussion: Nine RCTs and 542 patients were included. All the RCTs were performed in complex cardiac surgery, where the CytoSorb® cartridge was incorporated in the cardiopulmonary bypass circuit. Six trials were performed in patients with an expected long cardiopulmonary bypass duration and 3 in infectious endocarditis surgery. Hemoadsorption with CytoSorb® was not associated with lower IL-6 at 1 day (MD= -11.74 [95% CI, -47.09 to 23.62], p=0.52) or 2 days (Figure 1).



Similarly, CRP and PCT were not lower with CytoSorb® at 1 or 2 days (Figure 2). The certainty of evidence was moderate to low.



Conclusion(s): The use of CytoSorb® was not associated with a decrease in IL-6, CRP, and PCT up to 48 hours after start of treatment in complex cardiac surgery patients. The role of the device in removal of antiplatelets and anticoagulant agents in emergency cardiac surgery remain uninvestigated in RCTs.

07AP02-12
Comparative study of propofol versus dexmedetomidine for conscious sedation in transcatheter aortic valve implantation: a case series study

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Background and Goal of Study: Conscious sedation (CS) for Transcatheter Aortic Valve Implantation (TAVI) is gaining increasing popularity. Propofol and dexmedetomidine have both been used for this purpose, but there is a paucity of data comparing these agents for CS. We aim to comparatively evaluate their effect on cognitive function and postoperative delirium. Secondary outcomes include their effect on intraoperative haemodynamics, renal function, quality of sedation, post-procedural pain scores, length of hospital and ICU stay and anaesthesia-related adverse events.
Materials and Methods: This case series study is part of a prospective clinical study regarding CS for TAVI procedures and serves as a pilot sample. Eighteen patients were randomly allocated to receive either propofol (PROP group) or dexmedetomidine (DEX group), but two were excluded due to conversion to general anaesthesia. A total of 16 patients (n=6, PROP group and n=10, DEX group) were finally analysed. The Student's t-test (or it's nonparametric equivalent, Mann-Whitney U) and the Fisher's exact test were employed for comparison of continuous and categorical variables, respectively.
Results and Discussion: The two groups were homogenous concerning demographic and somatometrical characteristics, pre-procedural risk scores, comorbidities, and baseline cognitive and renal function ($p>0.05$). However, patients in the PROP group exhibited higher scores in the Edmonton Frail Scale ($p=0.041$). Intraoperatively, procedural, anaesthesia and emergence duration, apneic episodes, end-tidal capnography, $PaCO_2$ values, Richmond Agitation Sedation Scale (RASS) scores and intraoperative awareness did not differ between groups ($p>0.05$). Fentanyl consumption was higher in the DEX group ($p=0.028$). Concerning intraoperative haemodynamics, fluid administration and diuresis, no differences were detected between groups ($p>0.05$). Postoperatively, there was no difference in cognitive function, delirium, renal function, pain scores, anaesthesia-related adverse events, duration of ICU and hospital length of stay and 30-day all-cause mortality ($p>0.05$). Finally, satisfaction levels for both the patients and the cardiologists performing the procedure were kept high and did not differ between groups ($p>0.05$).
Conclusion(s): Within the study's limitations, our findings do not support superiority of one anaesthetic agent over the other regarding the primary goals of the study.

07AP03-01
Predicting complications in cardiac surgery patients beyond biomarkers: a retrospective study

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Background and Goal of Study: Predicting morbidity and mortality in search of improving patient outcome in cardiac surgery remains challenging. Extracorporeal circulation (EC) causes a disruption in perfusion and microcirculation but such techniques have not been taken into consideration. Minimal Invasive Extracorporeal Circulation (MiECC) has emerged as a more physiologic perioperative strategy over Conventional Extracorporeal Circulation (CECC) . Our aim is to elucidate the role of EC on the occurrence of adverse events in cardiac surgery.
Materials and Methods: The medical records of patients who underwent cardiac surgery from January 2020 to July 2022 at the Cardiothoracic department of the University Hospital of AHEPA were retrieved after approval of the Institutional Review Board.The data equally represented MiECC(n=50) and CECC(n=50) patients. Demographics, perioperative data including hemoglobin, Neutrophil-to-Lymphocyte Ratio, Platelet-to-Lymphocyte ratio, cardiopulmonary bypass duration, 12h drainage and transfusions were recorded. The total sample was divided in two Groups, MiECC and CECC as appropriate, to investigate any discrepancies between them. The presence of event was set as atrial fibrillation, myocardial infarction, stroke, need for revascularization, stage 3 acute kidney injury, prolonged ventilation or death occurring 30 days postoperatively. Logistic regression was performed for the outcome of event. Potential predictors included EuroSCORE, perioperative data and EC Group . For the model produced by logistic regression, predicted probabilities were used for the assessment of the accuracy, expressed by Receiver Operating Characteristics curve and area under the curve (AUC).
Results and Discussion: Baseline parameters were similar among patients within each group as no statistically significant differences were detected.EC was found to be an independent predictor of adverse events following cardiac surgery. MiECC Patients had 60% lower risk of developing any complication ($p=0.039$, CI95% 0.18-0.9, AUC 0.61). Overall, through this study we proved that the effect of the perioperative strategy may have a significant impact in postoperative outcomes and should be incorporated in future reviews or clinical trials looking into prediction tools.
Conclusion: The EC strategy is found to be an independent predictor of adverse outcomes in cardiac surgery.

07AP03-02
Dexmedetomidine versus propofol sedation reduces the duration of mechanical ventilation after cardiac surgery – a randomized controlled trial

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Background and Goal of Study: One of the main goals of the postoperative strategy in cardiac surgery is earlier extubation and a shorter duration of mechanical ventilation (MV) with adequate sedation. The aim of this study was to compare the clinical effects of sedation with dexmedetomidine versus propofol in patients undergoing cardiac surgery and analyze their effects on the duration of the MV, length of stay in the intensive care unit (ICU), and total hospital stay.

Materials and Methods: This was a prospective, randomized, single-blinded, controlled clinical trial. All 120 patients included in the study were randomized in a 1:1 ratio into two groups of 60 patients. The first group of patients, upon arrival to the ICU, were sedated with continuous dexmedetomidine infusion at doses 0.2-0.7 mcg/kg/h. The second group of patients were sedated with continuous propofol infusion in doses 1-2 mg/kg/h. Descriptive statistics, the t-test, Mann-Whitney test, and the chi-square test were used. Statistical significance for all of the tests was set at the p value of <0.05.

Results and Discussion: There were no significant differences in age and gender distribution and other baseline characteristics. Both groups had similar preoperative hemoglobin levels, heart rates, and left ventricular ejection fractions. Patients sedated with dexmedetomidine required 2.2 hours less time on MV (dexmedetomidine group 8.8 ± 0.1 vs. propofol group 11.0 ± 4.2 hours, $p=0.000$). There was a significant positive correlation between the duration of MV and the ICU length of stay ($r=0.368$; $p=0.000$), as well as between the duration of MV and the total hospital length of stay ($r=0.204$; $p=0.025$). Delirium occurred in the postoperative period in 25% of patients sedated with propofol, while in the other group it was only 11.7% ($p=0.059$). Patients who developed delirium had a significantly longer duration of MV (12.6 ± 5.4 vs. 9.3 ± 2.5 hours, $p=0.010$).

Conclusion(s): Postoperative sedation with dexmedetomidine in comparison to propofol reduces the duration of MV. Postoperative delirium is less common in patients sedated with dexmedetomidine.

07AP03-03
The advantage of remimazolam for circulatory management in patients with severe aortic stenosis undergoing transcatheter aortic valve implantation procedure

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Background and Goal of Study: Remimazolam is a newly developed ultrashort-acting benzodiazepine with few side effects, including hypotension. However, the superiority of remimazolam to conventional inhalation anesthetics on high-risk circulatory patients with severe aortic stenosis has not been thoroughly investigated. This study aimed to evaluate the hemodynamic effects of remimazolam in a patient undergoing transcatheter aortic valve implantation (TAVI) procedure.

Materials and Methods: This retrospective observational study included patients who had undergone transfemoral TAVI from April 2018 to October 2022. These patients were classified into two groups by administrated anesthetic agents for induction and maintenance of general anesthesia: patients treated with remimazolam for anesthetic induction and maintenance (Group R) and those treated with midazolam for induction and desflurane for maintenance (Group D). The relative change in mean blood pressure and dosage of vasopressors between the induction of anaesthesia and the release of aortic stenosis were extracted from the electric anaesthetic records. The total amount of vasopressor was calculated by assuming that the relative potency ratio of norepinephrine and phenylephrine was 11.3 (ref).

Results and Discussion: The study sample consisted of 138 patients (group R, $N=72$; group D, $N=66$). The ratio of mean blood pressure of pre-anesthetic induction to after induction did not show a significant difference between the two groups (74.0% and 76.2%, respectively). Although the mean dosage of phenylephrine was significantly larger in Group R (0.11 and 0.07μg/kg/min, respectively), the mean dosage of norepinephrine was significantly smaller in Group R than in Group D (0.031 and 0.046μg/kg/min, respectively). The total dosage of vasopressor calculated using the relative potency ratio of norepinephrine and phenylephrine was significantly smaller in Group R than in Group D (0.04 and 0.052μg/kg/min as converted in norepinephrine potency, respectively).

Conclusion(s): The amount of vasopressor required for perioperative circulatory stability in patients treated with remimazolam was smaller than in those treated with midazolam and desflurane. This result indicates that remimazolam is advantageous for anaesthetic management in high-risk circulatory patients.

Reference:

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07AP03-04
Comparison of Desflurane and Propofol on organ perfusion in a porcine model during partial support with a continuous-flow left ventricular assist device

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Background and Goal of Study: Partial support can be provided with a mechanical circulatory support (MCS) device to a native ventricle with an impaired left ventricular function to ensure adequate organ perfusion. The effect of anesthetic agents on organ blood flow has already been described but not during the use of a MCS device.
Materials and Methods: 16 minipigs were divided into two groups (8 animals per group), according to the anesthetic agent received (desflurane vs. propofol) in the maintenance of general anesthesia. A Biomedicus 540 centrifugal pump was implanted in the minipigs undergoing continuous-flow support. An aortic partial cross-clamp was applied. The output cannula of the MCS was anastomosed to the ascending aorta, and the input cannula was placed through the apex of the left ventricle. Console parameters were adjusted to obtain a pump flow of 50% (partial support) of the baseline cardiac output (cardiac output before MCS is initiated) using the pulmonary artery catheter for 30 minutes. Two moments for the study of the organ blood flow were defined using the colored microsphere technique: before left ventricle assistance was initiated and after 30 minutes of partial support. This was measured by analyzing organ biopsies (brain, heart, lungs, liver and kidney) that were taken once the procedure was finished and the animal was sacrificed. Statistical analysis was performed using the independent samples t-test. Statistical significance: $p<0.05$. This study was approved by the Ethics Committee on Animal Experimentation of the Gregorio Marañón General University Hospital.
Results and Discussion: A significant increase in the regional blood flow of the analyzed organs was showed after 30 minutes of partial support in the Desflurane group compared to propofol.
Conclusion(s): Desflurane showed a significant increase in the regional blood flow compared to propofol during partial assistance of the left ventricle with a MCS device in a porcine experimental model. Future studies will be needed to reproduce our findings in routine clinical practice.
Acknowledgements: This study was financed by a grant from FIS 17/01319 and FEDER Funding.

07AP03-05
Chest wall sarcomas: a retrospective comparison of 3 locoregional techniques to manage post-thoracotomy pain

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Background and Goal of Study: Both management of acute post-operative pain and prevention of chronic pain after thoracic surgery remain a challenge for anesthesiologists. We aimed to compare the different analgesic options for pacients undergoing thoracotomy for chest wall sarcoma resection including systemic analgesia and locoregional anesthesia.
Materials and Methods: We conducted a retrospective study analyzing 27 patients who underwent thoracotomy for chest wall sarcoma resection and we studied the locoregional technique chosen for intraoperative pain control and intravenous morphine consumption in the first 24h of surgery as the main objectives. As secondary objectives, the Numeric Pain Rating Scale (NPRS) from 0 to 10 was studied at one hour postoperatively, at 24h and 48h, as well as the presence of possible post-block complications.
Results and Discussion: Of the 27 patients, 70% received a locoregional technique and 30% did not. Of those who received locoregional technique: 37% received a thoracic epidural, 26% intrathecal morphine, 26% continuous paravertebral block and 10%, another kind of technique.
Regarding the need for intravenous morphine rescue in the first 24 hours, the results from greatest to least need were as follows:

Intravenous morphine rescue in the first 24h	No locoregional group	Thoracic epidural group	Continuous paravertebral block group	Intrathecal morphine group
	13,75mg (±7mg)	5,2mg (±3,6mg)	3,6mg (±5,3mg)	1,8mg (±4,7mg)

Regarding the NPRS, the following data were recorded:

NPRS average	No locoregional group	Thoracic epidural group	Continuous paravertebral block group	Intrathecal morphine group
First hour of surgery	6,2	5,5	2,2	1,6
24 hours postsurgery	0,8	1,7	2.25	1,4
48 hours postsurgery	0,6	0,8	1,5	0,5

Regarding complications, no serious complications such as respiratory depression were recorded in any of the techniques used. However, 3 patients suffered respiratory infection during hospital stay (one was not provided with a locoregional technique, the second received intratechal morphine and the third thoracic epidural).
Conclusion(s): Despite intratechal morphine is a technique that is widely used for postoperative analgesia in a wide variety of surgeries, there are very few studies on post-thoracotomy pain control after wide chest resections for sarcomas. It is a safe, rapid, effective, and economical technique, always implemented in a multimodal approach protocol, and may be an alternative to the technical impossibility of placing an epidural or paravertebral catheter, such as the case of wide resections of the chest wall.

07AP03-06
Impact of hypothermia and sevoflurane on TRPM8 channel activity

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Background and Goal of Study: Targeting the cold receptor TRPM8 with pharmaceutics could be a new cardioprotection therapeutic strategy to prevent myocardial ischemia reperfusion injuries. This receptor is known to be activated by cold and volatile anesthetics (sevoflurane) which are both cardioprotective. Therapeutic hypothermia and anesthetic drugs exposition are frequently combined in clinical practice.
We investigated the temperature threshold activating TRPM8 and how sevoflurane interacted with this channel depending on temperature conditions.
Materials and Methods: Using a *human*-HEK-293T cell model, the calcium fluxes induced by the activity of TRPM8 were measured with an epifluorescence microscope (LEICA) by mean of the calcium probe FURA 2AM. The activity of TRPM8 was studied at 37, 33 and 25°C. The impact of sevoflurane (diluted in DMSO, 0.5 mM) on the TRPM8 activity was observed at 37 and 33°C. Results are expressed as maximum response speed to WS-12 (agonist of TRPM8) stimulation (EC50, 0.8 μM) and mean ± SD. $P<0.05$ was considered statistically significant.
Results and Discussion: As depicted in Figure 1, the response of TRPM8 to a WS-12 stimulation was temperature dependent, significantly increasing when the temperature decreased to 33°C (+11%) and 25°C (+39%), respectively. At 37°C, sevoflurane increased TRPM8 response to a WS-12 stimulation (+7,8%, Figure 2). At 33°C, sevoflurane had an antagonistic effect on the activation of TRPM8 (-8,4%).These results demonstrated that TRPM8 was activated at a temperature compatible with clinical conditions (33°C). Sevoflurane was an agonist of TRPM8 channel at normothermia but inhibited the effect of cold on TRPM8 at 33°C.
Conclusion(s): Cold and sevoflurane activated TRPM8 channel and could be both valuable cardioprotective strategies. In hypothermia condition, the addition of sevoflurane could be counterproductive.

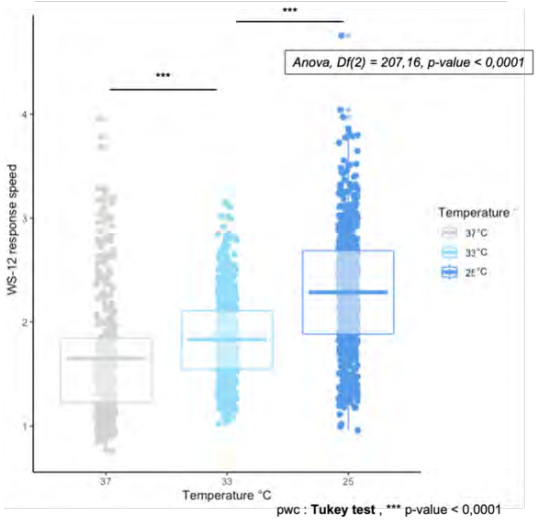

Figure 1. TRPM8 maximum response speed at different temperature conditions.

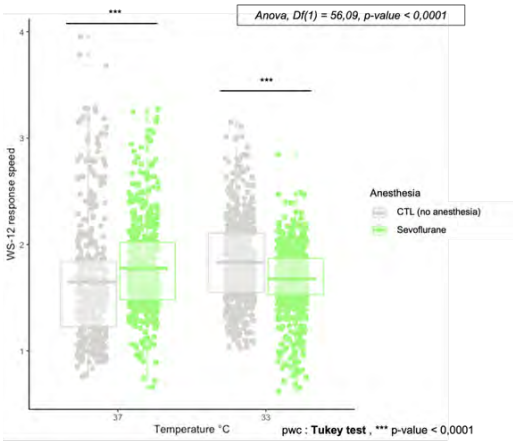

Figure 2. Effect of Sevoflurane on TRPM8 maximum response speed at 37°C and 33°C.

07AP03-07
Factors and patient characteristics specific to the timing of tracheal extubation following pediatric cardiac surgery

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Background and Goal of Study: Early tracheal extubation after cardiac surgery may contribute to a better recovery pattern, and early discharge from the intensive care unit results in a better turnaround of cases. If performed meticulously by recognizing factors that were explicitly found in pediatric patients who have already experienced tracheal extubation in a given unit, the technique may be associated with less reintubation incidence.
Materials and Methods: 467 pediatric patients undergoing on-pump cardiac surgery from the 1st of January 2019 that were managed with the same anesthetic regimen were included in this observational study. The patients were divided into 3 groups based on the timing of tracheal extubation after surgery.
Group I where the patient's trachea was extubated on the table immediately after completion of surgery in the operating room, Group II where the tracheal extubation took place within 6 hours and Group III in whom tracheal extubation was performed beyond 6 hours postoperatively.
The factors and patient characteristics that were recorded in each group of patients were age, weight, gender, (RACHS-1) score, the (STAT Mortality Categories), cardiopulmonary bypass time, aortic cross-clamp time, and VIS on admission to the intensive care unit.
Results and Discussion: There was a significant association between clinical variables and on-table extubation in terms of age, weight, RACHS-1 score, STAT category, cardiopulmonary bypass, aortic cross-clamp time and VIS.
The younger the child, the lower the weight, the higher the RACHS-1score and STAT category, greater the VIS, longer the cardiopulmonary bypass and aortic cross clamp time were associated with delayed extubation. The intensive care unit stay was significantly less in the on table and fast-track group.
The multivariate model showed weight, lower STAT category, cardiopulmonary bypass time and VIS were independent predictors for on-table and fast-track extubation. Age, RACHS-1 score, and aortic cross-clamp duration were not independent predictors for the time of extubation.

Conclusion(s): The factors and characteristics that were identified as independent predictors by a multivariate model in pediatric cardiac surgical patients undergoing open heart surgery under the same anesthetic regimen and had on table/ fast-track extubation were the weight of the child, STAT category, cardiopulmonary bypass duration and VIS.

07AP03-09
Using 3D printing to develop institutional equipment recommendations for one-lung ventilation in pediatric patients

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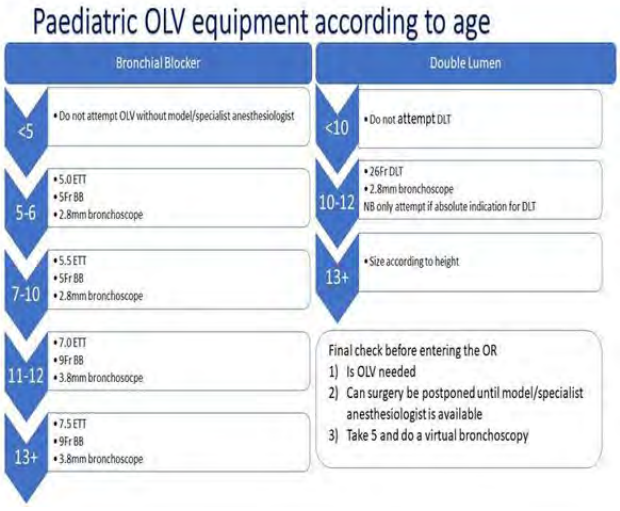
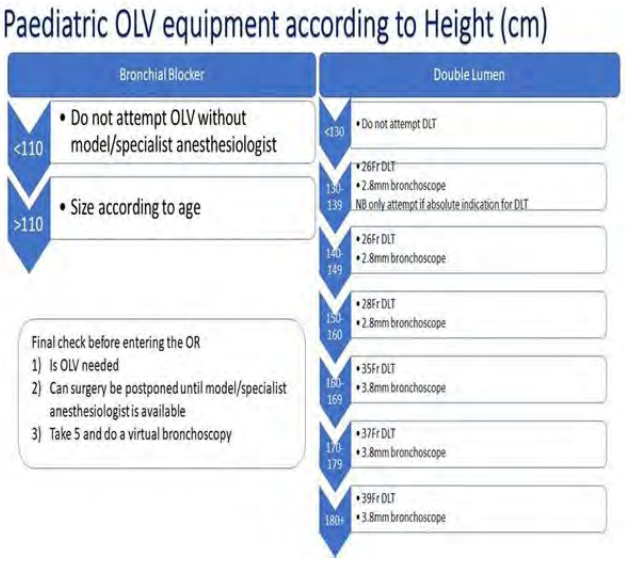
Background: Pediatric airway anatomy has unique features compared to adult anatomy. Despite multiple review articles, there are currently no guidelines published for pediatric one lung ventilation (POLV) equipment selection.
We routinely use a 3D-printed model of pediatric patients' airway to select POLV equipment. However, this is not feasible in urgent cases. We therefore aimed to use the results of previous airway plans to develop age- and height-specific equipment guidelines for POLV.
Methods: Patient electronic medical records were analyzed for age, sex, height, weight, operation, POLV equipment, POLV first attempt success rate, and 3D printed model equipment plan.
Airway equipment combinations which were successfully used to achieve POLV were tabulated according to patients' age and height. If a specific equipment combination was most common for an age or height group, it was included in the guidelines. If several combinations were found useful, an expert group was consulted, and the preferred option was chosen. In cases of no agreement, the most conservative option was chosen.
Results and Discussion: Following a review of 58 cases, recommendations were made for ages 5 and up, and for children over 110 cm. The expert group agreed that a double-lumen tube (DLT) should not be attempted in children <10 years. All agreed it is recommended to wait for 3D printed model before choosing a DLT in children aged 10-13 years, if feasible.





Our guidelines vary from suggestions previously mentioned in review articles on POLV. importantly, previous publications allowed using a DLT starting at 8 years of age. However, we were unable to insert a DLT in 3D printed models in children <11 years. We also recommend against using a bronchial blocker with endotracheal tubes sizes 6.0 and 6.5mm, due to the short length of the 5Fr blocker.
Conclusion: By combining the use of 3D printed airway models and clinical experience we have produced recommendations for equipment selection in cases requiring one-lung ventilation in pediatric patients.
These recommendations can be used in urgent or emergent cases, or when 3D printing of patients' airway is unavailable.

07AP03-10
Extubation practices after congenital cardiac surgery in pediatric patients over 1 year of age

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Background and Goal of Study: Several studies have demonstrated the benefits associated with early extubation (EE) after congenital cardiac surgery (CCS). Prolonged time to extubation after general anesthesia is an important metric associated with increased postoperative complications.
We performed this study to describe extubation practices in pediatric patients over 1 year of age undergoing CCS and to understand the factors associated with EE.
Materials and Methods: After ethics committee approval, a retrospective study was performed from January 2019 to December 2021. We reviewed medical records of pediatric patients submitted to CCS. Patients were distributed by groups according to the time to extubation: EE (extubated in the operating room or within six hours after surgery) and Delayed Extubation (DE) (extubated sometime after six hours or not extubated). IBM® SPSS® v28 software was used to perform statistics. For statistical analysis, we used Fisher exact test and Kruskal Wallis test, for categorical and continuous variables respectively, and we applied logistic regression analysis to determine possible predictors for EE.

Results and Discussion: We analyzed 104 patients with a median age of 4 years. Overall, the majority of patients had EE (65,4%) and 34,6% had DE. The variables ASA classification system, reoperation, age, weight, surgery time, extra corporeal circulation (ECC) and aortic cross-clamp time showed differences in the analysis between groups. Higher age and body weight were significantly associated with EE. Also, EE was associated with reduced surgery, ECC, and aortic cross-clamp time. ASA IV patients had reduced odds of EE. Risk Adjustment for Congenital Heart Surgery (RACHS) presented a significant association with EE, being RACHS 2 and 3 associated with reduced odds of EE, compared to RACHS 1.
In our study, most patients achieved EE with low incidence of postoperative respiratory insufficiency. Older and heavier patients were more likely to experience EE, as well as reduced surgery time, ECC and aortic cross-clamp time. Higher ASA and RACHS classification were less likely to experience EE.
Conclusion(s): Early extubation after CCS has demonstrated a relevant role in minimizing morbidity and allowed improved patients' postoperative functional status. In this study, we describe some factors that could influence the probability of EE during pediatric cardiac surgery.

07AP03-11
Factors associated with early extubation in congenital cardiac surgery in the first year of life

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Background and Goal of Study: There is increased focus on the benefits of fast-track anesthesia on minimizing morbidity and using health care resources sparingly after congenital heart surgery, being early extubation (EE) a major component.
We performed this study to understand the factors associated with early extubation in congenital cardiac surgery during the first year of life.
Materials and Methods: After ethics committee approval, we performed a retrospective study from January 2019 to December 2021 using electronic medical records to review pediatric patients submitted to cardiac surgery during the first year of life. Demographic, clinical and surgery data were collected. Patients were distributed by groups according to the time to extubation: EE (extubated in the operating room or within six hours after surgery) and Delayed Extubation (DE) (extubated sometime after six hours or not extubated). IBM® SPSS® v28 was used to perform statistics.
For statistical analysis, we used Fisher exact test and Kruskal Wallis test, for categorical and continuous variables respectively. We applied logistic regression analysis to determine possible predictors for EE.
Results and Discussion: We analyzed 89 patients with a median age of 60 days. Overall, 20,2% had EE and 79,8% had DE (5 not extubated). The variables reoperation, reintubation, age, weight, and extra corporeal circulation duration showed differences in the analysis between groups. The EE group had a significantly shorter median time of surgery, extracorporeal circulation (ECC) and aortic cross-clamp time.
Also, higher age and body weight were significantly associated with EE. Patients submitted to Risk Adjustment for Congenital Heart Surgery (RACHS) classification 3 had reduced odds of EE compared to RACHS 1. In our study, 20,2% of patients achieved EE and with lower incidence of reintubation needs. Older infants and higher body weight were more likely to experience EE. Also prolonged surgery, ECC and aortic cross-clamp time had been associated with EE.
Conclusion(s): EE appear to be safely accomplished in selected infants undergoing surgery for congenital heart disease. Prolonged postoperative mechanical ventilation is associated with adverse outcomes in pediatric cardiac surgery, so it is important to achieve successful EE if possible. In this study, we describe some factors that could influence the likelihood of EE after congenital cardiac surgery during the first year of life.

07AP03-12
Monitoring of levosimendan administration in patients with pulmonary hypertension undergoing cardiac surgery

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Background and Goal of Study: The perioperative management of patients with pulmonary hypertension (PH) undergoing cardiac surgery represents one of the most challenging clinical scenarios. This fact mainly depends on the relation between PH and right ventricular failure (RVF). Levosimendan (LS) is an inodilator that might be an effective agent in the treatment of PH and RVF. The aim of this study was to examine the impact of the duration of cardiopulmonary bypass (CPB) on the therapeutic drug monitoring of LS and to evaluate the effect of preemptive administration of LS on perioperative hemodynamic and echocardiographic parameters in cardiac surgical patients with preexisting PH
Materials and Methods: In this study, LS was administered in 30 randomized adult patients undergoing cardiac surgery before CPB in order to prevent exacerbation of preexisting PH and subsequent right ventricular dysfunction. Thirty cardiac surgical patients with preoperatively confirmed PH were administered LS at two different doses (6μg/kg and 12μg/kg) after the induction of anesthesia. The plasma concentration of LS was measured after CPB. In this study, a low sample volume was used combined with a simple sample preparation protocol. The plasma sample was extracted by protein precipitation and evaporated to dryness, then the analyte was reconstituted and detected using a specific and sensitive bioanalytical LC-MS/MS methodology. The clinical, hemodynamic and echocardiographic parameters were registered and evaluated before and after the administration of the drug
Results and Discussion: A fast bioanalytical methodology LC-MS/MS (a run time of 5.5 min) was developed for the simultaneous determination of LS and OR-1896, its main metabolite in human plasma. The LC-MS/MS method was linear over a range of 0.1-50 ng/mL for LS and 1-50 ng/mL for its metabolite OR-1896. Duration of CPB was inversely related to plasma concentrations of LS administered before CPB. LS administration before CPB during cardiac surgery was effective in reducing pulmonary artery pressure and improving hemodynamic parameters after CPB, with a more pronounced and durable effect of the drug at the dose of 12 mg/kg. Additionally, administration of LS at a dose of 12 mg/kg in cardiac surgical patients with PH before CPB improves right ventricular function.

Conclusion: LS administration decreases pulmonary artery pressure and may improve right ventricular function in patients with PH undergoing cardiac surgery.

07AP04-01
CRP and creatinine as predictors of mortality after type A aortic dissection surgery

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Background and Goal of Study: Aortic dissection type A (TAAD) is a surgical emergency with a mortality rate of 22% after surgery.[1] The aim of the study was to investigate whether certain laboratory and clinical parameters at admission can indicate the postoperative outcome.
Materials and Methods: The retrospective single-center study included 116 patients with TAAD surgically treated over a five-year period. The association between in-hospital mortality and clinical parameters was examined. Descriptive statistics, t-test, Mann-Whitney test, chi-square test, and Fisher test were used. The influence of variables on treatment outcome was determined using univariate and multivariate binary logistic analysis.
Results and Discussion: Total in-hospital mortality was 22.4%. The non-survivors were older than the survivors (p=0.001). The admission creatinine values were significantly higher in non-survivors (p<0.0005) as well as CRP values (p=0.020). The groups differed significantly in the presence of stroke, which was more present in the non-survivors group (p=0.004). Cardiopulmonary bypass (CPB) time was significantly longer in the non-survivors patient group (p=0.009). Also, surgical work in deep hypothermic circulatory arrest (DHCA) was significantly more common in non-survivors (p=0.044). These variables were included in the multivariate analysis, which designated the following parameters as independent mortality predictors: creatinine (OR 1.026 [1.006-1.046], p=0.009), CRP (OR 4.764 [1.066-21.283], p=0.041), and stroke (OR 6.097 [1.399-26.570], p=0.016). The ROC curve showed that creatinine could be a good predictor of mortality (Area under the ROC curve=0.767; p<0.0005). The cut-off point was 124.5μmol/L. The sensitivity was 65% and the specificity was 80%. The cut-off point for CRP was 14.5 mg/L - sensitivity 71.4%, specificity 75% (Area under the ROC curve=0.702, p=0.021).
Conclusion(s): Despite easier and more accessible diagnostics, advanced surgical techniques, and better postoperative treatment, TAAD surgery carries a high risk of mortality. Variables suggestive of poor outcomes following the surgery are higher preoperative creatinine and CRP values, and stroke.
Reference:
1. Evangelista A, Isselbacher EM, Bossone E, et al. Insights From the International Registry of Acute Aortic Dissection: A 20-Year Experience of Collaborative Clinical Research. Circulation 2018;137:1846-60.

07AP04-02
The BARTAAAKI Bundle: reducing AKI and RRT incidence rates following thoracoabdominal aortic aneurysm repair

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Background and Goal of Study: Open thoracoabdominal aortic aneurysm (TAAA) repair remains a complex intervention with associated morbidity and mortality. Minimisation of end-organ damage remains an ongoing challenge.
Acute kidney injury (AKI) and renal replacement therapy (RRT) are recognised as relatively frequent complications following TAAA repair. A modified KDIGO bundle, the 'BARTAAAKI Bundle', was introduced aiming to reduce AKI and RRT rates. The bundle consists of avoidance of nephrotoxins, haemodynamic optimisation, glucose control, dexmedetomidine, mannitol, and selective Custodiol renal perfusion.
The primary outcome was rates of AKI according to KDIGO classification. We also assessed adherence to bundle elements. Institutional approval 12376.
Materials and Methods: Baseline data was sourced from patients undergoing TAAA repair at Barts Trust between 2018 and 2020 (n=62). Post-bundle data (n=11) was collected from July to December 2022. Sources comprised anaesthetic charts and electronic patient records. Compliance to the BARTAAAKI bundle and AKI stage 2 and 3 and RRT incidence rates between pre- and post-bundle cohorts was measured in addition to ICU/HDU length of stay.
Results and Discussion: AKI stage 2 and 3 rates for the pre- and post-bundle groups at 72hrs were 67.7% vs 36.4% (p=0.047), and at 1 week 83.9% vs 36.4% (p=<0.001) respectively. RRT incidence rates at 1 week were 56.5% vs 18.2% (p=0.019). Median ICU/HDU lengths of stay were comparable at 14 vs 17.5 days.
100% bundle compliance was achieved for use of Custodiol perfusate, dexmedetomidine, avoidance of nephrotoxins, and maintaining cardiac output targets 12hrs post-operatively. However, there was poor compliance for post-operative glucose control (36.4%).

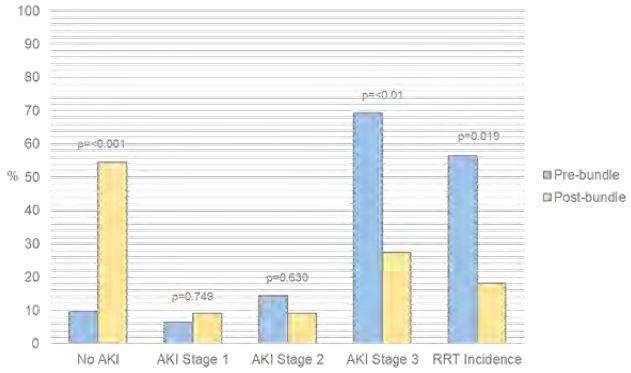

Figure. Renal outcomes 1 week post-operatively.

Conclusion(s): Preliminary data suggests AKI and RRT rates are markedly reduced following the introduction of the BARTAAAKI Bundle. Compliance was importantly conformed to for use of Custodiol perfusate and achieving cardiac output targets post-operatively.

Limitations include lack of data to assess some bundle elements and a small post-bundle sample size. Further data will ameliorate these factors, allowing greater statistical power.

07AP04-03
Title: Impact of intraoperative transesophageal echocardiographic assessment in patients with hypertrophic cardiomyopathy undergoing septal myectomy

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Background and Goal of Study: Hypertrophic cardiomyopathy (HOCM) is a genetic heart disease that affects 0.2% of the population. It is characterized by asymmetric septal hypertrophy that causes obstruction of left ventricular outflow tract (LVOT). Septal reduction is the surgical technique of choice for patient's refractory to medical treatment and is very effective in improving symptoms of LVOT obstruction. In this study, we aim to describe the impact of intraoperative Transoesophageal Ecchocardiography (TOE) monitoring in patients diagnosed with HOCM undergoing septal myectomy under cardiopulmonary bypass (CPB) at our institution.
Materials and Methods: An observational, retrospective study is presented. The clinical reports of 33 patients undergoing septal myectomy in the period between January 2020 and December 2021 were reviewed, following the international ethical recommendations for medical research. The study was also approved by the ethics committee of the institution.
Results and Discussion: Intraoperative pre-CPB echocardiography detected new findings not previously described in the preoperative echocardiography in 50% (15/30) of patients. These findings led to a 46% (7/15) change in the surgical attitude. 42% (3/7) of those changes involved the addition of the mitral valve reparation procedure. Post-CPB echocardiography showed unexpected findings in 50% (15/30) of patients and that led into CPB re-entry in 86% (13/15) of these patients. Statistically significant differences (p-value<0.05) were found between the CPB re-entry group (n=15) and the CPB non-re-entry group (n=15) in terms of: Transfusion of blood components, postoperative complications, intraoperative use of inotropes, occurrence of ventricular fibrillation during CPB weaning and extubation in the operating room.
Conclusion(s): The use of transoesophageal echocardiography has a significant impact on septal myectomies as it can reveal preoperative undetected lesions that lead to a change in the surgical behavior, detect complications and evaluate the outcome of the surgery. Changes detected in the TOE before entering CPB lead in most cases to a change in surgical behavior and TOE findings during CPB weaning such as persistent obstruction prompted re-entry in CPB in most patients. Therefore, according to this study, TOE monitoring during these procedures provides unique information to improve patient outcomes.

07AP04-04
Impact of Intraoperative Bispectral Index (BIS) monitoring on the perioperative outcome in patients undergoing thoracic aortic aneurysm surgery in Philippine Heart Center

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Background and Goal of Study: Surgical intervention for thoracic aortic aneurysm is complex, and therefore requires an anaesthetic approach to the specific goals for hemodynamic control, cerebral and spinal cord perfusion and neuromonitoring.
This study aims to determine the utility of intraoperative bispectral index (BIS) monitoring on the postoperative outcome in patients undergoing thoracic aortic aneurysm surgeries in Philippine Heart Center (PHC) from January 2014 to December 2019.
Materials and Methods: To fulfil the objectives, a retrospective cohort study was conducted. Data collection was conducted in the Clinical and Medical Records Section of PHC from January 2014 to December 2019. Using G*Power 3.1.9.2, a minimum of 68 patients were required based on desired large effect size between patients with and without BIS in terms of any continuous outcome variable, 5% level of significance and 90% power.
Results and Discussion: It was found that factors with increased risk of in-hospital mortality are age, body mass index (BMI), operation time, anaesthesia time, cardiopulmonary bypass (CPB) time, ischemic time, length of extubation time, length of ICU stay, patients with hypertension, diabetes, coronary artery disease, and patients having pneumonia complication and acute kidney injury (AKI) complication (>1.00 odds ratio).
On the other hand, those with decreased risk of in-hospital mortality are male patients, being current smoker, length of hospital stay, and patients with intraoperative BIS monitoring (>1.00 odds ratio). Results reveal that all these factors were found to be not significant except for patients having pneumonia complication and acute kidney injury complication with odds ratios equal to 5.133 and 12.619, respectively.
Conclusion(s): Results for impact of intraoperative bispectral index monitoring on the perioperative outcome in patients undergoing thoracic aortic aneurysm surgery may differ among other institutions.
Those with pneumonia and acute kidney injury as complications of surgery were at increased risk of in-hospital mortality than those without the complications.

07AP04-06
During cardiopulmonary bypass surgery blood ketone concentrations increase, irrespective of diabetes mellitus status

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Background and Goal of Study: Concern for perioperative ketoacidosis is rising with the increase in prescriptions of sodium-glucose co-transport-2 inhibitors (SGLT2i). As the indications for SGLT2i expand, so do the number patients taking them. However, little is

known about the effect of surgery on blood ketone concentrations. Therefore, we prospectively measured ketone concentrations in a cohort of cardiac surgery patients.

Materials and Methods: We collected measured blood ketone concentrations in 77 patients undergoing cardiac surgery with cardiopulmonary bypass. We recorded medical and medication history and recorded surgery and anesthesia records. We sampled blood at four time points: before start surgery, at start of CPB, end of CPB, and at time of transfer to ICU.

Results and Discussion: Between March and December 2022, we included 77 patients undergoing cardiac surgery. Of these patients, 21 (27%) had T2DM and 15 (19%) received an SLGT2 inhibitor (including on morning of surgery). Ketone concentrations for these four groups are plotted in Figure 1.

During cardiac surgery, ketone concentrations increased from .23 mmol/l (+/- .13) before surgery to 1.0 (+/- .51) at peak end of surgery difference, difference .77 (95% CI: .65 – .88) $p < 0.001$.

There was no difference between patients with and without T2DM, diff: 0.03 (-.32 – .26) p=.83. There was no significant difference between patients who did and did not receive SGLT2 inhibitors before surgery 0.98 (+/- .52) vs. 1.23 (+/- .60) diff 0.24 (-.10 – .57) p=.26

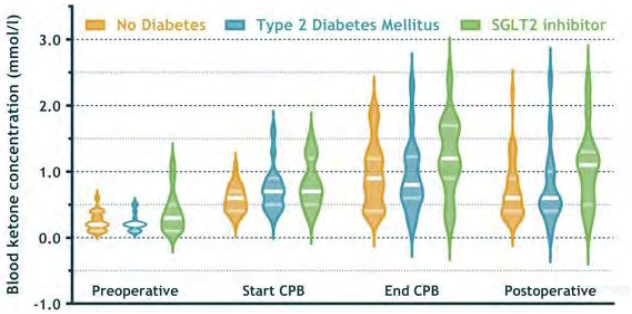

Figure 1. Perioperative ketonaemia during cardiac surgery with CPB

Conclusion(s): During cardiac surgery, patients develop a significant increase in ketone bodies during surgery. Clinicians concerned about ketoacidosis in patients taking SGLT2i should be aware that a certain degree of ketone concentration rise after surgery is likely normal. We advocate caution in attributing postoperative ketonemia to SGLT2i.

07AP04-07
Influence of Remote Ischemic Preconditioning (RIPC) on left ventricular wall motion measured with transoesophageal echocardiography (TOE)

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Background and Goal of Study: Remote Ischemic PreConditioning (RIPC) exposes non vital organs to periods of ischemia in order to activate protection mechanisms. Between 2011 und 2014 two multicenter studies examined the effect of RIPC on outcome parameters with neutral results.

This study observed the effect of RIPC on LV wall motion in cardiac surgery patients using echocardiography . The hypothesis was, RIPC before surgery will reduce wall motion abnormalities in the perioperative period.

Materials and Methods: Between December 2010 and May 2014 91 patients (50 RIPC, 41 Control) scheduled for cardiac surgery were included into this study. Four cycles of 5min upper limb ischemia followed by 5min reperfusion were carried out before surgery. Wall motion analysis was done 4 times during the perioperative period (pre bypass, 15 and 30min post bypass, 2h post OP). All myocardial segments were quantified using the 16 segments wall motion index and regional wall motion indices.

Results and Discussion: The wall motion worsened in both groups 15 min after CPB and returned 2h post operation, pronounced in the septal segments. No differences were detected between the groups. The wall motion index in the RIPC group changed from baseline 1,10±0,18 (T0), over 1,20±0,0,28 (T1, p=0,016), 1,18±0,27 (T2) to 1,15±0,27 (T3) and from 1,13±0,20 (T0), over 1,19±0,0,19 (T1, p=0,066), 1,20±0,23 (T2) to 1,14±0,20 (T3) in the Sham RIPC group. The septal regional wall motion index changed from 1,19±0,31 (T0), over 1,40±0,0,46 (T1, p=0.005), 1,33±0,47 (T2) to 1,26±0,41 (T3) in the RIPC group and from 1,21±0,31 (T0), over 1,39±0,38 (T1, p=0,013), 1,39±0,42 (T2, p=0,041) to 1,27±0,41 (T3).

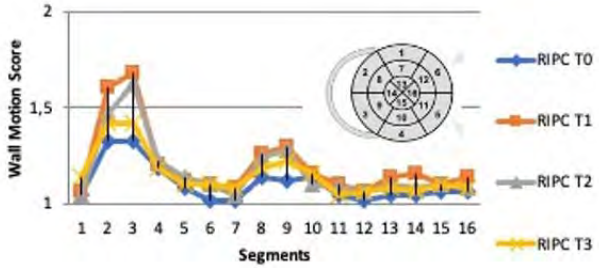

Figure. Wall motion analysis RIPC

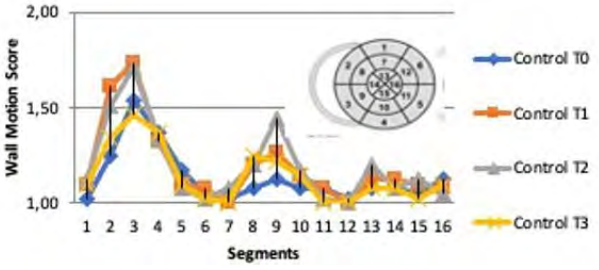

Figure. Wall motion analysis Control

Conclusion(s): The RIPC could not prevent or reduce septal wall motion abnormalities after cardiac surgery. The mechanism seams to play a minor role in patients with comorbidities and comedications.

07AP04-08
Clinical effects of High Flow Nasal Cannula on diaphragmatic function after thoracic surgery: a randomized controlled trial

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Background and Goal of Study: Postoperative diaphragmatic dysfunction after thoracic surgery (TS) is associated with a higher incidence of postoperative pulmonary complications (PPCs). Recently, ultrasound (US) has emerged as a point of care tool to detect diaphragmatic dysfunction (DDys)[1]. High Flow Nasal Cannula (HFNC) is a non-invasive respiratory support that can improve oxygenation and reduce work of breathing[2]. We hypothesized that HFNC could reduce the prevalence of DDys after TS assessed by US and reduce the incidence of PPCs compared to standard oxygenation therapy (SOT).

Materials and Methods: Patients ≥ 18 years old scheduled for major lung resection surgery in video assisted TS were enrolled. Two hours after extubation (T0) patients were randomized to receive either HFNC or SOT for 24 hours. Diaphragmatic function was assessed by ultrasound on the first (T1) and second (T2) postoperative day. Both diaphragmatic displacement (DD) and thickening fraction (TF) were assessed bilaterally with DD < 1 cm and TF < 30% indicating DDys. The incidence of PPCs was recorded daily from the 1st to the 7th postoperative day.

Results and Discussion: A total of 60 patients were included, 28 in the HFNC and 32 in the SOT groups. Clinical characteristics of the two groups were similar. DD and TF of the operated side tended to increase over time in both groups (Figure 1). DD < 1 cm was found in 45% of patients at T1 and in 23% at T2. TF < 30% was found in 47% patients at T1 and in 30% at T2. TF < 30% prevalence was higher at T1 in SOT group as compared to HFNC group (20/32 (63%) vs 8/28 (29%), p=.009). No statistically significant differences in PPCs incidence or in hospital length of stay were found.

Conclusion(s): HFNC therapy is a useful and tolerable device after TS. It might be useful in reducing postoperative DDys. Additional patients must be enrolled to assess whether HFNC might reduce PPCs incidence.

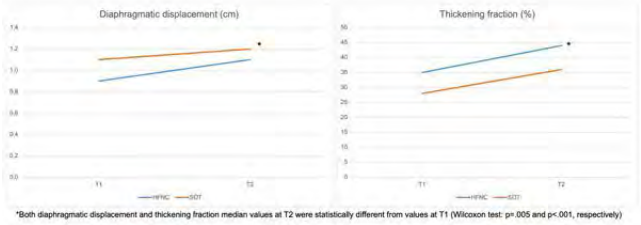

Figure 1. Diaphragmatic ultrasound measures trend.

References:

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2. Mauri T.*Open Access Emerg Med* 2019;11:109-120.

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07AP04-09
Which anesthesia regimen (desflurane vs. sevoflurane) is best to reduce acute kidney injury in endovascular repair of aortic aneurysm? A randomized controlled trial

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Background and goal of study: Acute kidney injury (AKI) is significant after endovascular aneurysm repair (EVAR). It is related with contrast administration, hypovolaemia, renal microembolization, ischaemia reperfusion syndrome, and cardiovascular risk factors. However, little is known about the contribution of volatile anaesthetics on the development of AKI in this context. We investigated renal function in anaesthetised patients with desflurane or sevoflurane after EVAR.

Materials and Methods: We designed a randomized controlled trial (NCT 03917186; EudraCT 2016-003906-16), approved by the local ethics committee. We included 80 patients undergoing EVAR. All the patients fulfilled the inclusion criteria. Patients were recruited consecutively and randomized into two groups depending on the anaesthetic drug used (desflurane or sevoflurane). They were managed with the same anaesthetic protocol. Blood samples were collected at two times: before anaesthesia and 24 hours after surgery; in order to study biomarkers of kidney injury. Linear mixed models were used, considering $p < 0.05$ as statistically significant; data was expressed as the mean ± SD.

Results and Discussion: Plasma creatinine, cistatine C, and estimated glomerular filtration did not significantly change between both groups. Mixed linear model showed a significant interaction ($p = 0.01$) of plasma neutrophil gelatinase-associated lipocalin (NGAL) between both groups, sevoflurane versus desflurane. Both groups showed a progressive increase in plasmatic NGAL (sevoflurane 3.713 ng ml^{-1}, $p < 0.001$ and desflurane 1.774 ng ml^{-1}, $p < 0.001$) when comparing the moment before surgery to 24 hours after surgery. However, sevoflurane caused higher plasma NGAL concentration than desflurane after 24 hours of surgery (8.66 ± 5.09 vs. 6.51 ± 3.86 ng ml^{-1}, $P = 0.03$).

Conclusions: Desflurane compared with sevoflurane could be the anaesthetic of choice in elective EVAR regarding kidney function. This is the first clinical trial showing the superiority of desflurane over sevoflurane on the maintenance of renal function in EVAR surgery.

07AP04-10
The use of supraglottic airway in therapeutic procedure of trachea via fiberoptic bronchoscopy reduced the requirement for airway manipulation compared to endotracheal intubation

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Background and Goal of Study: Therapeutic procedure of trachea via fiberoptic bronchoscopy is a choice of treatment for airway lesions. Due to the nature of airway lesions and the competitive route for ventilation and the procedure itself, the airway management during the procedure has always been challenging and repeated airway manipulation is usually required. Unlike endotracheal intubation, supraglottic airway can not only serve as an alternative airway, but also as the route for fiberoptic bronchoscopy (as shown in Figure 1). In this study, we conducted a retrospective study to compare the requirement of repeated airway manipulation and the effectiveness of ventilation between supraglottic airway and endotracheal intubation.

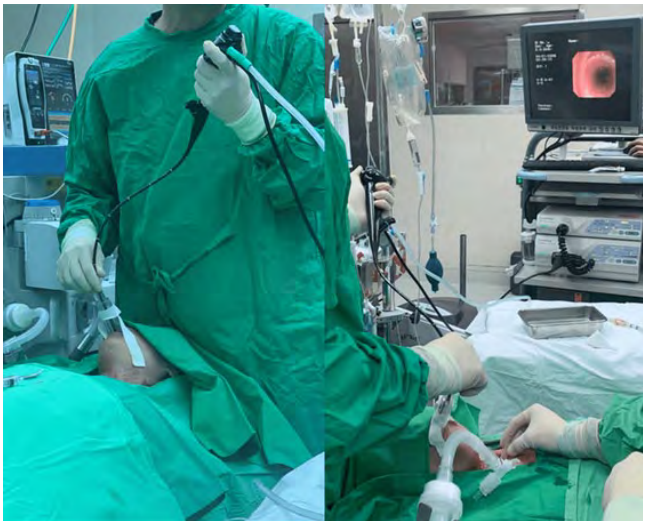

Figure 1. The use of supraglottic airway in therapeutic procedure of trachea via fiberoptic bronchoscopy.

Materials and Methods: Patients who underwent therapeutic procedure of trachea via fiberoptic bronchoscopy under general anesthesia during 2019 to 2021 in Taipei Veterans General hospital were included. Charts were reviewed and perioperative data was compared. The primary outcome was the total number of times for repeated airway manipulation. The secondary outcome included oxygenation and the level of end-tidal CO_2.

Repeated airway manipulation (Times)	Supraglottic airway (Cases)		Endotracheal tube (Cases)	
0	13	(92.9%)	2	(12.5%)
1	1	(7.1%)	12	(75.0%)
2	0	(0.0%)	2	(12.5%)
Total	14		16	

W = 21, p-value = 0.00002427

Table 1. The primary outcome of the use of supraglottic airway and endotracheal tube.

Results and Discussion: 30 cases of therapeutic procedure were included. As shown in Table 1, there was a significant reduction of requirement for repeated airway manipulation with supraglottic airway compared to endotracheal intubation by the Mann-Whitney U test. The lowest saturation recorded was significantly higher with supraglottic airway and there was no significant difference of the level of end-tidal CO_2 between the two groups.
Conclusion(s): The use of supraglottic airway for therapeutic procedure of trachea via fiberoptic bronchoscopy can reduce the requirement for repeated airway manipulation. In the meanwhile, it may offer a better oxygenation and compatible ventilation.

07AP04-11
Analgesic efficacy and adverse effects of different analgesic regimens for video-assisted thoracoscopic surgery

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Background and Goal of Study: In the past decade, the proportion of thoracic procedures performed by video-assisted thoracoscopic surgery (VATS) has increased dramatically. VATS is a minimally invasive procedure that allows a faster recovery after thoracic surgery. However, postoperative pain after VATS may affect the ability to cough and impair deep breathing and lung function, resulting in cardiorespiratory complications, delayed recovery, and increased costs. Analgesic regimens for VATS vary significantly.
The goal of this study was to evaluate the analgesic efficacy and adverse effects of different analgesic protocols for VATS.
Materials and Methods: Retrospective observational study that included adult patients submitted to uniportal VATS from 01/06/21 to 31/06/22 in a European Cancer Institute.
We reviewed the analgesic protocols and compared postoperative pain scores, opioid consumption after surgery and possible adverse effects related to the analgesic strategy. Statistical tests were used as appropriate.
Results and Discussion: From 173 procedures included, 39.3% were lobectomies and 35.8% were sublobar resections. All patients received multimodal analgesia. 88.9% of the patients received conventional analgesia: 39.9% had a regimen with paracetamol, parecoxib and tramadol; 32.9% paracetamol and parecoxib; 13.9% paracetamol and tramadol and 2.2 % only paracetamol – all of these included intravenous morphine as rescue analgesic.
In the patients with conventional analgesia protocols, an intercostal nerve block was performed in 97.3% and 2.6% received an erector spinae plane block. In 18 (10.4%) patients, epidural analgesia was the preferred regimen. 1 (0.6%) patient had paravertebral catheter placed for analgesia.
Most of our patients had their pain well controlled with 83.2% and 74% reporting only mild pain, at rest or with movement respectively, in the recovery room. We didn't find statistically significant differences between the different analgesic regimens in pain scores at the recovery room, 24, 48 or 72 h.
Also, we found no statistically significant difference in morphine consumption. In 9 patients, hypotension was described, 4 of which (44.4%) were in the epidural group.

Conclusion: Conventional analgesia combined with intercostal nerve block had good analgesic results with minimal rescue analgesia and adverse events. Epidural analgesia was not superior in efficacy and may have more adverse events associated, namely hypotension.

07AP04-12
Effect of a perioperative opioid free anaesthesia-analgesia (OFA-A) strategy on surgical stress response in elective open abdominal aortic aneurysm repair: a prospective randomized study – early study findings

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Background and Goal of Study: Open Abdominal Aortic Aneurysm (AAA) repair is accompanied by intense surgical stress response. Our basic hypothesis is that a perioperative multimodal Opioid-Free Anaesthesia-Analgesia (OFA-A) strategy will lead to attenuation of the AAA repair stress response, compared to a conventional Opioid-Based Anaesthesia-Analgesia (OBA-A) strategy.
Materials and Methods: 40 patients in total, undergoing open infrarenal AAA repair, will be divided in 2 equal groups and managed under 2 different perioperative strategies, OFA-A and OBA-A. In both groups blood samples are collected at 4 timepoints and analysed for inflammatory markers (IL-6, IL-8, IL-10, TNF-a, CRP, cortisol, AVP, WBC). Haemodynamic data are collected every 20 s intraoperatively and analysed for evidence of haemodynamic instability. Parametric data were analysed via t-test. Non-parametric data were analysed via Mann Whitney U test.
Results and Discussion: Preliminary data (20 patients so far, 10 in each group), showed no statistically significant difference in noradrenaline, phenylephrine or ephedrine requirement. Haemodynamic data were not collected for 2 OFA-A patients. Analysis n=18 patients showed no statistically significant difference in haemodynamic instability episodes (defined as HR or BP ≥120% or ≤80% of baseline values, lasting ≥1 min). OFA-A patients required significantly more nitroglycerine (n=20, p=0.0348) postoperatively.
Both groups received goal-directed fluid therapy and no statistically significant difference in fluid requirement were noted. OFA-A patients had a statistically significantly higher intraoperative urine output (n=20, p=0.04) and statistically significantly lower furosemide requirement (n=20, p=0.0161).
Cortisol levels were statistically significantly increased in the OBA-A group (26.29 ng/ml) compared to the OFA-A group (13.52 ng/ml) only 24 h post-aortic unclamping (U=20, z=-2.268, p=0.023). CRP and WBC did not show any statistically significant difference at any point of measurement. Analysis of the rest of the laboratory data is underway.
Conclusion(s): Despite the lack of difference in intraoperative haemodynamics up until this stage in the patients' recruitment process, the statistically significant difference in the cortisol level 24 h post-unclamping could suggest an attenuation of the surgical stress response in the OFA-A group. Further patient recruitment and analysis of the rest of the inflammatory markers is required.

07AP05-01
Cardiac hydatid cyst: a rare case

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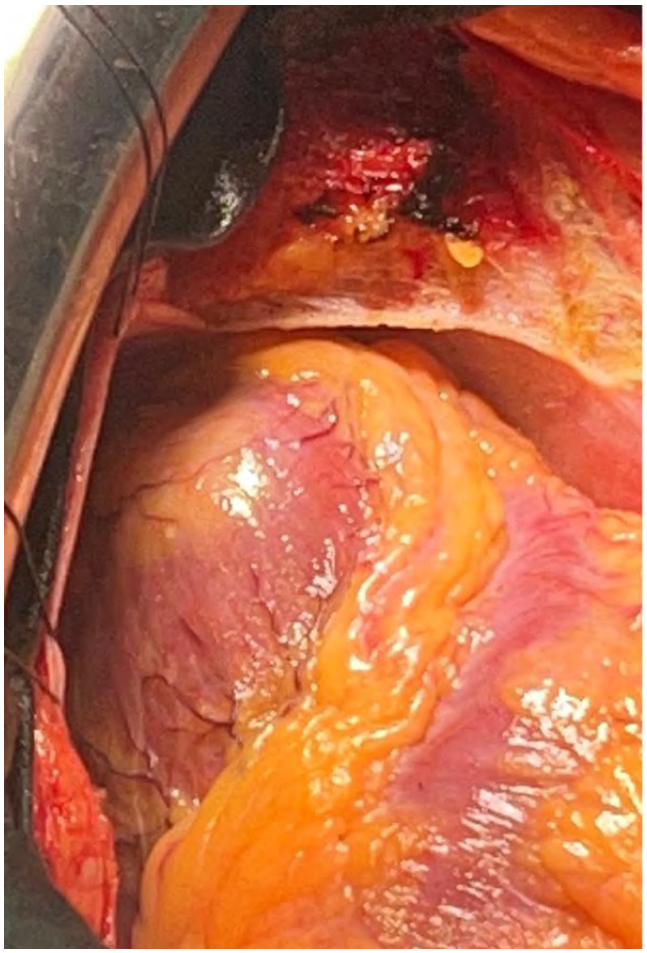
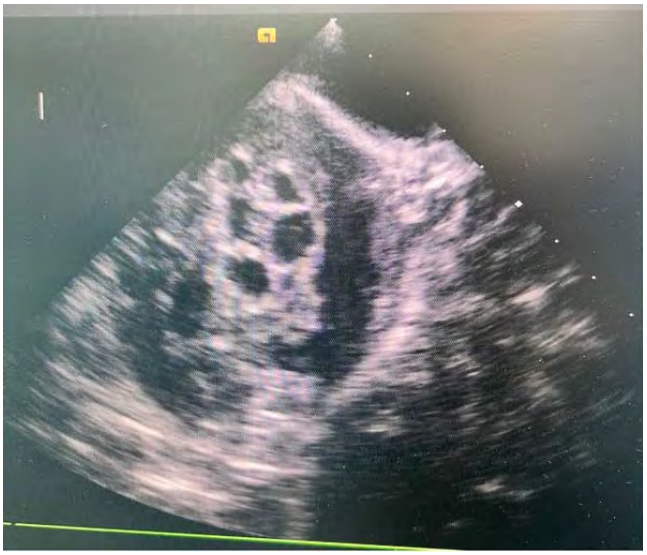
Background: Cardiac involvement of hydatid cysts is between %0,02 to %2. Clinical presentation may be asymptomatic, arrhythmia, valvular disfunction, cardiac tamponade or failure, stroke and death.
Case report: Our 41 year old female patient presented with persistent cough.A hydatid cyst was detected in left ventricle cavity by transthoracic echocardiography. X-ray examination also revealed cysts in upper, middle and lower lobes of the left lung. The patient scheduled for hydatid cysts excision with cardiopulmonary bypass. Electrocardiography, pulse oximetry, end tidal CO2, invasive atrial pressure (right radial artery), central venous pressure (right internal jugular vein), urine output, temperature and cerebral oximetry monitoring were performed on patient. A transoesophageal echocardiography was placed. The induction made with 5 mg midazolam iv,400 mcg fentayl iv and the intubation made with 50 mg rocuronium bromure. Anaesthesia was maintaned with iv. infusion of remifentanyl, iv. infusion of rocuronium bromure and 1% sevoflurane. The patient intubated with 37 Fr right endobronchial tube. Heart was approached with a median sternotomy. Multiple daughter cysts were removed from the left ventricle and the left lung. The patient was discharged 5 days after surgery.





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Learning Points: The most critical complication of a cardiac hydatid cyst is perforation.Cardiac hydatid cyst is a rare kind of zoonoses. Early diagnosis and treatment are important to prevent life-threatening complications.

07AP05-02
Protamine anaphylactic shock in patient with fish allergy and negative skin prick test

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Background: Protamine, a protein isolated from salmon gonads, is the standard of care, if not sometimes the only method, for acute reversal of anticoagulation with heparin, despite its side effects. Life-threatening reactions in patients with independent risk factors are less than 2%. We present a case of anaphylactic shock in patient with mild fish allergy and negative skin prick tests for protamine.
Case report: A 64-year-old female underwent valve replacement and coronary artery bypass surgery, with a history of fish allergy. Due to her background, steroids and antihistamines were given before induction, even though skin prick tests for protamine were negative. After the procedure, she was effectively weaned off cardiopulmonary bypass, deciding to proceed to administer protamine. Following 200 mg of treatment, cardiovascular collapse and bronchospasm occurred, showing increased peak airway pressure, acute pulmonary hypertension leading to right ventricular failure, with reduced response to fluid replacement, steroids and inotropic support. Since anaphylactic shock secondary to protamine was suspected, further administration was avoided deciding to achieve hemostasis with blood products, guided by ACT and thromboelastography. Hemodynamic stability was not reached in the operating room and patient was transferred to the intensive care unit with extracorporeal membrane oxygenation. Tryptase levels were evaluated after the event showing elevated results. During the next 24 hours, patient presented signs of general hypoperfusion and later died due to multiple organ failure.
Discussion: Patients with fish allergies are most at risk of a fatal reaction to protamine with a 13.2% mortality rate, recommending a skin prick test preoperatively. However, studies indicate that a positive skin test does not predict a patient's reaction to protamine, and in our case, the test was negative. Other methods to prevent adverse events should be used, such as intradermal testing for its higher sensitivity or administration of a reduced amount of protamine before the full dose.
Reference:
Collins C, O'Donnell A. Does an allergy to fish pre-empt an adverse protamine reaction? A case report and a literature review. Perfusion. 2008 Nov;23(6):369-72.
Learning Points: A negative skin prick test does not exclude the possibility of life-threatening adverse reactions to protamine. Further tests should be performed in high risk patients before administering a full dose of protamine.

07AP05-03
Tracheal bronchus: a rare scenario of difficulty in lung isolation

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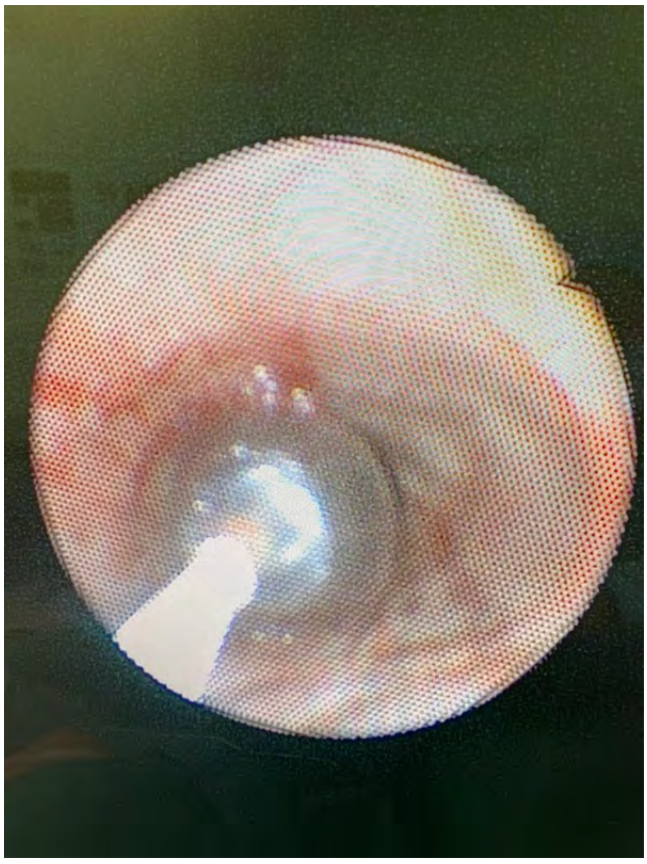
Background: Tracheal bronchus, usually diagnosed incidentally, is an aberrant bronchus that arises anywhere from cricoid cartilage to carina, most often from right tracheal wall, within 2cm of the carina[1,2].
Case report: Female, 60 year-old, ASA II, proposed for excision of lung hamartoma. Pre-operative evaluation presented no alterations in blood analysis and electrocardiogram. Respiratory function test revealed: FEV1 60%, FVC 70% and positive response to bronchodilators. CT scan presented a pulmonary nodule (13mm maximal diameter) in left inferior lobe. She had no history of previous general anesthesia. Difficult airway was predicted by Mallampati III and UpperLipBit test class 2.
We performed a balanced general anesthesia and airway approach was accomplished with left double lumen tube after two attempts, with the use of a bougie. After intubation, bronchoscopy was performed to confirm tube's correct location. Difficulties were encountered in carina identification by bronchoscopy in tracheal lumen. When approaching bronchial lumen, tube was removed until true carina was identified.
Repeating visualization in tracheal lumen, two distinct orifices were identified, prompting the diagnosis of tracheal bronchus just above the carina. Lung isolation was possible but difficult to perform due to this anatomical variant promoting easy cuff herniation and exclusive ventilation of upper right lobe. Intraoperative course was uneventful and patient was successfully extubated after 45 minutes of surgery.
Discussion: Presence of a right tracheal bronchus can lead to difficult lung isolation and right double lumen tube is probably a bad choice[2]. Left double lumen tube can be used for both lung isolation but, although probably the best choice, its correct position-

ing can also be difficult as shown in this case. Bronchial blocker or EZ-blocker are probably feasible only for left lung isolation. In conclusion, the use of intraoperative bronchoscopy is essential to guarantee safe anesthetic management, allowing visualization of correct tube positioning. If performed preoperatively, it can detect anatomical variants and guide airway approach plan[2].

Reference:
1. Lai, et al. Anesthesia for patients with tracheal bronchus. Asian J Anesthesiol. 2017;55(4);
2. Sarkar, et al. Tracheal bronchus: A rare unforeseen anaesthetic challenge. Indian J Anaesth. 2018; 62(8)

Learning Points: Bronchoscopy is essential to guarantee a safe anesthetic plan and management in lung isolation.



07AP05-05
Left main bronchus injury during esophagectomy with puncture of the double lumen tube. Use of Fogarty catheter for right bronchus collapse. A case report

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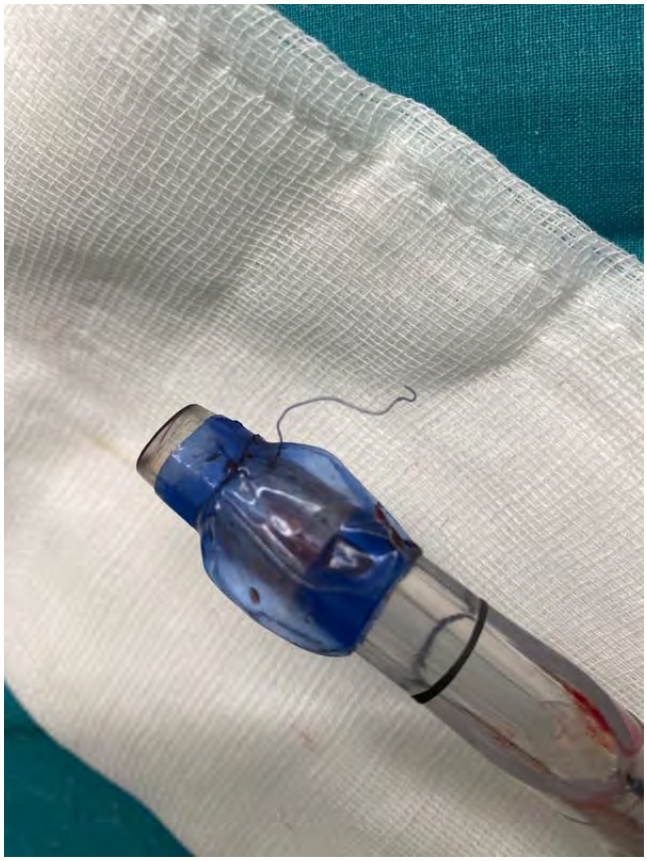
Background: Esophagus is anatomically positioned very close to trachea and main bronchus. Esophageal resection can damage these structures.
Bronchial tree lesions during esophageal surgery are associated with potentially serious pulmonary complications.

Case report: 72 years old man undergoing esophagectomy. Orotracheal intubation was performed with left double lumen tube. The patient was placed in prone position to perform thoracoscopy and tracheal lumen was clamped for selective ventilation of left lung. A iatrogenic perforation of left main bronchus happened. Surgeons repaired it but they accidentally punctured the left ballon so lung isolation was impossible. We requested for a Fogarty catheter. We introduced it under fiberscope vision through the tracheal branch of the double lumen tube, placed it in the right main bronchus and inflated it with 5 ml of air. We achieved the isolation of the right lung and protective left single lung ventilation was successfully done.

Discussion: Airway damages secondary to esophageal surgery should be managed as soon as they are detected. Lung isolation alternatives may be weighed[1 2].
We will suspect the persistence of bronchial damage if we observe a persistent air leak in the tube of thorax[3].

References:
1. Katariya K. Complications of transhiatal esophagectomy. J Surg Oncol, 57 (1994), pp. 157-63
2. Orringer MB. Transhiatal esophagectomy for treatment of benign and malignant esophageal disease. World J Surg, 25 (2001), pp. 196-203.
3. Hulscher JB. Injury to the major airways during subtotal esophagectomy: incidence, management, and sequelae. J Thorac Cardiovasc Surg, 120 (2000), pp. 1093-6

Learning points: Airway damage is a serious complication that we must know how to manage in our practice as anesthesiologists. Fogarty catheter can be a good alternative fot lung isolation in one lung ventilation during thoracic surgery.



07AP05-06
Managing a patient with a tracheoesophageal fistula

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Background: The anesthesia management of patients with a tracheoesophageal fistula (TOF) is challenging. Despite various techniques of managing the airway and ventilation, selective bronchial intubation has been previously reported.[1]

Case report: 50-years-old female cachectic patient, ASA IV, admitted to the intensive care unit (ICU) under mechanical ventilation after voluntary ingestion of a caustic substance which resulted in an esophageal stricture and a TOF with bile drainage through the orotracheal tube. The patient was submitted to an esophageal-colic transposition with maintenance of the native esophagus and placement of a feeding jejunostomy. She was extubated on the third day post-operative but needed to be reintubated after excessive bile vomiting with aspiration and airway compromise.

Due to her physical status and inadequacy for a major surgery, and after a multidisciplinary discussion, the patient was proposed for a bronchoscopy with the intention of placing a left double lumen tube whose tracheal cuff could block the fistula. The surgery was made under general anesthesia (GA), with ASA standard monitoring associated with anesthetic depth and invasive blood pressure monitoring.

On direct laryngoscopy, it was possible to visualize an edema and hyperemia of the glottis. The double lumen tube was introduced without complications. Aspiration of both bronchi was performed and correct tube position was confirmed with a pediatric bronchoscope. Three weeks after, the patient was submitted to an autologous pericardial patch to close the fistula under GA using the double lumen tube. Bronchoscopy was carried out to support selective intubation. At the end of the surgery, the patient was transfered to the ICU for recovery.

Discussion: TOF presents a challenge of airway control and ventilation but also presents a challenge of aspiration prevention. It is crucial to formulate strategies to minimise spillover of gastric contents into the respiratory tract.[2]

References:

1. *Au, C. L., White, S. A., & Grant (1999).A novel intubation technique for tracheoesophageal fistula in adults.Canadian Journal of Anesthesia*;

2. Diddee, R., & Shaw, I. H. (2006). Acquired tracheo-oesophageal fistula in adults. *Continuing Education in Anaesthesia, Critical Care & Pain*, *6*(3), 105-108.

Learning points: A double lumen tube can be used as a technique to temporarily close a TOF until patient is fit for surgery and to isolate the lung when thoracic surgery is needed to repair the lesion.

07AP05-07
Management of a Video-Assisted Thoracoscopic Surgery (VATS) case under attempted conscious sedation requiring conversion to general anesthesia. A case report

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Background: Spontaneous breathing reduces many complications of mechanical ventilation(1).This case report is an example of non-intubated technique(NITS) in some selected patients during thoracoscopic procedures although there is a risk of conversion to intubation.

Case report: A 73 years old male with a smoking history, lung cancer, HTN, COPD, PAD and TIA , was scheduled for VATS wedge resection of the right lower lobe. Exercise tolerance was limited and he required intermittently low O_2 concentration therapy via nasal cannulas preoperatively. Apart from his comorbidities his gas exchange and spirometry were of poor values.

Upon arrival at the operating theatre, essential monitoring was applied, including BIS and capnography. Peripheral cannulation and invasive BP left radial line were established. O_2 was administered via face mask and patient was placed on the left lateral position.

Conscious sedation with iv Midazolam 1 mg and TCI Remifentanil with titration from 0.5 ng/ml up to 1 ng/ml, was provided allowing spontaneous breathing. During the operation, the patient became tachypnoic impairing massively the operating conditions. Conscious sedation was upgraded to GA via single-lumen tube and he was then placed again on left lateral position.

Anesthesia was maintained with TCI Propofol/Remifentanil 1/0.5 ng/ml. Apnoeic oxygenation was used for 15 minutes with mild desaturation. For analgesia iv 1g Paracetamol and Fentanyl 35 mcg were used and local infiltration with ropivacaine. The patient was extubated in the operating theatre, hemodynamically stable after the correction of his gas exchange initially with the transition to PSV mode before conversion to spontaneous ventilation. He was discharged after two days.

Discussion: The conversion rate from NITS to intubated varies between 2% and 11%. Prolonged hypoxemia/hypercapnia, disease characteristics, pain, airway hypersensitivity, ineffective intravenous sedation or a noncooperative patient are the most frequent indications for conversion(1).

Thorough anaesthetic planning can predict unanticipated intraoperative events such as discomfort or tachypnea that occurred in our case requiring conversion to GA.

Learning Points: An effective anesthetic plan combined with specified inclusion criteria, is essential for a successful implementation of NITS.

Reference:

1.Chiang & Lin (2021)Converting to Intubation During Non-intubated Thoracic Surgery:Incidence,Indication,Technique and Prevention. Front. Surg. 8:769850

07AP05-08
Perioperative considerations in a patient abusing metamfetamin

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Background: Substance abuse is an increasing problem worldwide. Pathologies such as hypertension, coronary artery spasm-infarction, cardiomyopathy, pulmonary hypertension, tremor, hemodynamic instability, kidney-liver failure, coagulation disorder, infection, pulmonary edema can be seen in patients using ecstasy. In this presentation, we describe perioperative anesthesia management in a patient who underwent tricuspid and mitral valve replacement operation.

Case report: A 35-year-old, 175cm, 60kg male patient was listed for TVR+MVR operation due to infective endocarditis. The patient, who had been addicted to methamphetamine for 2 years, had hepatitisC, hyperthyroidism, had METS<4, poor general condition and SPAB:70 mmHg. The patient's liver enzymes were slightly elevated and kidney functions were depressed (eGFR:65). After induction of anesthesia with ketamine, midazolam, lidocaine, fentanyl, rocuronium, maintenance was provided with sevoflurane-remifentanil infusion. Tranexamic acid was given as 20mg/kg bolus and 2mg/kg infusion. USG guided bilateral pectointercostal facial block was performed after induction at two levels with a total of 60mL (15mlx4) of 0.25% bupivacaine.

The patient who bled 2000ml in the intraoperative period did not encounter any other surgical problem. CPB time was 180min, operation time was 360min. Intraoperatively, 3UES,2UFFP, 10Ucryoprecipitate, 500mg cofact, 1g haemocoplettan, 2500cc crystalloid were given to the patient, 500mL urine output was obtained and 1200mL UF was performed.

At the end of cardiopulmonary bypass, norepineprine,dopamine, dobutamine were required. Paracetamol 500mg and tramadol 60mg were administered at the end of the surgery. In case of VAS>4, parol-tramadol were repeateted (only 2 times). The patient was extubated on the 10th hour and was taken to the ward on the 5th day. Consent was obtained from the patient.

Discussion: Methamphetamine use is a well-known cause of pulmonary hypertension and hemodynamic changes during general anesthesia, and also potential hypotension may increase awareness, so hemodynamic depression and bleeding were aggressively managed and, both depth of anesthesia and hypoperfusion were monitored with BIS-NIRS. Analgesic management was provided with regional block and low dose analgesics. As a result, such patients require a good perioperative planning.

Intraoperative data	Basal	After inducton	CPB initial	CPB nadir temperature	CPB rewarming	CPB end	Sternal closure	ICU arrival
PaO2	198	206.6	246	212.4	200.8	187.5	129.4	160
SaO2	99	99	99.1	99.1	98.8	98.7	97.9	98.7
PaCO2	32.6	36.3	40.5	32.8	35.4	44.5	44	38.9
Lactate	1,23	1.97	2.15	2.3	2.51	2.99	2.35	2,08
Hb (g/dL)	9,4	10	6.1	6.7	7.6	8.8	8.9	10.4
BIS	77	44	46	45	45	49	48	
NIRS Left / Right	59/57	69/66	58/62	62/64	65/66	70/71	74/76	
Temperature (°C)	36.0	35.6	34.9	29.4	35.0	36.0	36.0	
Urine (ml)	25	25	200	300	400	450	500	

07AP05-09
Opioid-free anaesthesia for thoracoscopic operation in a previous opioid dependent patient under detoxification

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Background: Perioperative pain management can be challenging for former opioid addicted patients under detoxification programs.

Case report: A 51-year old male HCV positive, with a history of previous opioid addiction under detoxification and Vogt – Koyanagi – Harada syndrome was admitted for thoracoscopic excision of emphysematous cysts of the right lung. The patient has been on buprenorphine 16mg and diazepam 5 mg, as substitution therapy. Multimodal, preemptive opioid free anaesthesia plan was organized including dexamethasone 8mg, $MgSO_4$ infusion of 2,5gr (in 100mL N/S solution) and dexketoprofen 50mg.

Anaesthesia was induced with 180mg propofol and 70mg rocuronium. Ketamine 100mg bolus and 40μg dexmedetomidine (0.5μg/Kg BW) infusion were given immediately after intubation with 39Fr DLT. Anaesthesia was maintained with desflurane 4% to 6% (low flow, <1L/min) and O_2/air. Intraoperative analgesia was maintained via a lidocaine pump (10mg/ml) in 7 ml/hr infusion.

Continuous esmolol infusion (10mg/ml) was introduced according to NOL indices. Intraoperative monitoring included ECG, SpO_2, $EtCO_2$, Entropy, core body temperature, invasive arterial blood pressure and NOL. A central venous catheter was also introduced. Vital signs intraoperatively were stable and NOL was ≤25 almost, throughout the operation.

At the end of operation (4 hours lasted) 1 gr of paracetamol was given. The surgeons did not wish to perform a peripheral nerve block. Postoperatively, PCIA infusion (according to Mulier's protocol) with a solution of lidocaine 10mg/ml, dexmedetomidine 1μg/ml and ketamine 1mg/ml (3,5ml/h and bolus at 1ml every 15min) under standard monitoring was administered in PACU and in the ward (2 days in total), along with 1gr paracetamol quid. VAS score ranged between 1-3.

Discussion: Multimodal preemptive induction and intraoperative continuous infusion of opioid free drugs, with appropriate monitoring (NOL) can be effective in perioperative pain management of previous opioid addicts for thoracoscopic operations.

Reference:

R. Goyal, et al. Anesthesia for opioid addict: Challenges for perioperative physician, J Anaesthesiol Clin Pharmacol. 2013 Jul-Sep; 29(3): 394 –396

Learning points: Perioperative multimodal opioid free analgesia (dexamethasone, $MgSO_4$, dexketoprofen, lidocaine, ketamine, esmolol, dexmedetomidine, paracetamol) along with appropriate monitoring can be effective for thoracoscopic surgery in former opioid addicted patients under detoxification.

07AP06-01
Right phrenic nerve pacing to reduce risk of hemidiaphragmatic palsy after atrial fibrillation ablation by radiofrequency

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Background and Goal of Study: Catheter Atrial fibrillation ablation (CAAF) is an approach to treat atrial fibrillation (AF). CAAF-related complications are rare but can induce to major morbidities. Persistent phrenic palsy (PPP) occurred in <1% and compromises respiratory function leading to severe morbidities, particularly in obese patients and patients with chronic obstructive pulmonary disease, two AF risk factors (1, 2). Preventives strategies against PPP are not well documented. Historically, our cardiologists did not identify the phrenic nerve (PN) path. After several PN palsy, they changed their practice and systematically identify it by pacing on ablation sites looking for hiccups before right-sided pulmonary veins ablation. The aim of this retrospective study is to evaluate the interest of PN path identification by transauricular pacing prior CAAF in order to prevent PN palsy. All procedures are performed under general anesthesia.
Materials and Methods: After local IRB approval, we conducted a single center retrospective study. We compared two groups: Group (-), 491 patients without PN localization strategy, Group (+), 435 patients with PN localization strategy. CAAF technique was similar in both groups: a contact force-guided radiofrequency catheter (ThermoCool© SmartTouch) for CAAF (25-35W, Ablation Index >350-450). To locate right PN in Group (+), a transauricular pacing (20 mA, 1000 msec cycles) was applied before right-sided pulmonary veins ablation. If a hiccups is identified during pacing, ablation line was modified. All patients are monitored with accelerometer Philips IntelliVue© NMT to confirm decurarization (TOF ratio>25%) before pacing. PPN was diagnosed via a post-procedural chest X-Ray. Statistics used Chi-square and Mann-Whitney tests, p≤0,05 is considered as statistically significant.
Results and Discussion: Any statistical difference was found between both groups in term of characterization of AF, demographic (age, Body mass index, sex) or cardiovascular features (CHADVasc Score, presence of hypertension, diabetes, cardiomyopathies, cardiac failure, thromboembolic events). In Group (+), PN stimulation was observed in 59% (256/435) patients resulting to a modification of ablation line in 16% (42/256). None Group (+) patient presented post-procedural PN palsy versus 6 in Group (-) (p=0,05). None difference was found at 12-month follow-up: Group (+) 82% success versus Group (-) 73% (p=0,48).
Conclusion(s): In our study, systematic research of the PN before CAAF lead to a significant risk reduction of PPP, supporting the necessity of Identification, an adequate neuromuscular monitoring and team communication.
References:
1- Goudis CA. J Cardiol. 2017;69(5):699-705.
2- Lavie CJ and coll, J Am Coll Cardiol. 2017;70(16):2022-35

07AP06-02
Evaluation of common methods for double-lumen tube selection by 3D-reconstruction of left bronchial diameter

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Background and Goal of Study: Selection of left double-lumen tubes (DLT) remains a matter of debate. DLT should be selected small enough to prevent airway damage and large enough to minimize airway resistance[1,2].
The left bronchial diameter (BD) is the critical anatomical structure and the largest DLT with ≥1 mm difference of BD to DLT diameter (ΔBD-DLT) is suggested[3]. Selection methods approximate BD via sex and height[1], via tracheal diameter[1] or by 2D radiography[3].
Here, we determine BD by 3D-reconstruction, and evaluate common selection methods by applying the ≥1 mm criterion.
Material and Methods: 3D-reconstructions of BD were generated from CT scans (57♂, 43♀, height: 172±11 cm, age: 65±13 years). DLTs' (Mallinckrodt, BronchoCath™, Dublin, Ireland) outer bronchial diameter was taken from the literature[2]. Difference in ΔBD-DLT was tested by repeated measure ANOVA. All p-values were Bonferroni corrected.
Results: DLT selection differed between methods ($p<0.001$, χ^2-Test) and sexes ($p<0.001$ for all methods, Fisher Exact Tests). The ≥1mm criterion selected 41 Fr DLTs in 96% of men, and as the only method 32 Fr DLTs (12% of women, Table).

DLT Size (Fr)	≥1 mm criteria		Slinger (S)[1]		Brodsky (B)[1]			
	women | men	total	women | men	total	women | men	total	women | men	total
32	5 | 0 (12%) | (0%)	5	0 | 0 (0%) | (0%)	0	0 | 0 (0%) | (0%)	0	0 | 0 (0%) | (0%)	0
35	5 | 1 (12%) | (2%)	6	17 | 0 (40%) | (0%)	17	5 | 0 (12%) | (0%)	5	10 | 1 (23%) | (2%)	11
37	6 | 0 (14%) | (0%)	6	26 | 0 (60%) | (0%)	26	10 | 2 (23%) | (4%)	12	13 | 1 (30%) | (2%)	14
39	5 | 1 (12%) | (2%)	6	0 | 6 (0%) | (11%)	6	22 | 10 (51%) | (18%)	32	12 | 7 (28%) | (12%)	19
41	22 | 55 (51%) | (96%)	77	0 | 51 (0%) | (89%)	51	6 | 45 (14%) | (79%)	51	8 | 48 (19%) | (84%)	56

Distribution of DLT selection according to method

ΔBD-DLT also differed between methods ($p<0.001$) and sexes ($p<0.001$). Regardless of the method >75% of men had a ΔBD-DLT >2.5 mm. Current methods did not meet the ≥1 mm criterion in 5-10% of patients and even allowed DLT selection with ΔBD-DLT<0 mm in up to 4% of women (Figure, following page).
Conclusion: Existing selection methods may violate the ≥1 mm criterion and hold the risk of bronchial damage in women and high airway resistance in men. If DLT selection by 3D-reconstruction reduces pulmonary complications needs further study.

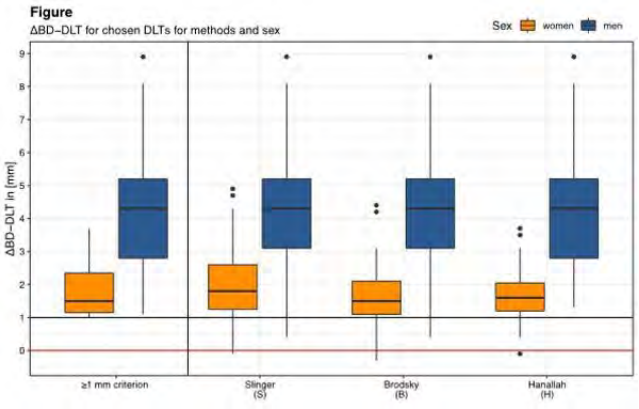

Figure.

References:
1. Meggiolaro KM et al. Anaesthesist. 2018;67:555-567.
2. Spaeth J et al. J Cardiothorac Vasc Anesth. 2016;30:954-960.
3. Hannallah M et al. *J Cardiothorac Vasc Anesth*. 1997;11:168-171.

sign of a low vascular tone, warning earlier than HPI alarm (set at 85/100 by default),[4]. Within the "grey zone" of MAP, when HPI is >50/100, DAP is too much often lower than 60 mmHg, despite its correlation with HPI is no more so strong (rs = -0.423).

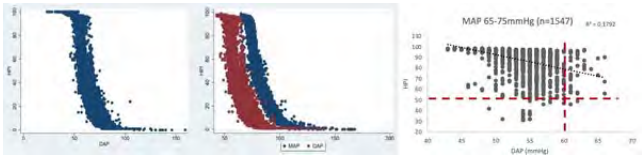

Figure 1.

Conclusion(s): Our results, showed that in apparently stable hemodynamics (MAP>65 mmHg), the diastolic blood pressure could be the marker of an incoming instability. So, Mind the DAP!

References:
1. Anesthesiology 2013;119:507-15.
2. BJA 2019;122(5):563-74.
3. Anesthesiology. 2022 Sep 1;137(3):283-289.
4. Anesthesiology 2022; 00:00–00[ahead-of-publish].

07AP06-03
Intraoperative hemodynamic management by Acumen™ Hypotension Prediction Index in open abdominal aortic repair. Mind the DAP!

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Background and Goal of Study: Open abdominal aortic repair (AAR) is an operation exposing the patient to the risk of intraoperative hypotension (IOH). IOH (mean arterial pressure, MAP, <65mmHg) has been demonstrated to be associated with the risk of poor post-operative outcome, [1],[2].
We used the semi-invasive hemodynamic monitoring platform Acumen HPI Hemosphere™ (Edwards Lifescience, Irwin, CA, USA) which provides the Hypotension Prediction Index (HPI). This marker alerts about an incoming (within 5, 10 or 15 minutes) hypotension and along with other parameters regarding the response to vasoconstrictor or the vascular tone (dynamic elastance, Ea_{dyn}), the fluid responsiveness (stroke volume variation, SVV) and the contractility by the blood pressure slope within the time-unit (dP/dt), permits to predict hypotension and the likely cause, [2],[3].
Since from our early experience with HPI we noticed that it starts to rise and then alerts when MAP is still in the range 65-75mmHg, we searched for the behavior of other monitored parameters which HPI could be more sensitive to.
Materials and Methods: We investigated 13 subjects submitted to elective AAR and monitored by Acumen HPI Hemosphere™ (Edwards Lifescience, Irwin, CA, USA). HPI has been used according to a simple algorithm. We focused our analysis on the diastolic arterial pressure (DAP) correlation with HPI.
Results and Discussion: As Figure 1 shows, we found a strong correlation between DAP and HPI which resulted statistically significant (rs = -0.9405; p = 0.0000).
HPI received some criticism by Enevoldsen et al, [3], about its potential over-estimation of hypotension when MAP is 65-75mmHg ("grey zone"). We found that within the grey zone of MAP (65-75 mmHg), diastolic pressure should be worthy of attention as it should be a

07AP06-04
Relationship between preoperative plasma albumin levels and development of kidney injury after cardiac surgery: risk stratification through a recursive partitioning analysis

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Background and Goal of Study: Acute renal injury associated with cardiac surgery (AKI-CS) affects 36.8% of our cardiac surgery patients with normal preoperative renal function. AKI-CS is an important cause of morbidity and mortality, increasing the need for dialysis, economic costs and length of hospital stay.
The plasma albumin level before cardiac surgery is an independent risk predictor for postoperative AKI. Recursive partitioning analysis (RPA) is a statistical method for multivariable analysis that allows stratification of individuals according to certain criteria.
We conducted a restropective study with 248 patients with ejection fraction higher than 40% undergoing cardiac surgery with cardiopulmonary bypass during 2018 and 2019 with the aim to assess the cut-off point related to the risk of developing AKI-CS depending on preoperative plasma albumin levels using the RPA.
Results and Discussion: A multivariate logistic regression model was performed including eight preoperative variables of all study patients. The selected variables were all described and published in previous studies as risk factors for AKI-CS. The selected variables were: glomerular filtration rate, plasma creatinine level, diuretic therapy, diabetes, hemoglobin, hypertension, ACEI and plasma albumin levels.
The only preoperative variable related to the development of the AKI-CS in our multivariate model was baseline albumin level. The cut-off point related to the risk of developing AKI-CS as a function of preoperative plasma albumin levels was 41 g/dL as assessed by RPA. 40.9% of patients with plasma albumin levels lower than 41 g/dL developed AKI-CS, while patients with albumin values above this cut-off point, developed AKI-CS only in 21.5% of cases.

Conclusion: Recursive partition analysis is an effective technique for the risk stratification of AKI-CS related to preoperative albumin plasmatic levels in patients undergoing cardiac surgery with cardiopulmonary bypass and ejection fraction higher than 40%

Reference:

Lee E-H, Baek S-H, et al. Preoperative hypoalbuminemia is a major risk factor for acute kidney injury following off-pump coronary artery bypass surgery. Intensive Care Med. 2012;38(9):1478–86

07AP06-05
Right Ventricle Response to major lung resection: the RIVER study

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Background and Goal of Study: Major lung resection is associated with high post-operative morbidity and mortality, especially due to cardiorespiratory complications. Right Ventricle (RV) ejection, pulmonary artery pressure and tone are tightly coupled. Since the RV is exquisitely sensitive to changes in afterload, an acute increase in RV outflow resistance (i.e., acute pulmonary embolism) will cause acute RV dilatation and, a reduction of Left Ventricle compliance too, rapidly spiraling to acute cardiogenic shock and death.

We investigated the changes in RV performance after major lung resection.

Materials and Methods: In this prospective observational trial, we performed transthoracic echocardiography (TTE) in 30 patients looking for the incidence of early RV systolic dysfunction (defined as TAPSE < 17 cm, S'-TDI < 10 cm/s) and estimating the RV-PA coupling by the TAPSE/PAPs ratio after major lung resection. The TTE was performed before and immediately after surgery.

Results and Discussion: After the end of the operation the echocardiographic parameters of right ventricle function worsened. TAPSE decreased from 24 (21÷28) to 18 (16÷22) mm (p = 0.015) and PAPs increased from 26 (25÷30) to 30 (25÷39) mmHg (p = 0.013). TAPSE/PAPs ratio decreased from 0.85 (0.80÷0.90) to 0.64 (0.54÷0.79) mm/mmHg (p = 0.002).

	Before surgery	After surgery	p
MAP (mmHg)	90 (80÷96)	86 (77÷97)	0.939
HR (bpm)	76 (65÷83)	80 (74÷88)	0.032
TAPSE/PAPs (mm/mmHg)	0.85 (0.8÷0.9)	0.64 (0.54÷0.79)	0.001
TAPSE (mm)	24 (21÷28)	18 (16÷22)	0.015
PAPs (mmHg)	26 (25÷30)	30 (25÷39)	0.013
EF (%)	55 (55÷58)	55 (53÷55)	0.289
S' TDI (cm/sec)	13 (12÷13)	12 (11÷14)	0.555
IVC collapsibility (%)	33 (22÷50)	30.5 (14.5÷50)	0.048
BNP (pg/ml)	34 (21÷62)	38 (29÷76)	0.010
Troponin I (ng/dL)	2.6 (1.8÷5.2)	44.75 (13÷293.2)	<0.001

Table. Pre- vs Post-operative heart function

Conclusion(s): In line with previous reports, after major lung resection the increase in afterload reduces the right ventricle function, but the impairment remains clinically not relevant.

The different clinical picture of an acute cor pulmonale due to pulmonary embolism implies that the pathogenesis of cardiac failure involves more pathways than the mere mechanic occlusion of the blood flow.

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07AP06-06
Long-term outcome patients, who had undergone open surgical reconstructions of the Ascending Aorta, the Aortic Arch for comparison with patients undergoing coronary artery bypass grafting (mortality, neurological, cognitive and psycho-emotional complications)

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Goal of Study: To identify mortality, stroke, cognitive and psycho-emotional disorders in the long-term postoperative periods in patients with Ascending Aorta and the Aortic Arch surgery.

Materials and Methods: The prospective study included 150 patients.

Group I (n=50) underwent aortic arch surgery with antegrade cerebral perfusion (ACP) and hypothermic circulatory arrest (26°C).

Group II (n=50) survived ascending aortic replacement with extracorporeal circulation (EC) and moderate hypothermia (32°C).

Group III (n=50) - control group after coronary artery bypass grafting. All 150 patients underwent a balanced multicomponent anesthesia based on propofol, midazolam, ketamine, fentanyl and sevoflurane.

Before and after surgery all patients underwent testing (MOCa, HADS, Covy anxiety Scale) and the postoperative delirium testing (RASS, CAM or ICDSC). Some of patients dropped out of the study, that is why only 80,67% patients were examined 5 years after surgical treatment (n=121), 67,33% - 10 years (n=101).

Results and Discussion: Mortality, stroke and changes in the neurological sphere are presented on the picture. The Long-term mental disorders were correlated with age, preoperative baseline cognitive impairment, intraoperative microembolisation or episodes of decreased cerebral perfusion, postoperative delirium and increased duration of EC more than 3 hours and ACP more than 48 minutes. Postoperatively in 16% of patients, with high HADS scores a significant effect on the cognitive sphere was recorded (p<0,01).

Conclusion: The control group showed, that aortic surgery is more complex in terms of long-term results of the intellectual sphere of patients and strongly depends on the competent management of the postoperative period in the intensive care unit. The main attention should be paid to the early detection of the patient's neurological impairment, diagnostic of subsyndromal delirium. Dynamic testing can identify psycho-emotional and cognitive disorders, delirium and cause therapy correction. The intellectual deficit can be aggravated by anxiety-depressive disorders or mask it, cause of their common localization of pathophysiological processes in the brain.

	Group I (patients)	Group II (patients)	Group III (patients)	Total n (patients)
Preoperatively:				150
Moderate cognitive disorders	8 (5,33%)	5 (3,33%)	2 (1,33%)	
Severe cognitive disorders	0	0	0	
Postoperatively:				150
Stroke	1 (0,67%)	0	0	
Delirium (+subsyndromal form)	10 (6,67%)	5 (3,33%)	2 (1,33%)	
Moderate cognitive disorders	21 (14%)	13 (8,67%)	8 (5,33%)	
Severe cognitive disorders	4 (2,67%)	0	0	
Mortality	2 (1,33%)	0	0	
Long-term period – 5-years				121
Moderate cognitive disorders	14 (11,57%)	8 (6,61%)	6 (4,95%)	
Severe cognitive disorders	4 (3,31%)	2 (1,65%)	2 (1,65%)	
Stroke	0	0	0	
Mortality	2 (1,65%)	1 (0,83%)	2 (1,65%)	
Long-term period - 10-years				101
Moderate cognitive disorders	24 (23,76%)	14 (13,86%)	10 (9,9%)	
Severe cognitive disorders	6 (7,9%)	5 (4,95%)	3 (2,97%)	
Stroke	2 (1,98%)	2 (1,98%)	0	
Mortality	1 (0,99%)	2 (1,98%)	3 (2,97%)	

07AP06-07
The safety and efficacy of preoperative carbohydrate loading in diabetic and non-diabetic cardiac surgical patients

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Background and Goal of Study: Traditional Nil per Oral for 6 – 8 hours' prior surgery causes emotional and metabolic stress leading to perioperative hyperglycemia. Enhanced Recovery After Surgery Society recommends preoperative oral carbohydrate loading (PCHO) for cardiac surgical patients to reduce hyperglycemia and insulin resistance. No major studies to evaluate the safety and efficacy of PCHO in diabetic patients. We aim to assess the effect of PCHO in diabetic and non-diabetic patients undergoing cardiac surgery.

Materials and Methods: In this prospective randomized study, 500 cardiac surgical patients were enrolled between November 2020 to October 2021 after obtaining institutional ethics committee approval. The patients were divided into Group A- Diabetic carbohydrate loaded, Group B –Diabetic placebo, Group C –Non-diabetic carbohydrate loaded, Group D – Non- Diabetic placebo. 12 hours' prior surgery, for PCHO patients 100 gm of maltodextrin in 800 ml of water followed by 50gm in 400 ml of water before 2 hours of procedure were given. Same amount of plain water given to placebo groups. Using visual analogue scale (VAS) hunger, thirst, anxiety, nausea and pain were measured. As per institutional protocol procedure was done. The blood sugar levels measured from induction to first post-operative day (POD). Total insulin requirement, inotrope score, ventilation duration, infections, Intensive care unit (ICU) and hospital stay were recorded.

Results: Low VAS score of hunger, thirst and anxiety in Group A compared to B (1.5±0.5 vs 6.9±1), (1.5±0.5 vs 7.7±0.8), (4.5±0.8 vs 4.7±8.9) and also in group C compared to D for (1.5±0.5 vs 6.6±1), (1.6±0.5 vs 7.1±0.8), (4.5±0.6 vs 4.8±0.7), P< 0.001 respectively. During CPB and first POD elevated blood sugar levels were noted in group B compared to A (190.4±16.5 vs 172.4±12.6), (156.3±7.5 vs 146.4±7.5), p<0.001 similarly in group D to C (155.3±16.7 vs 144.6±12.2), (156.3±7.5 vs 146.4±7.5), p< 0.001 respectively.

Insulin requirements were less in Group A compared to B (13.1±5.1 vs 18.5±0.3) and also in group C compared to D (0.2±0.6 vs 1.1±0.9), p< 0.001. Inotrope score was high in group B compared to A (4.5±4.3 vs 2.5±3.3, p< 0.001). No significant difference in ventilation duration, ICU and hospital stay between groups.

Conclusion: PCHO is safe in diabetic patients and reduces VAS scores for hunger, thirst, anxiety, and inotropic requirements. In diabetic and non-diabetics, PCHO reduces perioperative hyperglycemia and insulin requirement.

07AP06-08
Improving performance of the Cleveland Clinic Score for predicting AKI after cardiac surgery: a prospective multicenter cohort study

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Background and Goal of Study: Cardiac Surgery-Associated Acute Kidney Injury (CSA-AKI) is associated to increase short and long-term mortality rates. Prediction of CSA-AKI is crucial for early detection and treatment. Current predictive models may be improved by potentially useful preoperative and intraoperative information.

Materials and Methods: In this multicenter prospective cohort study, we recruited 261 consecutive patients at high risk for developing cardiac surgery-associated AKI, based on a Cleveland score of = or > 4 points, from July to December 2017th in 14 hospitals in Spain and the United Kingdom. Postoperative AKI occurred in 145 patients (55.5%). Receiver operator characteristics curve (AUC) of a base model including only the Cleveland Clinical Score (CCS) were compared to models including additional preoperative and intraoperative variables including estimated glomerular filtration rate instead of plasmatic creatinine, intraoperative urine output, baseline hemoglobin, nadir hemoglobin and glycosylated hemoglobin instead of diabetes mellitus. AKI was defined by the Acute Kidney Injury Network (AKIN) 2007 criteria. Performance of each model for any AKIN stage, as well as for AKIN stage I, stage II or III, and for Continuous Renal Replacement Therapy (CRRT) were compared.

Results and Discussion: The CCS alone gave an AUC of 0.67 (95% CI, 0.56–0.78) for postoperative AKI. None of the single variables added to the base model CCS improve discrimination. AUC for postoperative AKI was improved when baseline hemoglobin, estimated

Glomerular Filtration Rate (eGFR) instead of plasmatic creatinine, glycosylated hemoglobin, instead of diabetes mellitus, and nadir hemoglobin was added to the CCS (AUC = 0.77; 95% confidence interval, 0.67–0.87; P = 0.02).

Conclusion(s): Adding baseline hemoglobin, eGFR, glycosylated hemoglobin and nadir intraoperative hemoglobin may be useful for improving discrimination of clinical predictive risk scores for AKI, and it may provide a target for intervention.

07AP06-09
Carotid artery doppler screening in adult cardiac surgery patients – is it an effective screening method and does it predict post-operative cerebrovascular accidents in a racially diverse patient population?

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Background and Goal of Study: Carotid artery doppler screening is often used pre-cardiac surgery in order to stratify the risk for postoperative stroke. We aimed to see whether such screening predicts post-operative cerebrovascular accidents and whether it is associated with left main stem coronary artery disease in our diverse patient population.

Materials and Methods: We targeted the patients that underwent cardiac surgery for the years 2017-2020, The collected data includes data on left main stem coronary disease, carotid stenosis, ejection fraction, as well as demographics, smoking, and chronic diseases. Post-operative neurological findings (up to 30 days) were also collected.

The data is compared to data from the patients who did not undergo Carotid doppler to further evaluate the effectiveness of the same. Exclusions include doubtful neurological status and pre-op Intra-aortic balloon pump or other mechanical circulatory support.

Results and Discussion: The number of patients undergoing pre-operative carotid doppler increased 6-fold over the study period (a total 817 with doppler). In patients with significant left main stem disease who underwent doppler, an average of 17% also had significant carotid artery disease. Of those patients who underwent doppler, 1.2% had post-operative neurological findings. In those without screening (a total of 549 with no doppler), an average of 0.9% had post-operative neurological findings. There was no correlation between positive neurological findings and significant carotid artery disease.

Conclusion(s): There appears to be no difference in neurological outcome between the group who underwent carotid doppler and the group who did not. There was no apparent association with the presence of left main stem coronary artery disease. Carotid doppler costs 192USD to perform (charge quoted by a private hospital in this country), whereas the patient is only charged 14USD. There appears to be no cost-effectiveness in doing pre-operative carotid doppler in cardiac surgery patients in Qatar.

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07AP06-10
VITALISE-Pilot, a feasibility project to test methods and feasibility for the definite VITALISE-study: ex VIvo opTimisAtion of donor Lungs with Inhaled SEvoflurane during normothermic ex vivo lung perfusion, a project from bench to bedside

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Background: Volatile anaesthetics have shown to reduce pulmonary ischemia reperfusion injury (IRI) in various animal models and humans and are associated with reduced levels of oxidative stress and inflammation, reduced pulmonary oedema and improved oxygenation. Ex vivo lung perfusion (EVLP) facilitates evaluation of potential grafts and enables extension of preservation time.

In addition, EVLP could serve as therapeutic platform to improve quality of donor lungs. We hypothesize that ventilating lungs with sevoflurane during EVLP is feasible and improves lung quality.

Methods: We performed a pilot study to test the feasibility of ventilating lungs with sevoflurane during EVLP in a slaughterhouse sheep model, comparable with the clinical setting of a deceased circulatory dead donor. Lungs were harvested, flushed, and preserved cold storage for 3h, after which EVLP (4 hours) was initiated. When a temperature of 32°C was reached ventilation was started. The lungs were ventilated with a mixture of air and oxygen (EVLP, n 5) and in the intervention group sevoflurane 2% end tidal concentration (Cet) was added (S-EVLP, n 5). Perfusate and tissue samples were collected and functional measurements, including perfusate gas, were recorded and analysed. Compliance data were recorded every 30 minutes. Normally distributed, repeated measurements were analysed with a two-way ANOVA and a Mann Whitney test was used for not-normally distributed data.

Results: After approximately ten minutes, a steady state of the target Cet sevoflurane was reached. The S-EVLP group showed markedly better dynamic lung compliance over time than the EVLP group ($p = 0.003$). Oxygenation capacity was non-significantly superior in treated lungs, indicated by a better delta pO_2 (+3,8 vs. -11,7 kPa, $p = 0,151$) and a higher P/F ratio (437 vs. 347 mmHg, $p = 0,054$). Sevoflurane was measurable in the perfusate. Samples that have been taken right after the deoxygenation period showed decreased sevoflurane levels in the perfusate compared with samples taken during normal perfusion settings.

Conclusion: Ventilating lungs with sevoflurane during EVLP is feasible and showed potential to improve lung quality.

07AP06-11
Identifying factors which may predict remarkable cerebral hypoperfusion during carotid endarterectomy

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Background: Cerebral hypoperfusion during carotid endarterectomy may lead to several complications. In our previous study it was shown, that the border of potential harmful desaturation reffering to cognitive function is 16,6% with sensitivity of 82,9%, specificity 77,8%.
Proper haemodynamic management on the part of the anaesthesiologist may not always be sufficient to prevent hypoperfusion and consecutive destauration. In these cases shunt use may provide appropriate cerebral circulation. But preoperatively the indication of shunt use is not always obvious. We proposed to explore factors which may worsen cerebral hypoperfusion, and thus strengthen the indication for shunt use.
Methods: We enrolled 80 patients undergoing carotid endarterectomy (CEA) at Városmajor Heart and Vascular Center, Semmelweis University, Budapest, between 2019 and 2021. The surgeries were performed under general anaesthesia. To optimize collateral cerebral blood flow, mean arterial pressure (MAP) was kept within a 20% range of the baseline.
To detect cerebral hypoperfusion we monitored cerebral tissue saturation during the entire procedure using NIRS (Somanetics Invos 4000).
The maximum desaturation during the clamping period was calculated postoperatively. On this basis two patients group was formed according to a 16,6% desaturation limit.
Before surgery, a very detailed case history and a questionnaire were taken to assess the patients cognitive and "frailty" status.
Results: All 80 patients (45 men, mean age of 70,05±6,9 years, Vasc. Possum:19,06±2,991) were asymptomatic. 47 patients underwent EEA and in 33 patients TEA with shunt was performed.
From the comorbidities insulin dependent diabetes mellitus (p: 0,009), hyperlipidaemia (p: 0,001) and peripherial arterial disease (p: 0,001) showed significant connection with the degree of desaturation using the χ^2 test. Analysing the frailty questionnaire, preoperative weight loss (p: 0,006) and preoperative stress (p: 0,002) showed significant connection with the degree of desaturation. There was a significant correlation between the Nagi score (p: 0,001, Spearman rho: -0,568), social support (p: 0,005, Spearman rho: -0,422) and desaturation.
Conclusion: In our study we attempted to identify factors for the better evaluation of shunt indication. Beside comorbidities we have found other social factors, the presence of which may forecast cerebral hypoperfusion, and which thus may help in the decision making process about shunt use.

07AP06-12
Can you HOLD or can YOU hold?

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Background and Goal of Study: The cerebrovascular reactivity (CVR) is reduced in patients with internal carotid artery (ICA) stenosis to a point where cerebral perfusion is decreased, which leads to the dilatation of cerebral arterioles. An increase in arterial CO2 (which occurs after 30 sec of breath holding) also influences arteriolar dilatation. However, the brain has its own capacity for further arteriolar dilatation, and in this group of patients by measuring the difference in cerebral blood flow, CVR can be estimated. We assumed cerebral reactivity need time till recovered after carotid endarterectomy.
Materials and Methods: Fifty-five patients with internal carotid stenosis with an indication for carotid surgery procedure (aged 53-86 years) were divided into 2 groups according to preoperative neurological status; 28 symptomatic (TIA in anamnesis) and 27 asymptomatic. Breath-holding index (BHI) was measured and calculated the day before surgery, after the surgery procedure, and after 8 weeks. During measurements, two transducers were placed on the temporal bone window, and three breath-holding procedures were performed. The mean of all values was calculated. This study tested differences in the dynamics of BHI at these time points, as a surrogate of cerebral blood flow.
Results and Discussion: BHI is a non-invasive, using transcranial Doppler (TCD) difference in blood velocity of the middle cerebral artery (MCA) is measured during the rest phase and then during a breathing pause of 30 seconds. Analyzing our data we found a statistically significant difference only in symptomatic patients on the right side. When preoperative BHI values 0,62 (+/- SD 0,40) were compared with postoperative values, immediately after surgery we notice an average decline of 0,45 (+/- SD 0,23) p=0,02, but after 8 weeks BHI recovered 0,8 (+/- SD 0,40) p=0,0002. As the diameter of MCA is not influenced by CO2, the flow velocity change reflects the changes in cerebral blood flow.
Conclusion(s): According to available data in the literature, BHI should be significantly decreased with increased stenosis of the ICA. A BHI value <0.69 was found pathological. Measuring BHI at different time points after surgery, we found time is needed for improvement in cerebral blood flow. For a better understanding of statistically significant improvements only on the right side, more patients are needed to strengthen the quality of our results.

07AP07-01
Anesthetic management for pulmonary trunk aneurysmectomy with patent ductus arteriosus

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Pulmonary artery aneurysm (PAA) is a rare finding in the population and has multiple etiologies[1].

Woman, 29 years old, previous percutaneous treatment of congenital pulmonary valve stenosis in childhood, presenting with PAA with severe valve insufficiency, right heart failure symptoms, ventricular and atrial dilatation, and pulmonary hypertension. Aneurysmectomy and reconstruction of the pulmonary trunk, and arteries, were indicated, with a valved tube. Total intravenous general anesthesia was chosen. Added to standard monitoring, minimally invasive cardiac output monitor, bispectral index monitor, and transesophageal echocardiography were used.

After pulmonary decompression, already in CPB, there was an abrupt drop in mean arterial pressure, unresponsive to vasopressor, reaching 18 mmHg, with an immediate need to return to spontaneous circulation, opening of the aortic clamp.

In the absence of technical factors that could justify the hypotension, the existence of a shunt was suggested. Intraoperative echocardiography showed patent ductus arteriosus (PDA), requiring correction. CBP was restarted uneventfully after the closing of the PDA. Despite the prolonged CPB, and technical difficulty, the procedure was finished uneventfully.

Weaning from CPB was uncomplicated with dobutamine and nitroprusside infusion. As bleeding was noted in the surgical field, a thromboelastometry was performed and the patient was further treated with protamin and platelet apheresis. The patient was transferred to the ICU, intubated, receiving dexmedetomidine, and dobutamine.

Complex and rare cases may be extremely challenging even for the most experienced professionals. According to Laplace's law[2], shunt flow or valvular disease cause persistent hemodynamic stress, leading to PAA formation, dilatation, and rupture. Therefore to prevent undesirable events, the causative factor must be diagnosed and treated.

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Learning Points: Sudden intraoperative events may require quick and effective action and suspicion. A multidisciplinary and specialized team is vital to manage complex and rare pathologies. Thinking of differential diagnoses was fundamental for the resolution and success of this case.

07AP07-02
Near-infrared spectroscopy guided anesthesia in a patient submitted to cardiac surgery compromised with unusual carotid-vertebral occlusive disease

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Background: Cardiac surgery patients are at a relatively high risk of neurological complications, primarily stroke. Patients with the occlusive carotid disease are particularly susceptible to this complication.

Case report: We report the case of a 62-year-old male patient, admitted for aortic valve replacement. Bilateral common carotid artery occlusion (BCCAO) and bilateral internal carotid artery occlusion (BICAO) have been reported in the past, as well as right vertebral artery (VA) occlusion (Figure 1).

Given his medical history, the patient was at a very high risk of a perioperative stroke. Aortic valve replacement was performed in the standard fashion using cardiopulmonary bypass because, at that time, transcatheter aortic valve implantation was not performed in our institution.

In the perioperative course, the patient maintained hemodynamic stability; the gas exchange was adequate, and hematocrit and hemoglobin levels were satisfactory. Cerebral oximetry was assessed using near-infrared spectroscopy. Also, the bispectral index was used to monitor the depth of anesthesia (Figure 2).

After the surgery, the patient was transferred to the intensive care unit. No neurological deficit was apparent on emergence from anesthesia, and the patient was extubated after 8 hours. After 10 days, he was discharged in good overall condition.

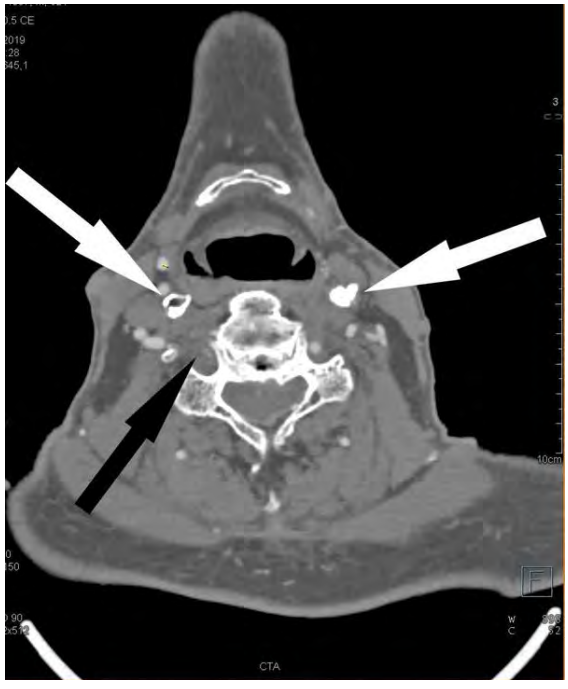

Figure 1.

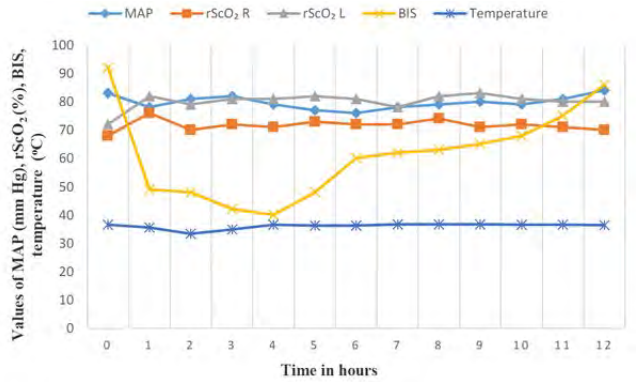

Figure 2.

Discussion: BCCAO associated with BICAO and unilateral VA occlusion is extremely rare. Despite the very high risk of stroke, we successfully performed brain perfusion during anesthesia, especially during cardiopulmonary bypass.
Learning Points: Severe carotid disease does not necessarily mean a perioperative neurological complication in cardiac surgery.

07AP07-03
Acute aortic dissection and andexanet alfa: a case of clots on cardiopulmonary bypass

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Background: Andexanet alfa (AA) is licensed for reversal of direct factor Xa (FXa) anticoagulation in cases of major bleeding[1]. We present a case of heparin resistance and cardiopulmonary bypass (CPB) clots caused by AA during emergency surgery for acute aortic dissection.
Case report: A 75 year old man presented with a De-Blakey type 1 acute aortic dissection with a background of hypertension and atrial fibrillation for which he was anticoagulated with edoxaban. AA was administered by the local medical team prior to transfer to the tertiary cardiac centre for immediate repair of the dissection and aortic valve. Baseline activated clotting time (ACT) was 138s but after 300U/kg of heparin the ACT increased only to 190s. After more than 500U/kg the ACT remained less than the 400s threshold required for safe CPB, but an anti-FXa level was 4.68U/ml so CPB was commenced. The operation was completed successfully, however numerous blood clots were visible in the venous reservoir and the returned pump blood. The patient recovered uneventfully and was discharged home 12 days later.
Discussion: In vitro data suggests binding of AA to the heparin-antithrombin III complex results in heparin resistance but its use for anti-FXa reversal before urgent surgery has not been evaluated[2].
Anti-FXa assays, an alternative measure of coagulation to ACT, causes AA to dissociate from direct FXa inhibitors in the laboratory causing detection of falsely elevated anti-FXa levels and an underestimation of the effect of AA[1].
Use of antithrombin III concentrates has been shown to successfully treat heparin resistance associated with AA administration[3] and may have been useful to prevent clots in the circuit in this case.
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Learning points: AA resulted in heparin resistance in this case and therefore its administration should be withheld when possible prior to emergency surgery requiring CPB. In cases where it has been given, Anti-FXa levels are unreliable and consideration of anti-thrombin III infusion should be given prior to CPB.

07AP07-05
Splenic rupture after iliac artery angioplasty: a case report

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Background: The aortoiliac obstructive disease is a common cause of chronic limb-threatening ischemia. The endovascular approach has been recognised as an effective alternative to the open surgical revascularization due to the further development and widespread availability of endovascular devices. However, it is not a procedure exempt from complications and it is estimated around 1% of major complications[1].
We present a rare case of an iatrogenic splenic laceration and its management in a patient who had been performed an iliac angioplasty.
Case report: A 54-year-old gentleman, with history of chronic hepatitis C, presented for elective endovascular iliac artery recanalization. In the postoperative period, the pacient presented abdominal pain accompained with hipotension. The analytical results highlighted an hemoglobin drop of three points (being initially of 13.3 g/dL) and lactate of 42mg/ml.
An abdominal CT scan showed signs of splenic rupture associated with a voluminous splenic hematoma with active bleeding. The patient underwent an emergency splenectomy, finding a complete splenic rupture with 2.5L of hemoperitoneum. Intraoperatively, it highlights the necessity of vasopressor use (noradrenaline 1mcg/kg/min) and massive transfusion.
At the end of the procedure, the patient was transfered to the intensive care unit for ventilatory and hemodynamic support, being extubated 48h after surgery and discharged from the hospital on the 12 th postoperative day.
Discussion: The majority of iliac artery interventions complications are access site-related, due to the revascularization procedure itself or related to stent misadventures.
Therefore, there are rare but life-threatening complications, such as iatrogenic splenic injury. It should be routinely considered in patients who have been enrolled in a technique which implies manipulation of larger guidewires or catheters, that can be related to distal complications, so as to allow for early intervention and so that the definitive management can be instituted.
Reference:
1. Plaza Martínez, S. Carrera Díaz, M.I. Alonso Álvarez, et al. Tratamiento endovascular de la patología obstructiva aortoiliaca. *Angiología* 2011; 63(2): 75-94.

Learning Points: Distal complications such as splenic lesions should be considered in any patient who undergoes endovascular procedures, especially if they remain hypotensive, and physicians need to be hypervigilant for any signs and symptoms of intra-abdominal bleeding.

07AP07-06
Surgical repair of a true axillary artery aneurysm by cephalic vein graft under regional anesthesia by PECS II and infraclavicular brachial plexus block: a case report

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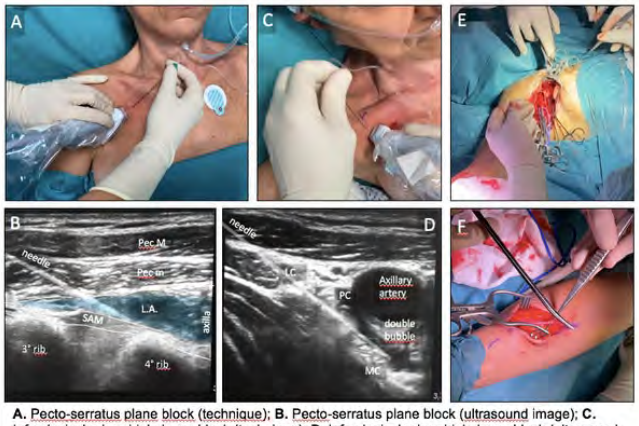
Background: Axillary true aneurysms are not uncommon. Surgical repair is usually performed via trans-axillary approach under general anaesthesia.
A major concern with locoregional anaesthesia is the difficulty of covering the axillary region.
The pecto-serratus plane (PSP) block is a safe regional technique that involves the axillary region and blocks the intercostobrachial, intercostals III-IV-V-VI, the thoraco-dorsal and the long thoracic nerves.
We report a successful anaesthetic management of a true axillary aneurysm repair under regional anaesthesia only.
Case report: A 61-year-old woman with a 2 cm true aneurysm of the right axillary artery underwent surgical repair by means of an ipsilateral cephalic vein graft.
An ultrasound (US) guided PSP block and an infraclavicular brachial plexus (ICB) block were performed.
PSP block was performed in the plane between the serratus anterior muscle and pectoralis minor muscle above the third rib with 25 mL of 0.5% ropivacaine.
ICB was performed by injection of 5 ml of 0.5% ropivacaine close to the lateral cord and 10 ml of the same solution below the artery obtaining the "double bubble sign". (1)
After vital signs monitoring, sedation with propofol TCI (1.5 μg/ml) started.
Surgery started 35 minutes after the block and lasted 162 minutes. Intraoperative vital signs were stable.
The patient did not complain of pain or nausea. No opioids were required perioperatively.



A. Pecto-serratus plane block (technique); **B.** Pecto-serratus plane block (ultrasound image); **C.** Infraclavicular brachial plexus block (technique); **D.** Infraclavicular brachial plexus block (ultrasound image); **E.** Axillary surgical access; **F.** Surgical access to the brachial vein graft

Discussion: This is the first report of an axillary aneurysm repair performed under regional anaesthesia. We chose to inject the anaesthetic on the third rib instead of the fourth, to facilitate its flow toward the axilla rather than serratus plane; similarly, we chose an ICB approach to the brachial plexus to cover the vein graft region and simultaneously deliver perivascular local anaesthesia while reducing the vessel-related pain.

Reference:

1. Tran DQ et AL. The double bubble sign for successful infraclavicular brachial plexus blockade Anesth Analg 2006 Oct;103(4):1048-9.doi:10.1213/01

Learning Points: Adequate knowledge of anatomy allows regional techniques to be combined to cover all required surgical maneuvers.

07AP07-07
Anaesthetic management of a patient with fontan circulation: a case report

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Background: Incidence of single ventricle congenital disease is around 5 per 100,000 births. Corrective surgery is the technique of choice, being Fontan surgery (FS) one of the most performed, which achieves a survival rate of around 84 percent at 20 years of life[1]. We present the case of a patient with Fontan circulation and its anaesthesic considerations.
Case Report: 24-year-old male, 183cm tall and 75kg weight, with a history of hypoplastic right heart syndrome who underwent extracardiac FS at 6 years of age. The patient had congestive liver disease without signs of pulmonary hypertension. Talc pleurodesis surgery plus bullectomy is indicated due to recurrent pneumothorax (PT) using video-assisted thoracoscopic surgery. Once in the operating room, ASA standard monitoring was performed[2].
High-flow nasal cannula with capnography was placed. Two large peripheral venous catheters were cannulated, and Vigileo system was used to monitor blood pressure; a right paravertebral catheter was placed as an intraoperative and postoperative analgesic strategy, using bolus and continuous infusion (CI) of 2% lidocaine for this purpose. Anaesthetic sedation was performed with CI of remifentanil and CI of propofol.
The techniques and the procedure went without incident (Table 1). The patient reported a visual analogue scale of 5 out of 10. He was transferred to the post-anaesthesia care unit without incident.

	Baseline	After LA by PV catheter	After LLD	Start of surgery	End of surgery
BP (mmHg)	136/67	91/52	114/69	112/67	121/79
CI (L/min/m²)	2.5	3	3.7	3.3	4.3
PPV (%)	7	6	13	6	24

Table 1: Haemodynamic parameters. BP: blood pressure. CI: Cardiac index. PPV: pulse pressure variation. LA: local anaesthetic. PV: paravertebral. LLD: left lateral decubitus.

Discussion: After FS, right ventricular (RV) preload is decreased and afterload is increased, both worsened by mechanical ventilation (MV), as well as pulmonary vascular resistance (PVR) is augmented due to non-pulsatile blood flow from RV. General anaesthesia with muscular relaxation (MR) leads to an impaired V/Q ratio, as well as

VM and one lung ventilation could worsen the physiology of RV, resulting in a fall of cardiac output (CO). We therefore decided to do it under sedation and spontaneous ventilation, as surgical PT favours lung collapse. Patient tolerated it well.

References: 1.
Circulation. Sep 11,2007; 2. ASA. *Dec 13,2020*

Learning Points: As part of anaesthesic technique, it is important to avoid MR and MV in order to keep the physiology of the RV, opting for regional anaesthesia and sedation strategies.

07AP07-08
Management of already developed dissecting aortic aneurysm in 29 weeks pregnant patient with Marfan syndrome: case report

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Background: Presence of aortic aneurysm could be a fatal condition in pregnant patients. Dilation of aortic root more than 40 mm is considered as a high risk of aortic dissection during pregnancy (1). This case demonstrates successful management of aortic dissecting aneurysm and emergent delivery in 29 weeks pregnant patient with Marfan Syndrome.

Case report: A 29 years old female complained on dyspnea, general weakness and dizziness upon minimal physical exertion. She was 29 weeks pregnant, primigravida, with a history of untreated arterial hypertension for 3 years. Dyspnea upon physical exertion started in 2019, but worsened last two months, when she was diagnosed with dissecting aneurysm of aorta (type I, DeBakey), aortic valve insufficiency of stage D, and Marfan Syndrome. Surgical correction was recommended.

Instrumental data: reduced systolic function of LV (41.25%), moderate pulmonary hypertension (32 mmHg), EDV 160 ml. Concomitant diagnosis: pelvic bone deformity, bilateral congenital dislocation of the hip, aseptic necrosis of femur heads.

Surgery: Bentall–de Bono surgery following cesarean delivery was performed under cardiopulmonary bypass and hypothermia (18°C).

Length of stay in ICU: 46 days. Presence of mixed encephalopathy (GCS=8), hypernatremia (165 mmol/l), acute kidney injury, vasoplegia.

Complications: sepsis, antimicrobial resistance and extirpation of the uterus and fallopian tubes.

Outcome: symptomatic and intensive treatment resulted in successful patient's discharge.

Discussion: Current case report represents a successful recovery of a 29 weeks pregnant patient with Marfan Syndrome and dissecting aortic aneurysm. Although simultaneous performance of C-section and Bentall–de Bono surgery is truly complex, postsurgical treatment in ICU during 46 days was no less significant, and comprised of continuous symptomatic treatment including stabilization of hemodynamics, restoration of lung function, and sepsis elimination.

References:
1. Kuperstein, R. et al. (2017) "Risk of aortic dissection in pregnant patients with the Marfan syndrome," The American Journal of Cardiology, 119(1), pp. 132–137. Available at: https://doi.org/10.1016/j.amjcard.2016.09.024.

Learning points: Successful resolution of pregnancy in patients with Marfan Syndrome suffering from dissecting aortic aneurysm is possible, but requires vital combination of excellently performed surgery and thorough intensive treatment and monitoring in ICU.

07AP07-10
Pseudoaneurysm of radial artery - rare complication of widely used procedures

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Background: Radial artery (RA) blood gas analysis is a very common procedure in clinical practice. RA catheterization allows hemodynamic monitoring and frequent arterial blood gas sampling. RA has also become the preferred access for cardiac catheterization.[2] Although widely used, serious complications may occur.[1]
Discussion of these iatrogenic lesions helps to prevent its occurrence.
Here, we present two cases of radial artery pseudoaneurysm after blood gas sampling and arterial line placement.

Cases Reports: 85 years old woman, with vascular leukoencephalopathy (treated with acetylsalicylic acid), was hospitalized with acute cardiac failure and respiratory insufficiency. Arterial blood gas samples were collected to confirm the diagnosis and evaluate clinical evolution. Three weeks after discharge, she returns to the hospital presenting a pulsatile and painful tumefaction of the wrist. Doppler echography reveals pseudoaneurysm of distal RA. Surgical correction of the lesion was conducted under axillary brachial plexus block.
66 years old man, without known past history, went surgical repair of an infra-renal aorta aneurysm. Six days later, he presents with inflammatory signs in the place of the arterial line used for hemodynamic monitoring and an echography revealed a pseudoaneurysm. He is scheduled for surgical correction under peripheral nerve blocks of median and radial nerve in the forearm.

Discussion: Pseudoaneurysms is caused by catheterization of the vessel in most cases[3] but infection of catheter site may also contribute to its formation.[4]
Preventive measures of complications such as asepsis and prolonged compression of the puncture site should always be applied,[4] especially in high-risk cases. Hypocoagulation and antiplatelets may increase risk.
Choice of the most adequate treatment depends on the size of pseudoaneurysm, presence of pain, hemorrhage, infection, hand ischemia, or compression of other nearby structures.[2, 3]

Learning Points: Despite being a widely used procedure, puncture of RA may lead to limb threatening complications. Prevention through local compression should always be applied and high-risk patients recognized.

References:
1. Novak T *et al*. Cardiac Interventions Today. 2017 (11) 5: 52-56
2. Tatli E, *et al*. Journal of interventional cardiology. 2015 (28): 305-312.
3. Greenberg J. The journal of hand surgery. 2021 (9): 821e1-821e4.
4. Truong A., Thakar D. Anesthesiology. 2013. 118 (1): 188.

07AP08-01
Significance of isolated persistent left superior vena cava for the patient and for the anesthesiologist - a case report

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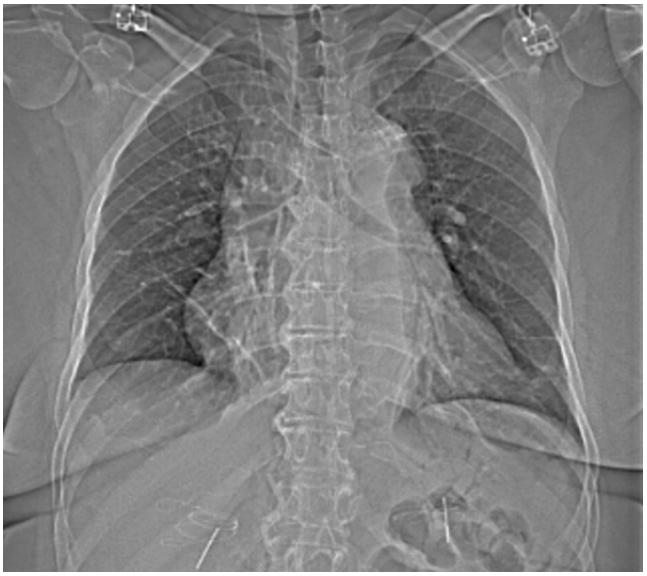
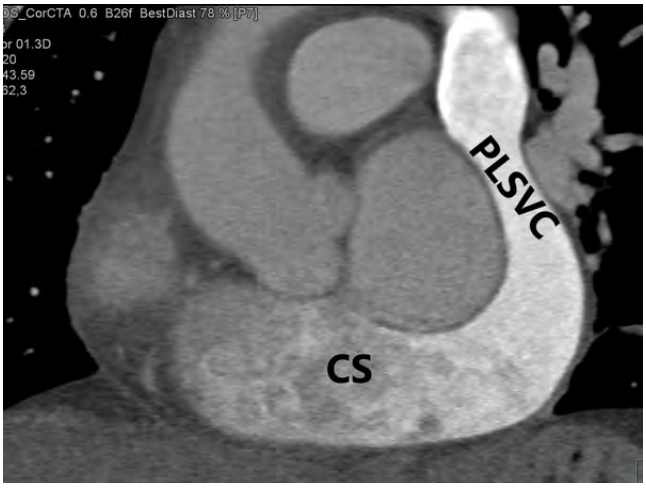
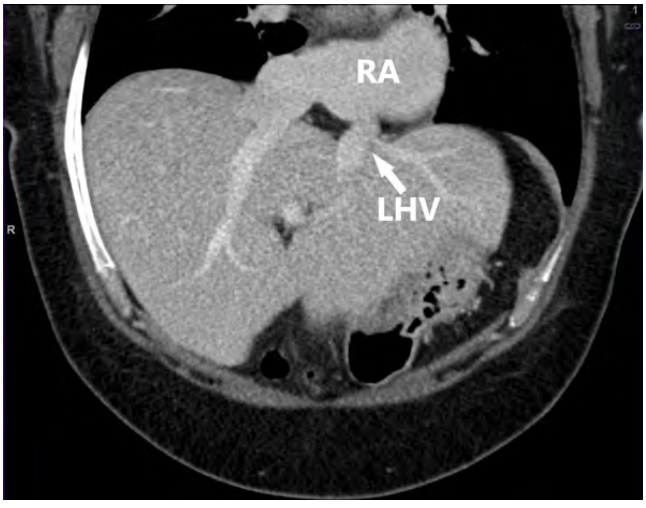
Background: Anomalies of systemic veins are not common, but they can pose a serious problem for anesthesiologists when performing invasive procedures.
Case report: A 57-year-old woman was admitted for mitral valve surgery. The introduction to anesthesia went smoothly. However, during the operation, after the pericardiotomy, the surgeon noticed vein anomalies, which caused him to postpone the further operation for additional diagnostics. In the postoperative computed tomography (CT) topogram, the course of the central venous catheter was from the right internal jugular vein through the innominate vein to the persistent left superior vena cava (PLSVC) (Fig. 1).
A contrast-enhanced CT of the heart showed the presence of a PLSVC draining into the right atrium (RA) via the dilated coronary sinus (CS), along with the agenesis of the right superior vena cava (RSVC) (Fig. 2). A contrast-enhanced CT of the abdomen showed anomalous left hepatic vein (LHV) drainage into the RA (Fig. 3).
Discussion: PLSVC with the agenesis of RSVC is extremely rare, and it is known as an isolated PLSVC. It is often discovered incidentally while undergoing an examination for heart disease, during central venous line insertion, or pacemaker implantation. PLSVC usually drains into a dilated CS, and its catheterization can cause hypotension, angina, and perforation of the heart, causing tamponade and cardiac arrest.
Learning Points: Although anomalies of the systemic veins usually have no hemodynamic significance, they are important for anesthesiologists when performing invasive procedures.







07AP08-02
Optic nerve sheath diameter as a surrogate for intracranial pressure monitoring using ultrasound in a rare case of glucose-6-phosphate dehydrogenase deficiency with cerebral vein thrombosis undergoing pulmonary thromboendarterectomy under deep hypothermic circulatory arrest

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Background: Monitoring of ICP with the help of optic nerve sheath diameter(ONSD)measurements using ocular ultrasound and IOP using a handheld tonometry device definitely helps us in timely interventions aiding to achieve a good postoperative outcome,especially in a patient undergoing PTE surgery for CTEPH under DHCA with raised ICP along with raised IOP due to cerebral venous thrombosis, plus G6PDD.

Case report: A 30-year-old gentleman presented to our hospital with breathlessness, was diagnosed to have CTEPH, raised ICP, and IOP underwent PTE surgery under general anesthesia with standard ASA monitoring after obtaining high-risk consent. We monitored the brain with NIRS, BIS, ONSD (value >5mm=ICP >20cm H20-Figure-1), IOP and intervened at crucial steps (Table 1).

Medications to be avoided in G6PDD were cautiously considered and triggers for hemolysis like hypoxia, hypotension,and acidosis were avoided. Total intravenous anesthesia was administered for maintenance. The procedure was uneventful and he was extubated on postoperative day one.

EVENTS	IOP (mmHg) right eye	IOP (mmHg) left eye	ONSD (mm)	NIRS Right frontal	NIRS Left frontal	BIS	Intervention
Preinduction	10	10	4	73	72	76	
Postinduction	26↑	26↑	7↑	66	65	42	Brimolidine+timolol eye drop methylprednisolone 1 gm
Pre DHCA	2.4	2.4	8↑	67	66	0	Mannitol 20% 0.5mg/kg
During DHCA	4.2	8.9	6	56	57	0	
Post DHCA	4.9	8.4	6	68	69	1	
Post CPB	8.9	8.8	5	70	72	40	

Table 1.
IOP- Intraocular pressure, ONSD- Optic nerve sheath diameter, DHCA- Deep hypothermic circulatory arrest, CPB- Cardiopulmonary bypass, NIRS-Near infrared spectroscopy, BIS- Bispectral index CTEPH-Chronic pulmonary thromboembolic pulmonary hypertension, PTE-Pulmonary thromboendartectomy, ICP-Intracranial pressure, G6PDD- glucose -6 phosphate dehydrogenase deficiency, IOP-Intraocular pressure

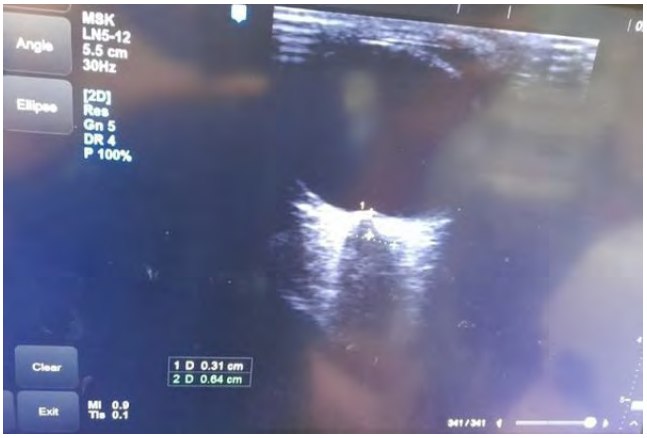

Figure 1. ONSD

Discussion: PTE surgery under DHCA is challenging,as it is known to cause postoperative neurological insult. Although invasive monitoring of ICP is more reliable, the complications associated with CPB and heparin can be catastrophic. Thereby noninvasive monitoring of ICP with ONSD is safer in such scenarios. It has been described previously in trauma, intensive care and robotic surgeries but none in cardiac surgery. CSF accumulation around the retrobulbar optic nerve by deriving the ONSD is a useful technique to know if the ICP is raised by measuring the diameter, 3mm behind the eyeball. Any measurement above 5 mm corresponds to an ICP of >20cm H2O (sensitivity >90%) could be diagnosed and timely intervened.

References:
1. Staudt, et al Deep Hypothermic Circulatory Arrest in a Patient with Severe G6PD Deficiency.JCardiothoracVascAnesth.2018J un;32(3):1394-1397
2. Geeraerts, et al Ocular sonography in patients with raised intracranial pressure: the papilloedema revisited. CritCare.2008;12(3):150.

Learning Points: ICP monitoring using ONSD could be a game changer in the success of such complicated surgeries.

07AP08-03
How to manage a cryoglobulinemia safetly: normothermia vs hypothermia. A case report

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Background: Moderate hypothermia during cardiopulmonary bypass (CPB) is a standard practice. However, patients with cryoglobulinemia could not to tolerate it. Unfortunately, there are a lack in the literature describing adequate perioperative management of these patients. Our case is referred to a patient with severe cryoglobulinemia who underwent moderate hypothermia during CPB successfully.

Case report: A 62-year-old man with severe cryoglobulinemia associated with Hepatitis C underwent a CABG and mitral valve replacement.

Firstly, following hematology recommendations, plasmapheresis and corticoids was required prior the surgery in order to decrease or eliminate cryoglobulins (CGs). As levels of CGs were undetectable in patient blood, CPB under moderate hypothermia (32°C) was planned. During the CPB (123 minutes), cerebral oximetry was not inferior to 20% of baseline data, diuresis was more than 0,5ml/kg/h and lactate levels were no superior to 1.8mmol/L. After CPB, the peripheral pulses were detected. Once in ICU, the patient was awake in the next four hours successfully.

Discussion: Cryoglobulinemia is an autoimmune disease characterized by the persistent presence of CGs in the serum that precipitate at low temperatures (<37º) and redissolve upon warming. The clinical manifestations are often related to intravascular obstruction due to increase of blood viscosity and deposition of CGs into small arteries (1).

Cardiac surgery is usually performed using systemic normothermia (>35°C) in patients with severe cryoglobulinemia. However, we did consider performing surgery at a moderate temperature (~32°C) because of negative qualitative analysis of cryoglobulin (CG) after preoperative plasmapheresis and corticoids treatment.

Cerebral oximetry was observed continuously in order to detect cerebral ischemic. Milliliters of diuresis, glomerular filtration and creatinine per hour was also registered in order to detect any renal vascular obstruction. Levels of lactate every thirty minutes showed the peripheral blood perfusion.

Reference:
1. Desbois A C, Cacouba P and Saadouna D. Cryoglobulinemia: An update in 2019. Joint Bone Spine 86 (2019) 707–713.

Learning Points: Patients with undetectable CGs blood levels due to preoperative optimization (plasmapheresis and corticoids) could undergo moderate hypothermia during cardiac surgery safetly. However, it is important to balance the hypothermic benefits of CPB against the potential risk of CG precipitation in every patients.

07AP08-04
Hyperthermic intrathoracic chemotherapy: a unique anesthetic challenge

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Background: Hyperthermic Intrathoracic Chemotherapy (HITHOC) is a rare procedure with promise for treating malignant pleural effusions but without well established guidelines for anesthetic care[1]. The anesthetic is technically challenging due to the anatomy, aggressive nature of the surgery, and complications[1].
Case report: A 60 year old male presented with metastatic disease of the right hemithorax causing leftward mediastinal shift. History included peritoneal adenocarcinoma treated with hyperthermic intraperitoneal chemotherapy 6 years prior. Thoracotomy, tumor debulking, and HITHOC were planned. Anesthesia proceeded with a preoperatively placed thoracic epidural, intravenous induction, and arterial line for blood pressure and gas monitoring. A single lumen endotracheal tube (ETT) was initially used for bronchoscopy then exchanged for a double lumen ETT for one lung ventilation. A significant air leak developed at closing due to debulking of the pleura, precluding chest tube suctioning. Extubation in the operating room occurred prior to transfer to the intensive care unit, and the hospital course was uncomplicated. He remains in remission 3 years postoperatively.
Discussion: An estimated 15% of cancer patients will develop pleural metastasis, with HITHOC increasing median survival - yet few anesthetic guidelines are described in the literature[2]. Complications include atrial fibrillation, air leak, and pneumothorax[2]. Ventilation is challenging due to the need for one lung ventilation. Airway management is tenuous if concurrent tumor or mediastinal shift exist. Pain control is difficult due to the thoracotomy. Hemodynamics fluctuate considerably due to chemotherapy, temperature changes, and thoracic cavity pressure variation.
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2. Zhou H, Wu W, Tang X, Zhou J, Shen Y. Effect of hyperthermic intrathoracic chemotherapy (HITHOC) on the malignant pleural effusion: A systematic review and meta-analysis. Medicine (Baltimore). 2017 Jan;96(1):e5532.
Learning Points: Anesthetic management must be carefully planned for HITHOC cases with particular attention paid to intubation, ventilation, fluid management, and pain control. Consideration of possible complications will dictate additional equipment.

07AP08-05
The transformative role of veno-venous extracorporeal membrane oxygenation in trachea resection and reconstruction

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Background: Post-intubation trachea stenosis is a well-known complication of prolonged ventilation at the intensive care unit (ICU). Conservative management is lengthy and indefinitive, with trachea resection alone being a definitive solution. The airway management is a challenge for the surgeon and the anesthesiologist, as well. Veno-venous extracorporeal membrane oxygenation (vv-ECMO) can be a solution.
Case report: The 54-year-old male patient suffered a haemorrhagic stroke, and after respiratory weaning his tracheostomy was removed after 31 days of ventilation. Two weeks later he developed stridor caused by tracheal stenosis that could not be resolved with repeated endobrochial interventions, so he received a tracheostomy and tracheal resection was planned. The surgery was performed in apnea using VV-ECMO (Cardiohelp, 7.0 HLS Advanced Set). Under sedation, while maintaining spontaneous breathing, ultrasound-guided cannulation of the right femoral and jugular veins was performed. After setting up ECMO flow corresponding to 50-80% of the patient's cardiac output, the patient was anaesthetised with TIVA. During surgery, we aimed for a PaO2 of 80-120 mm Hg and a PaCO2 of 35-45 mmHg. The surgical management was the removal of the stenotic lesion and an end-to-end anastomosis of the viable trachea. Following the procedure, the patient woke up with good muscle strength and adequate spontaneous breathing, the ECMO cannula was removed in the operating room and he was transferred to our ICU. During the three-day stay in ICU, he did not require any organ support. On postoperative day 10 he was discharged home in stable condition.
Discussion: Tracheal surgery is a challenge for both the surgeon and the anaesthesiologist. With an endotracheal tube, the surgeon's access to the surgical site is limited and the visualisation is poor. When a laryngeal mask is used, the surgeon's position is easier, but there is a risk of aspiration and hypoxia. In contrast, when using VV-ECMO, the airway is more accessible to the surgeon, the surgery can be performed more quickly and patient oxygenation can be adequately ensured. The incidence of complications has been reduced and the number of bleeding events has not increased despite anticoagulation.
Learning Points: By using VV-ECMO, we can provide surgeons with a more suitable surgical field and reduced operating time and complication rate. A cohesive surgical team can help the patients to benefit from using VV-ECMO.

07AP08-06
Intraoperative left side thrombus in transit in sequential double-lung transplantation diagnosed by transesophageal echocardiography

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Background: Lung transplantation is considered an established treatment for patients with end-stage chronic respiratory failure. Pulmonary vein thrombosis (PVT), kinking or stenosis and clots in the left atrium (LA) during the intraoperative stage are known but rare and challenging diagnoses.
Case report: 61-year-old man without any thrombotic predisposition was undergone double sequential lung transplantation due to terminal stage of COPD without ECMO support. After implantation and reperfusion, a transoesophageal echocardiography exam was performed to check especially the pulmonary venous anastomosis. In this exam, a large heterogenous, dense, hyperechoic mobile mass was identified in the LA, which was compatible with a thrombus in transit from pulmonary veins circulation. This finding was communicated to the surgical team to reopen the anastomosis and remove the clot before further consequences.
Discussion: In the intraoperative scenario, TEE is the recommended technique to monitor suture complications. Turbulent flow in color doppler and velocities over 120 cm/s suggest the diagnosis of PVT or significant pulmonary vein blood flow obstruction. In the postoperative setting, pulmonary vascular complications should be suspected when hypoxemia, pulmonary hypertension or radiographic edema occurs. In addition to CT scan, the use of bedside TEE in the intensive care unit may help to diagnose it in the postoperative period and allows the follow up of the thrombosis regression during therapy.
PVT treatment remains controversial and depends on several factors such as diagnose stage, size and clinical course. When small thrombus are detected in the postoperative course a conservative approach with proper anticoagulation has been described. Albeit poor outcomes emergent thrombectomy has also been described when postoperative large thrombus is detected. In the Intraoperative scenario, the extraction of a visible and mobile mass in left side of the heart should be the first choice for treatment despite of the challenge and complications it presents.

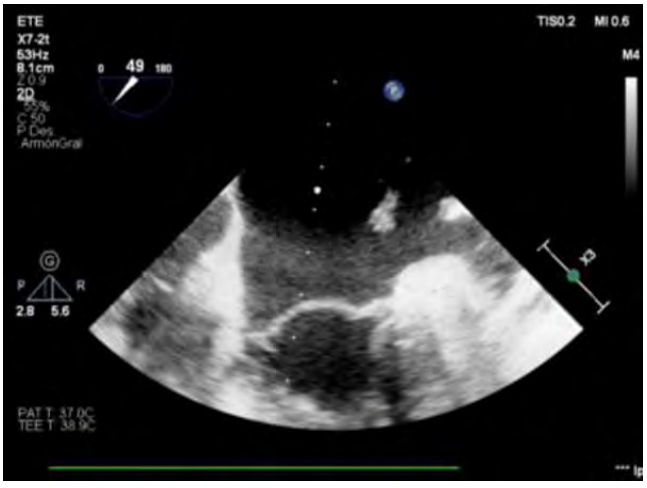

Fig 1: 80-100º ME plane with the thrombus in LA

07AP08-07
Central venous waveform and oxygen pressure, misleading features during cardiac surgery

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Background: Insertion of central venous catheter (CVC) is a common practice in cardiothoracic surgery. Due to limitations of confirming CVC position in theatre, paired arterial and venous blood gas is commonly used to confirm venous position. The usual case points out that blood gas and waveform analysis can give false negative confirmation of endovenous position.
Case report: A patient presented for CABG with background of renal failure with AV fistula in both upper limbs. A left subclavian was cannulated successfully using US. A CVP transducer showed a venous waveform. On coming off cardio-pulmonary bypass, the CVC waveform simulated arterial waveform and the difference between mean pressures was 15mmHg and PO2 difference was 17Kpa . A chest X-ray ,after shifting to ICU, confirmed correct position.
Discussion: Confirmation of site of CVC before usage is mandatory using waveform manometry, the position should be radiologically confirmed as soon as clinically appropriate. Williamson reported a similar incidence with PaO2 difference 28Kpa [(1)]
Arterial injury remains the most common complication of CVC insertion although US usage decreased incidence. The catheter migration to arterial system could be a possible immediate scenario especially if the nearby artery is punctured during insertion. Special concern should be paid to the patients with A-V fistulae owing to the associated circulatory system changes. Increased pressure of the venous system due to the connection with the high-pressure arterial system will eventually cause remodeling of the venous wall. This effect is mainly attributed to the vasodilators as NO and TGF-B1.[(2) (3)]
References:
1. R. M. Williamson,E. Werstler. Central lines in patients with AV fistula. *Anaesthesia* 2006; 61: 819- 820
2. Mary Hammes: Hemodynamic and Biologic Determinates of Arteriovenous Fistula Outcomes in Real Failure Patients. *BioMed Research International.* 2015; 2015: 171674.
3. Stracke S., Konner K, Kostlin I., et al. Increased expression of TGF-B1 and IGF-I in inflammatory stenotic lesions of hemodialysis fistulas. *Kidney International.* 2002;61(3): 1011-1019.
Learning Points: AV shunt may affect the readings of the central venous access inserted at the same side. US guided insertion of CVC as a standard of care and radiological confirmation of the tip position is mandatory as early as possible. Avoidance of cannulation of venous system near an AV fistula is recommended.

07AP08-08
VenoVenous extracorporeal membrane oxygenation (VV-ECMO) for an urgent lung lobectomy. A case report of a patient where invasive mechanical ventilation is not tolerated

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Background: Venovenous extracorporeal membrane oxygenation (VV-ECMO) provides adequate tissue oxygenation when conventional management has failed[1]. Nowadays, its applications have spread in thoracic surgery, beyond the transplantation field.
Case Report: We report a case of a 50-year-old male with the findings described in *Figure 1*, who presented an episode of life-threatening hemoptysis from the cavitated pneumonia requiring emergency intubation. Using a fiberscope, we place a left double-lumen tube in the right lung skipping the branch of the upper right lung to isolate only this lobe. Despite having started ventilation of the mild and the lower right lobes, he had inadequate oxygenation. An emergent right upper right lobectomy was indicated, making not tolerable the mechanical ventilation (MV). In the operating room, VV-ECMO was initiated by femoro-femoral cannulation.
At the start, blood flow was set at 4L/min and the sweep gas flow at 2L/min. There were no ECMO-related complications during the placement, but during the surgery, highlighted a tendency to bleed from the surgical bed that is difficult to control, requiring high doses of vasopressor and the transfusion of several blood products.
After finishing, the patient was transferred back to the ICU, where he died in the first 24 postoperative hours because of bleeding and hemodynamic instability.
Discussion: The VV-ECMO is a bridging therapy in patients with compromised respiratory function, who would be otherwise excluded from surgery[2]. This case required multidisciplinary management to give a chance to a critical situation where MV is not an option. With further experience, a more sophisticated protocol for the management of critical patients or other thoracic surgeries can be derived.
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McRae K, Perrot M.Principles and indications of extracorporeal life support in general thoracic surgery. J Thorac Dis.(2018)10:S931–46. DOI:10.21037/jtd.2018.03.116
Learning Points: ECMO can be considered a feasible method for complex thoracic surgery.

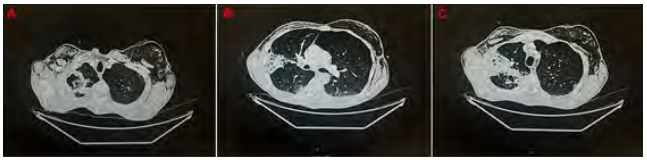

Figure 1. Chest CT scan. A. Cavitated lesion with a maximum axis of 55mm, with thickened walls and heterogeneous content, related to probable necrotizing pneumonia. B) Focal areas of alveolar hemorrhage. C) Pneumothorax and subcutaneous emphysema.

07AP08-09
Right ventricle outflow tract velocity-time integral for hemodynamic shock differential diagnosis and management in postoperative cardiac surgery

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Background: Cardiogenic shock due to right ventricle(RV) failure can appear in the early postoperative cardiac surgery period. Left or right ventricle outflow tract velocity-time integral (ITV) obtained by echocardiography could be helpful for differential diagnosis in these hemodynamic shock scenarios.[1,2]
Case report: We present a 70-year-old man admitted to the intensive care unit (ICU) after coronary artery bypass and aortic valve replacement due to severe aortic stenosis with preserved biventricular function. He also had hypertension, dyslipidemia, diabetes and lower limbs ischemia. The patient was admitted in the ICU intubated and with dobutamine infusion. Hours later, dobutamine weaning was possible and the patient was extubated. Next morning the patient was disoriented with low cardiac output signs as prolonged capillary refill time, central venous saturation of 49%, venous-arterial CO_2 of 12, lactic acid of 1.6mmol/L and impared diuresis. An ST segment elevation in V2-V3 without troponin elevation was present. Point of care ultrasound showed a non-dilated RV with longitudinal hypokinesis and proper free wall circumferential contractility, non-dilated left ventricle with basal and middle inferoseptal wall hypokinesis and hepatic and renal congestion(VEXUS 3). Low cardiac index(CI) of 1.6L/min/m^2 was estimated from RV outflow tract(RVOT) ITV(15cm). Dobutamine infusion was restarted at 4mcg/kg/min with improvement of RVOT ITV(19cm) and a consequent CI improvement (2.3L/min/m^2). Tissue perfusion was also recovered. The patient was discharged the day after.
Dicussion: The low RVOT ITV associated with VEXUS 3 suggested that the cause of the hemodynamic shock was a cardiogenic shock due to RV failure, ruling out hipovolemia and hyperdinamic shock[2]. Thus, starting dobutamine infusion improved both CI and perfusion signs.
References:
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2. Mercadal J, Vives M, et al; Spanish Critical Care Ultrasound Network Group. A simple algorithm for differential diagnosis in hemodynamic shock based on left ventricle outflow tract velocity-time integral measurement: a case series. Ultrasound J. 2022 Aug 24;14(1):36.
Learning points: Right or left ventricle outflow tract ITV could help the differential diagnosis and management of hemodynamic shock.

Acute and Chronic Pain Management and Palliative Medicine

08AP01-01
Opioid-free anaesthesia: a systematic review and meta-analysis

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Background and Goal of Study: Opioid-free anaesthesia has become a topic of discussion**.** Evidence is mounting that the use of opioids during surgery may cause postoperative hyperalgesia, leading to chronic postsurgical pain and long term opioid use. However, some studies showed adverse effects of opioid-free anaesthesia, and reviews of earlier literature are contradicting. This systematic review and meta-analysis aims to study all available evidence on opioid based versus opioid-free anaesthesia and its effect on acute and chronic postoperative pain.
Materials and Methods: We performed a systematic search in the MEDLINE, Embase and Cochrane database. Primary outcomes were acute and chronic postoperative pain. Secondary outcomes included quality of recovery, postoperative opioid consumption and adverse effects.
Results and Discussion: We identified 1245 citations, of which 38 studies met our inclusion criteria. There is moderate quality evidence showing no clinically relevant difference of NRS scores or opioid consumption in the postoperative period (pooled mean difference of 0.39 points with a CI of 0.19 - 0.59 and 4.02 MME with a CI of 1.73 – 6.30). We found only one small-sized study reporting no effect of opioid-free anaesthesia on chronic pain. The quality of recovery was superior in patients with opioid-free anaesthesia (mean difference of 8.26 points), however, this pooled analysis was comprised of only two studies. Postoperative nausea and vomiting (PONV) occurred less in opioid-free anaesthesia, but bradycardia was more frequent.
Conclusion(s): We concluded that we cannot recommend one strategy over the other. Future studies could focus on quality of recovery as outcome measure and adequately powered studies on the effects of opioid-free anaesthesia on chronic pain are eagerly awaited.

08AP01-02
Subgrouping of patients with zoster-associated pain according to sensory symptom profiles: a cluster analysis

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Background and Goal of Study: Patients with zoster-associated pain show a variety of sensory symptoms and pain qualities. Analyzing sensory symptom profiles in these patients and knowing etiological differences are important in effective drug development. The purpose of this study is to subgroup patients who visited the hospital with zoster-associated pain through sensory symptom scores of painDETECT, analyze their respective characteristics and pain-related data, and compare similarities and differences between the groups.
Materials and Methods: The characteristics of 1050 patients complaining of zoster-associated pain and pain-related data were reviewed. To identify subgroups of patients with zoster-associated pain according to sensory symptom profiles, a cluster analysis was performed based on Korean painDETECT questionnaire. We compared epidemiological data and pain-related data between each subgroup.
Results and Discussion: We classified patients with zoster-associated pain into 5 groups according to the distribution of sensory profiles and found remarkably different profiles in the expression of the symptoms. Patients in cluster 1 complained of all three symptoms of burning sensation, allodynia and thermal sensitivity. Cluster 2 and 3 complained of burning sensation and electric shock-like pain, individually. Cluster 4 expressed tingling pain. Cluster 5 complained of both burning pain and shock-like pain. The patient age and the frequency of cardiovascular disease were significantly lower in cluster 1. Also, cluster 1 and 4 had a longer pain duration compared cluster 2 and 3. However, there were no significant differences in sex, body mass index, diabetes mellitus, mental health problems, and sleep disturbance. Even pain score, distribution of dermatomes and gabapentinoid usage were similar between the groups.
Conclusion(s): Despite the cause of the pain arising from the same origin, there was a difference in the distribution of sensory profiles depending on the factor of the patients. In particular, the younger the age, the more likely both the central and peripheral sensitization were to affect pain. Unlike patients with acute or subacute pain, patients with chronic pain showed diversity in sensory symptom profiles. These results show that the peripheral and central mechanisms in the pathophysiology of zoster-associated pain varies among subjects, and it is thought that it can help to develop precision pain treatments in the future.

08AP01-03
A clinical audit on pain management and its impact over patient wellbeing leading to start of pain follow up clinic at Madras Medical Mission Hospital

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Background and Goal of Study: Pain is the unpleasant somatic experience and may be acute or chronic .The impact of pain can be many ways.
1. Patient related-the consequence includes organ dysfunction, anxiety , depression and poor wound healing.
2. Hospital management related- impending pain shall lead to extended stay of the patient and unpleasant experience.
The main goal is to address the pain in a more effective way by clinical audit, teaching and consultant lead pain management according to clinical governance.
Materials and Methods: All doctors, staffs were educated on documentation of pain score in the case sheet. Wong baker faces pain scale and Analog scoring pattern was followed. Pain score more than two was informed to the pain team which includes nurse, physician assistants, consultant. Pain rounds was conducted and structured periodic pain assessment score sheet was prepared and documented for all patients. Depending upon the pain score patient was treated according to WHO pain ladder and neurological pain ladder guidelines.
Results and Discussion: Sample size of the clinical audit comprises of 40 patients randomly sampled out of 1100 patients assessed for pain score.

	Pain score before intervention	Pain score after intervention
Mean	3.7	1.47
Variance	7.06	0.2
Standard deviation	2.6	0.5

The mean of the pain score before intervention and after intervention is significant at $p < 0.05$.

The clinical audit of pain management has a significant benefits in the patients across the hospital and leads to addressing rare cause of pain such as trigeminal neuralgia. neuropathic pain due to diabetic. The outcome benefited patient sleep pattern, enhance the psychological wellbeing and self-confidence.
Conclusion(s): The clinical audit on pain management have impacted tangible benefits on the well being of patients in both identifying, addressing and intervening pain across the hospital.
It shows by following the pillars of clinical governance like audit, education, leadership, follow up clinic (using information) high quality and safeguarding high standard of care was achieved.
Reference:
1. Darnall B.D., Carr D.B. & Schatman M.E., 2017, 'Pain psychology and the biopsychosocial model of pain treatment: Ethical imperatives and social responsibility' 18(8), 1413–1415.
Acknowledgements: Dr. Senthilkumaran

08AP01-04
Use, abuse and inappropriate use of naloxone in perioperative and medical setting: a retrospective review in a District General Hospital

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Background and Goal of Study: Opioid use carries the risk of opioid-induced respiratory depression. Naloxone is a competitive antagonist used to reverse the effect of opioids. Naloxone may be considered a proxy for significant postoperative opioid-induced respiratory depression[1]; its use may be an indirect marker of inappropriate use of opioids.
We aimed to investigate the extent of naloxone administration in our district general hospital and any correlation between its administration and opioid received, as well as patient factors including age and administration location.
Materials and Methods: The project was registered with the hospital Audit Department. We carried out a retrospective review of hospital notes over eight months in 2022. We excluded administration in Accident and Emergency (A&E), where use is less likely to be due to clinician opioid prescribing; as well as naloxone administration on Intensive Care Unit (ICU) where it is used enterally to treat opioid induced ileus. Once naloxone use was identified, we looked at which opioid the patient had received and patient demographics including age. We also looked at the location of administration.
Results and Discussion: From January to August 2022 there were 75 episodes of naloxone administration, 24 were excluded. Of the 51 remaining episodes, 24 happened on surgical wards, 20 on medical wards and 7 in obstetrics.
Oxycodone was the most prescribed opioid associated with naloxone administration, followed by patients receiving opioid mixtures. The mean age was 62 years. 14 patients were female and 16 male; 4 patients died within 48 hours of naloxone administration.
Literature demonstrates the incidence of postoperative naloxone use after use of opioids in general anaesthesia is 0.1% and 0.23–2.7% after intrathecal opioids[1]. However, little data exists looking at the use of naloxone in the postoperative setting and medical wards.
Conclusion(s): Naloxone was administered most frequently on medical wards. Its administration was most associated with oxycodone prescribing, followed by opioid mixtures. This may be due to the lack of appreciation of the relative potency of oxycodone as compared with morphine, and a lack of appreciation of peak effects of medications when considering mixed opioid prescribing. Further education and review of prescribing policy is recommended.
Reference:
Khelmisky Y et al. Incidence & Demographics of Postoperative Naloxone Administration. *Pain Physician* 2015; 18:E827-E829.

08AP01-06
Contributing to a crisis? An evaluation of prescribed opioid use following discharge from hospital – a single-centre, retrospective audit

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Background & Goal: Opioids are high-risk drugs associated with poor outcomes when used in the general population[1], with growing concern that hospitals are contributing[2] to the ‚opiate crisis'. This study aims to evaluate opioid prescribing patterns in a district general hospital around the time of discharge and into the community, in order to guide better prescribing practice.

Materials & Methods: A retrospective analysis was performed of patients discharged from medical and surgical wards in Forth Valley Royal Hospital over a two-month period, including acute and elective admissions. Patients discharged on any opioid were identified using a database from the electronic prescribing system. Prescriptions including an opioid were grouped by drug name and evaluated if the patient was taking the opioid prior to admission and if the general practitioner was asked to continue therapy in the community. Individuals taking any opioid prior to admission were excluded, so only those with a new opioid prescription were investigated. The data were then cross-referenced with each patient's own community prescribing record to identify the subsequent course of action taken, if any, with regards to the opioid(s).

Results & Discussion: 449 patient discharges including an opioid occurred in June/July 2021. 72.8% were for patients with a new prescription of an opioid and a total of 499 “new to patient” opioid drugs were dispensed. 62.7% of discharges requested the GP to continue therapy in the community. Excluding patients who died between discharge and study period, 55.8% of patients had their opioid stopped, 26.1% had therapy switched or deescalated by their primary care team and 16.4% of patients remained on the same opioid, a notable proportion one-year following discharge.

Conclusion: A large number of opioids on discharge were prescribed to patients new to the drug(s). The majority of patients later stopped therapy or stepped down to simpler analgesia, yet a significant proportion continued to be prescribed such high-risk analgesic drugs. Reducing these numbers by educating on appropriate prescribing beyond discharge is one step hospitals can take towards tackling the opioid crisis.

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08AP01-07
Comparison between two methods of intravenous titration of morphine in terminal cancer patients: optimizing B.I. mode of patient-controlled analgesia vs. conventional method

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Background and Goal of Study: Opioid titration without side effects is an essential in cancer pain management. However, sufficient pain control may not be achieved rapidly, because opioid titration dose is calculated based on the opioid demand for the previous 24 hours. A recent patient-controlled analgesia (PCA) device can perform an optimizing B.I. mode in which the background infusion rate is adjusted according to the patient uses the bolus button. We aimed to determine the efficacy and safety of the optimizing B.I. method of PCA in titration of intravenous morphine in patients with cancer pain.

Materials and Methods: This study was conducted as a prospective, randomized, open-label, active-controlled study. After randomization, the previously administered opioid was switched to intravenous morphine. In the conventional group, the dose of continuous infusion morphine for the next day was adjusted by physician based on the total amount of morphine administered during previous 24 hours. In the optimizing PCA group, morphine titration was performed by increasing or decreasing the background infusion rate immediately by the number and interval of pressing the bolus button. The patients received pain management for at least 3 days, and we compared the two groups by the pain-related outcomes via medical records and questionnaires.

Results and Discussion: 20 and 19 patients were assigned to the conventional and the optimizing PCA group. The number of breakthrough pain complaints (NRS$\geq$4) decreased in the optimizing PCA group within 24 hours ($p=0.012$) compared to the conventional group. The total daily dose of morphine was increased significantly between 0-24 hours in the optimizing PCA group ($p<0.001$). The pain reduction rate increased between 24-48 hours ($p=0.022$) and was maintained until 72 hours in the optimizing PCA group. The conversion rate to oral or transdermal opioids after 72 hours was higher in the optimizing PCA group (35.0% vs. 78.9%, $p=0.010$). There were no uncontrolled side effects due to morphine titration in both groups. Patients using the PCA with optimizing BI mode showed faster intravenous morphine titration and achieved rapid pain relief compared to the conventional method.

Conclusion(s): This study revealed that active opioid titration is necessary for patients admitted by cancer pain. It also suggested that the patient's actual opioid demands for pain control may be greater than the amount of opioid through conventional titration methods.

08AP01-08
TMI-1, TNF-α-converting enzyme inhibitor, alleviates mechanical hyperalgesia in CINP rat by inhibiting TLR4 signaling

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Background and Goal of Study: Chemotherapy-induced peripheral neuropathy is challenging to treat and can adversely impact the quality of life. TNF-α contributes to CIPN by neuroinflammation and upregulation of TRPV1. The objective of study is to assess the analgesic effect of TMI-1, a TNF-α-converting enzyme inhibitor, and the underlying mechanism in a rat model of paclitaxel-induced neuropathic pain (PINP).
Materials and Methods: Rats received intraperitoneal injections of 4 mg/kg paclitaxel on days 0, 2, 4, and 6 and received single or multiple intraperitoneal injections of TMI-1 at various times. The mechanical thresholds, TNF-α, TNFR, PI3K, phospho-Akt, TRPV1, TLR4, and Cav 3.2 were assessed with behavioral testing, Western blotting, RT-PCR, ELISA, and immunohistochemistry in lumbar DRG.
Results and Discussion: Single and multiple injections of TMI-1 reduced mechanical hyperalgesia (Figure 1).
Paclitaxel significantly increased, and TMI-1 subsequently decreased, the expression levels of TNF-α, TNFR, PI3K, phospho-Akt, TRPV1, TLR4, and Cav 3.2 in the lumbar DRG (Figure 2).
In addition, TMI-1 showed an analgesic effect by inhibiting TLR4 signaling and secretion of TNF-α (Figure 3).
Conclusion(s): TMI-1 alleviated PINP by reversing the upregulation of TRPV1 and decreasing levels of TNF-α through TLR4 signaling in the rat model of PINP.

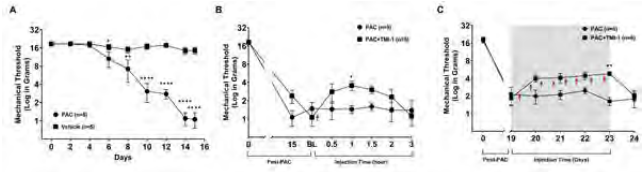

Figure 1. The analgesic effect of single administration and multiple administration of TMI-1 in rats.

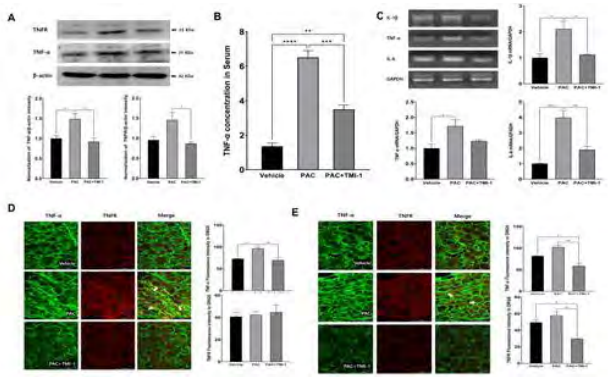

Figure 2. The difference of expression of TNF-α, TNFR, proinflammatory cytokines by TMI-1.

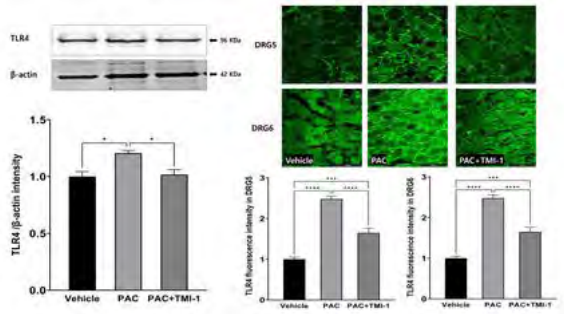

Figure 3. The difference of expression of TLR4 and signaling protein by TMI-1 in DRG.

08AP01-09
Long COVID 19 infection and acute inflammatory demyelinating polyneuropathy

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Background and Goal of Study: Certain severe neurological illnesses associated with long COVID-19 include immune neuropathies like Guillain-Barré syndrome (GBS) and exacerbation of preexisting chronic inflammatory demyelinating polyneuropathy (CIDP). The aim of this study was to determine the prevalence of pain in patients with acute inflammatory demyelinating polyneuropathy (AIDP) and to analyze sociodemographic, clinical predictors for the occurrence of pain, clinical phenotype and course of the pain.
Materials and Methods: A total of 124 patients with recently diagnosed long COVID-19 infection presented at the Pain Clinic, UCC of Vojvodina, Novi Sad. The research was conducted with the consent of the Ethics Committee of the Faculty of Medicine, University of Novi Sad. Data were collected monthly for one year.
Results and Discussion: The patients had pain, bilateral lower extremity weakness, mute reflexes and sensory loss. Pain was present in 62 patients, 3 months after the onset of symptoms, but only five patients had neuropathic pain. More pronounced deficits, age, female gender, the presence of protein in cerebrospinal fluid, occurrence of sensory symptoms and dysautonomia were recorded as predictors for maintaining pain. When comparing types of pain, non-neuropathic pain was more frequent but less intense and had fewer consequences on the mental health of the sufferer. Musculoskeletal pain persisted for up to 2 years in as many as 1/3 of the patients.
Conclusion(s): Neuropathic pain in AIDP was experienced by 3.72% of the total number of patients; 50% of all patients mentioned pain as a symptom. After 3 months, neuropathic pain was recorded in less than 10% of the total number of patients.

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08AP01-10
Pain after childbirth – preliminary study in a Portuguese sample

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Background and Goal of Study: Labor pain is an intense and usually limited experience. However, it can persist beyond the healing process and evolve to chronicity. Postpartum Chronic Pain (PCP) prolongs for more than 3 months after delivery and affects a young population, can hinder functioning, and carry an emotional, social and economic impact. Few studies have explored the risk factors associated with the chronicity of pain after childbirth. This together with the fact that its incidence is unknown in Portugal, calls for more studies in this area. The aim of this study is to characterize pain after childbirth and quantify the incidence of persistent and chronic pain after childbirth.

Materials and Methods: A prospective observational cohort study is being carried out since May 2022. A sample of pregnant women whose delivery takes place in two Portuguese maternity wards was collected. The participants completed a set of questionnaires that measure pain assessment and hypothesized determinants of progression to PCP, along with emotional regulation factors using validated psychological scales. The participants were contacted by telephone in the first, third and sixth months postpartum to evaluate pain progression. All participants with moderate to severe pain were invited for a face-to-face consultation.

Results and Discussion: In the first six months, 86 participants were recruited for the study. The mean age was M = 32 years. 78% of the participants reported moderate to intense pain before labor analgesia was implemented compared to 20% during labor. The majority (91%) had an epidural block as labor anesthesia and 44% of women went through a cesarean. Up to 72 hours after delivery, 24% and 62% reported moderate to intense pain at rest and in movement, respectively. The cesarean incision was the main expressed pain location. At one- and three-months postpartum 27% and 31% of participants reported persistency of pain, with 11% filling criteria for PCP. The main location of pain remained the cesarean incision.

Conclusions: We had an incidence of PCP at 3 months of 11%, which corroborates with the incidence reported in international studies in this area. After ascertaining the determinants associated with progression to PCP, we intend to develop a Risk Score for the development of PCP to predict which pregnant women are at increased risk of PCP. This allows the integration of predisposed women in educational and preventive programs for pain after childbirth.

08AP01-11
CBC in chronic pain management: evidence and limitations

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Background and Goal of Study: Cannabidiol (CBD) component of the Cannabis Sativa plant, has a mechanism of action that is not well known. However, it seems to have a low affinity for the receptors involved in the psychotropic effects of Δ9-tetrahydrocannabinol (THC)[1]. These properties could give CBD an adjuvant role in chronic pain treatment in consumer patients.

Materials and Methods: Systematic review following the methodology exposed in the PRISA guidelines. PubMed and Cochrane Library are used as the main databases, selecting articles from the last 5 years with the advanced search terms *Cannabidiol & Chronic pain.* With the obtained results and answering the study question: *What role does CBD play in the treatment of chronic pain?* 23 articles are selected.

Results and Discussion: CBD is associated with statistically significant reductions in chronic pain intensity and opioid use, compared to placebo. It also shows statistically significant improvements in sleep quality and mood.

On the other hand, THC and THC:CBD compounds show greater reductions in perceived pain, with a preference for non-oncological neuropathic pain.

Dronabinol oromucosal spray (THC/CBD 1:1) reduces spasticity in Multiple Sclerosis refractory to first-line drugs[2].

Regarding side effects, mild physical symptoms are described, ruling out tolerance and physical dependence[1].

Conclusion(s): The action of CBD on receptors without psychotropic activity suggests a new therapeutic target in adjuvant treatment of chronic pain[1]. CBD has better side effect profile than THC[2]. The available literature shows promising results, however it is a low-quality evidence bibliography (GRADE very low/moderate), so more studies are required to include CBD in chronic pain treatment protocols.

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08AP01-12
Remifentanil-induced hyperalgesia in healthy volunteers: a systematic review and meta-analysis of randomized controlled trials

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Background and Goal of Study: Several pre-clinical studies suggest that exposure to opioids may enhance pain sensitivity resulting in opioid-induced hyperalgesia (OIH). This phenomenon is still controversial in humans. We performed a systematic review and meta-analysis to evaluate if remifentanil may induce hyperalgesia after withdrawal in healthy volunteers.
Materials and Methods: A systematic literature search was performed in the following databases, CENTRAL, PubMed, Embase, Scopus, clinicaltrials.gov up to June 27th, 2022. We selected randomized trials, including those with cross-over design, comparing pain intensity after receiving remifentanil or placebo. Primary outcome was pain severity at 30±15 minutes after discontinuation of remifentanil assessed by any pain scale using any quantitative sensory testing modality. Secondary outcomes included the area of hyperalgesia and allodynia. Outcomes were presented as Standardized mean differences (SMD) with 95% confidence interval (CI). The weighted averages of pain score differences between baseline and 30 min measures after withdrawal of remifentanil or placebo were calculated.
Results and Discussion: Ten studies involving 150 patients were included in the analyses. Healthy volunteers showed higher pain intensity after remifentanil withdrawal (SMD: 1; 95% CI: 0.43, 1.57; p=0.0006; I^2=79%). Subjects treated with high intra-operative doses of remifentanil reported higher postoperative pain intensity than the reference groups (SMD: 0.89; 95% CI: 0.07,1.71; p=0.03; I^2=79%) whereas those treated with low doses did not show OIH (SMD: 0.81; 95%CI: -0.84,2.45; p=0.34; I^2=91%). We found a reduction in the average pain score 30 min after withdrawal of 0.1 points (0.57 SD) for remifentanil and 0.67 points (0.68 SD) for placebo. The area of hyperalgesia was greater in the remifentanil group (SMD: 1.45; 95% CI: 0.36,2.54; p=0.009; I^2=83%). The impact of remifentanil on allodynia is less clear because of limited data.
Conclusion(s): Our review suggests that OIH occurs in human experimental pain models after remifentanil withdrawal. These results corroborate clinical observations that high intra-operative doses of remifentanil are associated with small but significant increases in acute pain after surgery. If a significant concern for the development of remifentanil OIH is suspected, we suggest using the least possible effective dose of remifentanil as the primary prevention strategy.

08AP02-01
Management of symptomatic cervical facet cyst with cervical interlaminar epidural block

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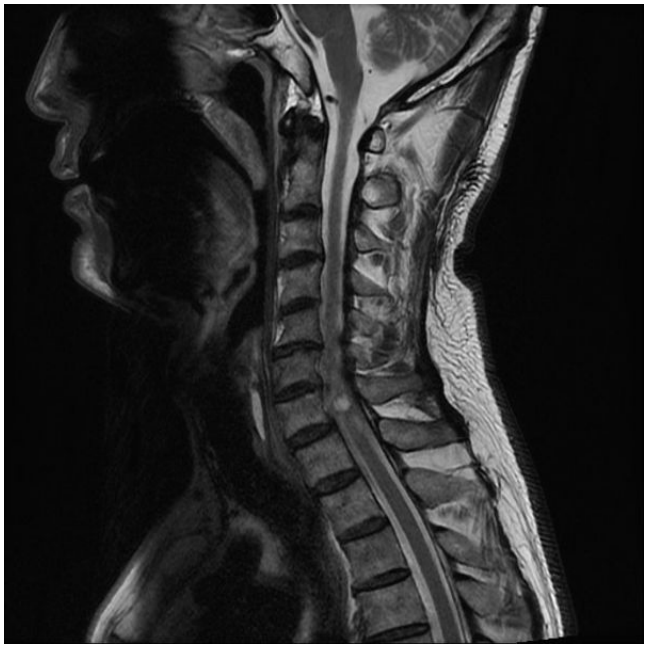
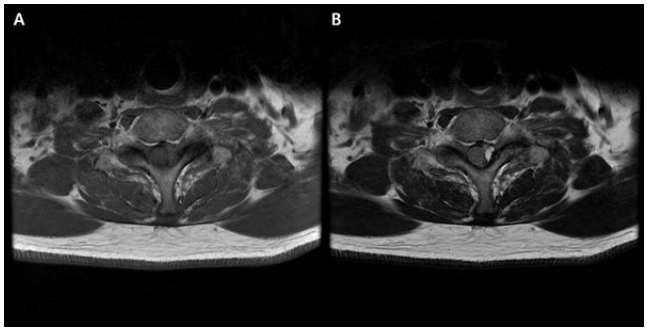
Background: Symptomatic cervical facet cysts are relatively rare compared to those in the lumbar region. Surgical excision is performed in most cases. However, facet cysts are associated with degenerative conditions, and elderly patients are often ineligible for surgical procedures.
Case report: A 70-year-old man complained of a tingling sensation in the left hand, focused on the 4th and 5th fingers, for 1 year, and posterior neck pain for over 5 months. The patient's numeric rating scale(NRS) score was 5/10.
The patient was diagnosed with symptomatic cervical facet cyst at the left C7/T1 facet joint. Fluoroscopyguided cervical interlaminar epidural block at the C7/T1 level with 20 mg triamcinolone and 5 mL of 0.5% lidocaine was administered.
The patient's symptoms improved immediately after the block, with an NRS score of 3 points. After 3 months, his left posterior neck pain and tingling along the left 8th cervical dermatome were relieved, with an NRS score of 2.





Discussion: A cervical interlaminar epidural block is a good alternative for managing symptomatic cervical facet cysts.

References:

Phan K, Mobbs RJ. A rare case of cervical facet joint and synovial cyst at C5/C6. J Clin Neurosci 2016; 29: 191-194

Learning Points: Intraspinal facet cysts are usually asymptomatic and incidentally identified. However, they could be symptomatic and interfere with the patient's quality of life. Symptomatic cervical facet cysts are relatively rare compared to those in the lumbar region.

Guidelines for the management of cervical facet cysts have not been well established. Several patients reported in the existing literature underwent surgery for symptomatic cervical facet cysts, but there are situations where surgery may not be possible, such as an underlying disorder or refusal of the patient. In such cases, a cervical interlaminar epidural block can be a good alternative.

08AP02-02
A slightly different BRILMA for chest tube pain relief

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Background: The block of lateral branches of the intercostal nerves in the midaxillary line (BRILMA) is an interfascial block for analgesia in thoracic wall and upper abdominal surgery.[1] It's a superficial block, safe and easy to accomplish under ultrasound guidance.[2] Tube thoracostomy is painful and poorly tolerated, commonly requiring opioids,[3] with its pain management being particularly challenging. Serratus anterior plane and intercostal nerve block have been described as useful,[3] but there isn't much information about BRILMA in this context. We present a case of a modified BRILMA for chest tube pain relief.

Case report: An 18-year-old male, 35kg, with post-anoxic cerebral palsy was admitted to the intensive care unit (ICU) due to complicated pneumonia, with empyema. A chest tube was inserted on the 6th intercostal space under sedoanalgesia. After the drug effects wore off, the patient had a FLACC-r (revised face, legs, activity, cry, consolability score) of 8 under continuous intravenous analgesia. After the family agreement, it was decided to use a BRILMA approach. Since the chest tube was placed in the midaxillary line, a singleshot, ultrasound-guided block was performed at the 6th rib of the anterior axillary line, with ropivacaine 0.1% (10mL). Afterward, the patient had a FLACC-r score of 0.

Discussion: BRILMA is a simple block that can provide significant relief of chest tube discomfort. This modified block allowed for excellent pain control and opioid eviction in this patient. BRILMA should be regarded as an excellent option for analgesia in the ICU.

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Learning Points: BRILMA is a simple block that provides excellent pain relief for chest procedures.

It is an excellent choice for chest analgesia and patient comfort, including for chest tube associated pain.

08AP02-04
Nociception guided opioid free anesthesia for breast cancer surgery: a case report

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Background: Recently, Opioid Free Anesthesia (OFA) for breast cancer surgery is gaining ground over Opioid Based Anesthesia (OBA) due to the well documented opioid administration disadvantages. In terms of general anesthesia, both OFA and OBA protocols demand nociception monitoring for effective titration of the administered drugs.

We present a pilot case of our OFA protocol for breast cancer surgery, where nociception monitoring is being deployed.

Case report: A 64-year-old woman, ASA III, was scheduled for left radical mastectomy due to invasive ductal carcinoma ductal (NOS grade I). HT 150cm, BW 58kg, medical history of well controlled hypothyroidism under T4 replacement and past surgeries for cervical Loop Electrosurgical Excision procedure and Core Needle Biopsy. She was under anti-estrogen and monoclononal antibodies anticancer treatment. Standard anesthetic along with nociception monitoring (Analgesic Nociception Index, ANI®, MDoloris, France) was applied. Induction included midazolam (3 mg, 0.05 mg/kg), lidocaine (60mg, 1mg/kg), propofol (120mg, 2mg/kg) and rocuronium (1mg/kg, 60mg).

After 150 sec mask ventilation with 4% sevoflurane, intubation was performed uneventfully. Immediately after induction, ketamine 30mg (0.5mg/kg), clonidine 120mcg (2mcg/kg), omeprazole 40mg and dexamethasone 8mg were administered.

Anesthesia was maintained with sevoflurane 1-2% (MAC 0.9-1.2), lidocaine infusion 0.5-1.5mg/kg/h, MgSO4 infusion (total 3g, 50mg/kg). Drug titration was based on ANI instantaneous (ANIi) and mean (ANIm) values targeted at a range 50-70. 30 minutes before skin closure ketamine 30mg (0.5mg/kg), paracetamol 1g, parecoxib 40mg and ondansetron 4 mg were administered. Neuromuscular blockade was reversed with sugammadex 120mg (2mg/kg). ANIi and ANIm values after extubation were 66 and 67 respectively.

Lidocaine infusion was continued till circular breast binder was placed. Patient's pain scores were 2/10, 4/10 and 1/10 at 10 minutes, 6 and 12 hours after extubation, respectively. Postoperatively, the patient's analgesia needs were fulfilled with only 1g of paracetamol.

Discussion: Current evidence indicates the beneficial effects of OFA in patients undergoing breast cancer surgery. ANI use for nociception monitoring during OFA protocol is of significant value for OFA optimization. Oncologic patients' outcomes may be improved with OFA appropriate use.

Learning points: Nociception monitors suggest a useful tool for optimizing OFA delivery.

08AP02-05
Lumbar epidural blood patch for the treatment of spontaneous intracranial hypotension syndrome

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Background: The incidence of spontaneous intracranial hypotension is 1 in 50.000. The exact pathogenetic mechanism is unknown.
Case report: A 33-year-old male visited the ED, in the context of sudden onset of occipital headache and neck pain, unable to treat with classical analgesic treatment (paracetamol, ibuprofen).
A brain CT was performed, which showed a non-traumatic right parietal subdural collection. A brain MRI and an MR myelography confirmed the CT findings. On the 7th day of his hospitalization, the patient presented sudden diplopia, left abductor paresis and cervical stiffness.
A Lumbar Puncture was performed with an accompanying CSF pressure measurement (=55mm H2O), without significant microscopic, cytological or biochemical findings. Based on CSF pressure and MRI findings, diagnosis was spontaneous intracranial hypotension.
The patient was initially treated conservatively, with intravenous hydration, Trendelenburg position and per os classical analgesic and caffeine treatment, offering some benefit for a few days, followed by a relapse. Methylprednisolone iv was added.
The patient demonstrated a slight symptom improvement, without reaching his previous functionality level, so an epidural blood patch epidural was performed after informed consent. 15ml of autologous blood was withdrawn aseptically via the left main cubital vein and was administered in L2-L3 level.
The patient remained in Trendelenburg position for 1 hour and in supine position for 24h. Symptom relief was immediate. On a three month follow up the patient remained asymptomatic and satisfied with the treatment outcome.
Discussion: In case of conservative treatment failure of low intracranial pressure headache, a blood patch is recommended. Lumbar blood patch is recommended in case of unknown site of CSF leak, but also to reduce possible complications related to targeted approaach. Lumbar blood patch is described to have a high success, while repeated sessions or targeted administration might be necessary. Blood volume described in the literature is quite heterogenous, from 10-20 ml to quite larger volumes. There are no randomized trials, and all evidence comes from case series reports.
Learning Points: Symptoms related to spontaneous intracranial hypotension syndrome can be managed by epidural blood patch, should conservative treatment fail.

08AP02-06
Clinical usefulness of bone scan with SPECT/CT on the diagnosis of lumbar facet joint syndrome

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Background: Conventional radiographic modalities have a limitation in providing only detailed information on anatomical aspects. However, it is often seen that an anatomically abnormal structure is not always the cause of lower back pain (LBP). Bone scan along with single photon emission computed tomography (SPECT/CT) can help identify structures that are anatomically normal but cause pain or anatomically abnormal but not causing pain.
Case report: A 54-year-old female patient complained of left buttock pain that had started 4 years ago. Her Visual Analogue Scale (VAS) score was 6 out of 10. She underwent spinal surgery for spondylarthrocace 30 years ago.
In the meantime, despite continuous various treatments, there was no improvement, so she is only taking painkillers. Lumbar MRI showed suspicious internal disc disruption at L45 and L5S1 discs, and fluid collection in the left L45 facet joint.
Because of the deformity of the spine as a result of suffering from spondylarthrocace, a bone scan along with SPECT/CT was performed, and asymmetric tracer uptake was confirmed in the left L45 facet joint. I injected 1 ml of mixture with 0.5% lidocaine and 20 mg of triamcinolone into the left L45 facet joint under the fluoroscopic guidance, and after 1 week, the patient's VAS score decreased from 6 to 3. I performed the same procedure once again, and after that, the patient's VAS score was maintained at 1 or 2 after 6 months.
Approval of this case report was waived from the Ethics Committee of Kyungpook National University Chilgok Hospital, based upon their policy on case reports. The authors obtained written consent from the patient to publish this case report.
Discussion: Until now, it is known that the gold standard for the diagnosis and treatment of lumbar facet joint syndrome is treatment using radiofrequency after confirming the diagnosis by performing MBB. However, when MBB cannot be performed accurately, treatment using intra-articular corticosteroid injection after diagnosing lumbar facet joint syndrome through bone scan with SPECT/CT can be useful.
References:
O'Neill C, Owens DK. Role of single photon emission computed tomography in the diagnosis of chronic low back pain. Spine J. 2010;10(1):70-2.
Learning Points: When lumbar facet joint syndrome is suspected as the cause of LBP, but accurate implementation of MBB is difficult, diagnosis using bone scan with SPECT/CT and treatment using intra-articular corticosteroid injection may be useful.

08AP02-07
Erector spinae block makes opioid use unnecessary for pain management of hepatic chemoembolization with irinotecan

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Background: Transarterial hepatic chemoembolization (TACE) with irinotecan-relasing beads (DEBIRI) is a treatment for unresecable metastatic liver cancer. Post procedural pain is severe (VAS score 8-9) requiring high doses of opioids. Ultrasound- guided erector spinae block (ESP) is an alternative analgesic technique for sparing periprocedural opiod use.
Case report: We present a series of 5 procedures underwent in two pacients. Bilateral ultrasound guided ESP blockade was performed, as an alternative to the usual opioid analgesic management.
First case: 58-year-old woman with colon cancer and liver metastasis. After resection surgery and chemotherapy treatment she presented recurrence with unresectable lesions. Two sessions of DEBIRI were performed under ESP block. In the first one VAS after the chemoembolisation were 0 and no nausea or vomiting were registered. After the second session she presented VAS 4 controlled with NSAIDs and some nausea.
Second case: 55-year-old man with a stage IV colonic cancer being not candidate to surgical resection. After convetional chemotherapy and due to the progression of the disease three DEBIRI sessions were performed under ESP block registering VAS scores of 0 and no nausea or vomiting were recorded.
Discussion: Analgesic management protocols of TACE DEBIRI include high doses of opioids to treat the severe pain (1). The high opioids doses synergizes with chemotherapy in the presentation of post procedural nausea and vomiting.
ESP block was well tolerated by the patients making unnecessary the use of opioids in the recovery, thus reducing nausea and vomiting and improving recovery times. ESP block makes an excellent alternative in the management of post –procedural pain in TACE DEBIRI.
Learning Points: This small case series shows that ESP block is an excellent alternative analgesia technique to the use of high dose opioids in pain management for TACE DEBIRI and has the advantage of avoiding the potentiation of nausea and vomiting cuased by the use of opiods with chemothepy.
References:
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08AP02-08
Dorsal root ganglion pulsed radiofrequency in postherpetic neuralgia of the gluteal area: a case report

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Background: Post-herpetic neuralgia (PHN) is a persistent pain syndrome, described as a burning sensation constantly present in the dermatome that corresponds with the acute herpes zoster rash. Early treatment of the infection and the pain reduce the risk of PHN. However, recommendations for PHN treatment are limited evidence based. A neuromodulation method such as pulsed radiofrequency (PRF) of the dorsal root ganglion (DRG) may be a useful option for reducing the progression of neuropathic changes.
We present the case of a woman with refractive PHN in an unusual location who was submitted to DRG PRF. Our aim is to describe the therapeutic options and highlight the importance of aggressive, early action.
Case report: A 73-year-old woman, treated with corticosteroids, presented with a tingling sensation on her left thigh and gluteal. 72 hours later, vesicles appeared in a L5 dermatome pattern. She was then diagnosed with herpes zoster and treated with antivirals, both oral and topic. In the next two months, tramadol, corticosteroids, and amitriptyline, pregabaline and lidocaine 5% patch were started with limited success. On day 90, the patient was submitted to left L5 DRG RPF.
Up to day 160, the scab formation was still present but her pain and quality of life had improved substantially.
Discussion: PHN may persist for years and is difficult to treat. The vesicles most commonly appear on the trunk, along a thoracic dermatome. Our patient was affected in the lumbar and gluteal region, which delayed the diagnosis. In addition, although multiple treatments were ordered, pain control was never achieved before PRF. Considering her age, low immunity, and the insidious course of her illness, we believe that interventional measurements should have been proposed earlier on.
No single best treatment has been identified. Amitriptyline, gabapentin and topical lidocaine, opioids, capsaicin 8% patch, epidural and paravertebral injections have been used. When conservative treatment fails, PRF, sympathetic block or spinal cord stimulation may be considered. It is important for the clinician to establish a baseline pain intensity as well as quality of life measures against which to judge the effectiveness of any treatment.
Learning points:
- Early and aggressive treatment of herpes zoster can reduce the incidence of PHN.
- Better drugs and interventions are needed for the therapy of PHN.
- This case illustrates PRF DRG may be a successful treatment option for PHN.

08AP02-09
Splanchnic denervation in the treatment of refractory abdominal adhesions

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Background: Splanchnic denervation is a technique that has been used to treat pain from cancer and metastasis or chronic pancreatitis, here it is used to treat abdominal pain from adhesions.
Case report: A 44 year old woman presented with severe intractable abdominal pain radiating to L1 on the right and L2 on the left after having had multiple abdominal surgeries, which was severe enough to necessitate multiple admissions for IV ketamine. She was investigated by general surgery and gynaecology with scans and laparoscopies, with no pathology other than adhesions found. Adhesiolysis had not provided relief.
A diagnostic splanchnic nerve block was carried out with good effect so it was decided to go for a splanchnic nerve radiofrequency (RF) ablation. The patient was consented and admitted, and she was given an IV bolus of crystalloid prior to starting. Vital signs were monitored. Prone positioning allowed for fluoroscopic imaging of T10 to L3. T11 was identified keeping the edge of the diaphragm visible. A curved RF needle was introduced at the junction of the rib and vertebra and directed anteriorly, towards the lateral aspect of T11 close to the costovertebral angle and advanced until the junction of the anterior 1/3 and posterior 2/3 of the vertebral body. Sensory and motor stimulation was carried out to ensure the stimulated nerves were eliciting pain in the abdomen and not along the rib margin. Local anaesthetic and steroid were infiltrated via the RF needle prior to creating an RF lesion. A 2nd lesion was created after rotating the RF needle by 180º. The same procedure was the repeated on the other side, then at T12. There were no side effects or complications.
Discussion: At a three month follow up the patient reported that for the first time in years her pain had improved with no need for rescue analgesia or any sick days and cutting back on antineuropathics is being discussed. The ablation was used as part of a multimodal biopsychosocial approach to pain management.
References:
Noor NA et al. Radiofrequency Ablation of the Splanchnic Nerve and Superior Hypogastric Plexus for Chronic Abdominal Pain Status Post-Abdominal Surgery.
Yanaizumi R et al. Efficacy and Safety of Neurolytic Splanchnic Nerve Block via Transintervertebral Disc Approach to Retrocrural Space: A Multicenter Retrospective Study.
Learning Points: Splanchnic nerve denervation can be a useful tool in the management of severe intractable abdominal pain in cases other than malignancy.

08AP02-10
The use of infraclavicular catheters in the treatment of refractory CRPS

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Background: Complex regional pain syndrome (CRPS) is a relatively common complication with an incidence of up to 5% after injury or surgery.
Case report: A 55 year old gentleman with CRPS affecting his right upper limb after a traumatic biceps tendon rupture and repair. His CRPS was refractory to various types of therapy such as physiotherapy, occupational therapy, TENS, and pharmacological therapies, including analgesics, antidepressants, anticonvulsants and steroids.
He had undergone multiple infiltrations for pain with variable results. An infraclavicular nerve block had some success, and therefore a decision was taken to insert an infraclavicular catheter to enable titration of the block to target sensory nerves as well as to prolong the block allowing for increased cooperation with therapy.
The procedure was carried out using a strict asepsis under ultrasound guidance using an in-plane technique with a linear probe. The patient was positioned supine with his head turned away from the side to be blocked and his arm abducted to 90 degrees. A costoclavicular approach was used. The skin was infiltrated with local anaesthetic and a 19G spinal needle was used to infiltrate the brachial plexus at the level of the cords around the axillary artery with 20mls of 0.375% bupivacaine with adrenaline.
A 20G epidural catheter was used and its tip was left in the middle of the cords, cephalad to the axillary artery, at a depth of 4cm. The catheter was then tunnelled and secured with fixators. The catheter was then attached to an elastomeric pump filled with 0.05% bupivacaine solution which was started at a rate of 4ml/hr.
Discussion: An infraclavicular nerve block is a peripheral nerve block that anaesthetizes the brachial plexus at the level of the cords as they surround the axillary artery deep to the pectoralis major and minor muscles, and therefore anaesthetizes most of the arm below the shoulder.
Leaving a catheter in situ for a few days allows for an infusion to be set up and therefore prolong the block for multiple days. This enabled the patient to have controlled pain for several days and facilitated cooperation with physiotherapy and occupational therapy as well as giving him a respite from the pain.
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Learning points: Nerve blocks with catheters may prove useful in the multi-modal management of refractory pain in CRPS management.

08AP02-11
Epidural blood patch in CSF fistula after neurosurgery - an approach to practice in anesthesiology

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Background: Epidural blood patch (EBP) is the gold standard technique for the treatment of post-dural puncture headache (PDPH) in patients who don't respond to conservative measures. The typical headache is characterized by worsening orthostatic fronto-occipital pain.[1] More than 90% of PDPH resolve spontaneously in 7 to 10 days. However, if left untreated, some may worsen and lead to cerebral venous thrombosis, subdural hematoma, seizures or even coma and death.[2]

Case Report: We present a case of a 57yo woman, ASA II, complaining of severe and incapacitant orthostatic frontal headache with photophobia, 2 months after lumbar arthrodesis. In other previous surgeries, a CSF fluid leak was diagnosed fibrine glue was applied. During this period, the symptoms didn't improve despite conservative measures and pharmacological treatment, so the patient was admitted for an epidural blood patch. The technique was uneventful, and the headache improved during her stay in the hospital. On reevaluation, the patient had a significant improvement in symptoms and is now capable of standing for more than 10 hours. The patient reported an improvement in her daily life.

Discussion: EBP is most used for the management of post-dural puncture headaches after a neuraxial approach, when non-responsive to medical treatment. It has a high success rate and can be used to treat CSF hypotension after complicated neurosurgery.[3] Hence, anesthesiology and its techniques offer treatment options, even if not directly related to anaesthetic management.

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Learning Points: Epidural blood patch is the most effective treatment for PDPH after medical treatment fails. In many cases, the success of this technique improves patients' quality of life and can simultaneously avoid complications.

08AP02-12
Intrathecal infusion pump of morphine, bupivacaine and ziconotide in the treatment of oncologic pain: a case report

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Background: Chronic pain in pancreatic cancer patients is a major health problem due to its high prevalence, up to 82% [1]. Intrathecal analgesia has shown to reduce systemic opioid doses, minimize adverse effects and improve pain control. Ziconotide has recently proven of use in intrathecal infusion and has positioned as first-line monotherapy for cancer pain [2].

Case report: Our patient is a 52-year-old male who was diagnosed with locally advanced pancreatic adenocarcinoma and treated with chemotherapy and surgery. 2 years later, as disease progressed, a lytic lesion in left scapula is found, for which he is referred to our Pain Unit. The pain has mixed somatic and neuropathic features and scores 10/10 on VAS; it is poorly controlled with systemic treatment.

The implantation of an intrathecal pump is decided after a test dose with combined opioids and local anesthetics achieves a 50% improvement of pain. The patient underwent controls every two weeks for dosing adjustment and pump refill. Three months after, ziconotide was added to the pump.

At 12 months he reports optimal pain control (VAS 2/10) with intrathecal perfusion of morphine 3.35mg/24h, isobaric bupivacaine 3.48mg, ziconotide 3.35mcg. Within the first month of treatment with ziconotide, he reports mild symptoms of agitation and aggressiveness, both well-known adverse effects of the drug that were controlled with a temporary decrease in the dose.

During treatment, he required a maximum of 1-2 oral morphine rescue doses per day, and did not report the usual adverse effects of systemic opioids. Following an readmission for pneumonia in another country, the pump was refilled with morphine alone. Our patient reported escalation of pain to levels of 9-10/10, which subsided with the return to the usual regimen.

Discussion: It is concluded that treatment with morphine, bupivacaine and ziconotide by continuous intrathecal infusion pump was effective, achieving better pain control, a lower dose of systemic opioids and an improvement in the patient's quality of life.

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Learning points:

• Intrathecal pumps may be used in an earlier stage of oncologic pain treatment in patients with life expectancy longer than 6 months.

• Combined treatment with opioids, local anesthetics and adjuvants like ziconotide confers an advantage over individual drugs.

08AP03-01
Interlaminar epidural steroid injections versus conservative treatment for lumbar central spinal stenosis

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Background and Goal of Study: Lumbar central spinal stenosis (LCSS) is a pathological condition associated with degeneration of the spine and often results in disability and persistent chronic pain. The goal of the study is to evaluate the effectiveness of interlaminar epidural steroid injections (IESI) compared with conservative therapy (CT) in adults with symptomatic LCSS.
Materials and Methods: The randomized controlled study which compares the efficacy of IESI with CT. Primary outcomes included quality of life (European Quality of Life Questionnaire (EuroQol EQ-5D)), disability (Oswestry Disability Index (ODI)), pain (Visual Analog Scale (VAS)). Outcomes were analyzed as short-term (≤ 3 months), intermediate-term (3 to 6 months) and long-term (3 months, 3 months to 6 months, 6 months to 1 year). Patients included with VAS ≥ 7.
Results and Discussion: 169 patients with symptomatic LCSS were randomly assigned to IESI or CT group: 82 (age 57±9) and 87 participants (age 63±9), respectively. Mean improvement in physical function for IESI and CT groups was 22.4 (95% confidence interval (CI) 16.9 to 27.9) and 19.2 (95% CI 13.6 to 24.8), respectively. IESI was valuable for pain relief at short-term (MD 1.23, 95% CI 0.54-1.89; P=0.0002) and intermediate-term (MD 0.85, 95% CI 0.46-1.24; P∠0.0001) follow-up compared with CT. But this effect was no maintained at long-term follow-up (MD 2.43, 95% CI 0.46-4.33; P=0.02). There were no statistically significant differences in functional improvement after CT and IESI at short-term and intermediate-term follow-up (MD 3.65; 95% CI 2.24-9.53; P=0.21). This study showed that patients' satisfaction with the treatment was significantly higher in IESI group than those who received CT (MD 1.33; 95% CI 1.15-1.54; P∠0.0001)
Conclusion(s): Basing on the results of the study, the use of IESI is more effective for relieving LCSS pain than CT in short-term and intermediate-term. Patients also noticed more successful outcomes after receiving IESI. However, this effect was not achieved at long-term follow-up. This study might help clinicians to make decisions for the treatment of patients with LCSS.

08AP03-03
Analgesic efficacy of lumbar sympathetic ganglion block in post spinal surgery syndrome

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Background and Goal of Study: Persistent or recurrent lumbosacral pain is a commonly encountered symptom after spinal surgery. Several interventions have been introduced for post spinal surgery syndrome, but the clinical efficacy, safety, or cost-effectiveness are insufficient. Sympathetic ganglion block has been selected for pain associated with sympathetic nervous system. In this study, we evaluated analgesic efficacy of lumbar sympathetic ganglion block (LSGB) in post spinal surgery syndrome.
Materials and Methods: We retrospectively analyzed data from patients who underwent LSGB. The patients were diagnosed with post spinal surgery syndrome and had lumbosacral pain. Clinical outcomes were assessed before (T0), 1 week after (T1), and 4 week after (T4) LSGB. Based on pain difference from T0 to T1, we categorized patients into two group: patients over 50% pain reduction as responder group and patients under 50% pain reduction as non-responder group. Demographic data, clinical data, surgical data, and fluoroscopic data were evaluated and compared.
Results and Discussion: Of the 87 patients assessed for eligibility, 3 were excluded. Among 84 patients analysed, 41 (48.8%) experienced over 50% pain reduction (responder group). Demographic, surgical, and fluoroscopic data did not differ between the groups. LSGB had significantly improvement in pain at T1 and T4 when compared with T0 in both groups. LSGB improved EuroQol-5D (EQ-5D) at T1 when compared with T0 in responder group (p=0.046). Responder group had a significant decrease in pain at T1 from T0 and at T4 from T0 (p <0.001, p <0.001) and a significant decrease in EQ-5D at T1 from T0 (p=0.016) compared with non-responder group. Coldness of leg did not differ over time in both groups. No serious adverse events occurred in both groups.
Conclusion(s): LSGB may improve pain at 1 and 4 week in post spinal surgery syndrome. Patient with over 50% pain reduction at 1 week showed improvement in quality of life at same time and in pain reduction at 4 week.
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08AP03-05
Effect of Dexmedetomidine as an adjuvant to bupivacaine in epidural infusion on postoperative analgesia after upper abdominal cancer surgeries

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Background and Goal of Study: Patients after upper abdominal cancer surgery experience severe pain. Opioids as an adjuvant to local anesthetics in epidural are the most commonly drugs used for management of postoperative pain but use of opioid is debatable in cancer patients. Dexmedetomidine (DEXM) as an adjuvant to local anesthetics in bolus doses has been used previously for postoperative analgesia with promising results.[1] In this study, we have compared epidural DEXM and epidural fentanyl in infusions as an adjuvant to bupivacaine for postoperative analgesia.
Materials and Methods: This randomized control study was done on 68 patients who underwent upper abdominal cancer surgeries . Group F (n=34) received epidural analgesia with bupivacaine .1% and fentanyl 2μgm/ml for 24 hrs @ 6 ml/hr. Group D (n=34) received epidural analgesia with bupivacaine .1% and DEXM 0.5μgm/ml for 24 hrs @ 6 ml/hr. SPSS software version 20 was used for statistical analysis.
Results and Discussion: Both static and dynamic mean VAS scores remained higher in group F in comparison to group D. But a significant difference was observed only at baseline (immediately after extubation) for static VAS score and at baseline and at 1 hr and 2 hrs for dynamic VAS score. For rescue analgesic requirement a significant difference was observed only at baseline and at 1 hr. Regarding side effects, 4(11.76%) patients had hypotension in group D and 3(8.8%) patients had hypotension in group F in postoperative period. Nausea was observed in 4(11.76%) patients in group D and 7(20.6%) patients in group F. Hetta DF et al observed in their study that epidural infusion of DEXM added to bupivacaine significantly reduces requirement of analgesia and pain scores postoperatively.[2]
Conclusion(s): Both DEXM and fentanyl as an adjuvant to bupivacaine in continuous infusion are effective for providing postoperative analgesia after upper abdominal surgery.
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08AP03-06
Defective branched-chain amino acid catabolism in dorsal root ganglion neurons sensitizes mice to mechanical pain

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Background and Goal of Study: Diabetes is linked to impaired branched-chain amino (BCAA) catabolism and mechanical pain. But the internal association between defective BCAA catabolism and the hypersensitivity to mechanical stimuli is ill-explored. BCAA catabolism is activated by protein phosphatase 2C in mitochondria (PP2Cm). In this study, we assess the role of defective BCAA catabolism in the development of mechanical pain, and elucidate the metabolic mechanism of dorsal root ganglion (DRG) neurons underlying the phenotype.
Materials and Methods: AAV9-hSyn-Cre was injected into L4-L5 DRGs of *PP2Cm*$^{flox/flox}$ mice to delete *PP2Cm* (cKO). Mechanical pain was tested by von Frey test. For cell study, lentivirus-shRNA was applied to silence *PP2Cm* expression in primary DRG neurons. Glycolytic flux was determined through Seahorse assay and ^{13}C metabolic flux analysis. Downregulation of lactate dehydrogenase A (Ldha) was achieved by intrathecally injecting siRNA with the help of In vivo SilenceMag™ transfection reagent. Colorimetry was used to measure lactate content. Protein expression was measured by immunofluorescence and western blot.
Results and Discussion: Conditional knockout of *PP2Cm* in DRG neurons sensitized mice to mechanical pain. Mechanistically, glucose-dependent glycolytic capacity and glycolytic reserve were enhanced in sh*PP2Cm* neurons, which was accompanied by increased lactate release. ^{13}C-flux analysis suggested that the increased lactate was derived from glucose. Inhibiting lactate accumulation by si*Ldha* ameliorated mechanical pain. Our study demonstrates the regulatory role of defective BCAA catabolism in mechanical pain and highlights lactate as a critical intermediary.
Conclusion(s): Defective BCAA catabolism in DRG neurons sensitizes mice to mechanical pain by increasing glycolytic flux and lactate production. Targeting BCAA catabolism or lactate production might be a potential therapeutic strategy for mechanical pain.

08AP03-07
Perioperative pain management in spine surgery: a retrospective observational study

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Background: Spinal surgery (SS) is related with poor pain control (PPC). Our goals were describe pain management, perioperative patients' characteristics and complications related to PPC.
Methods: Retrospective unicenter observational study during 2019 and 2020. 501 patients were enrolled. Demographic and SS data were described. Incidence of PPC [verbal numerical score (VNS) $\geq$4] during hospital [H] stay, length of H stay and early rehabilitation [ER, feasibility to walk $\leq$48hours (h) after SS] were analyzed. Perioperative Analgesic regimens [PAR] applied and complications related to them were studied.

Major SS definition: intrumented thoracolumbar SS , laminectomy≥3 or scoliosis SS. Chronic Opioid Treatment patients (COT) definition: major opioid or tramadol ≥200mg/24h treatment 3 months before SS. Available PAR were paracetamol intravenous (iv) 1g/6h and dexketoprofen iv 50mg/8h plus: tramadol (T) iv 1mg/kg/6h; Morphine (M) iv patient-controlled analgesia [PCA]; sublingual sufentanil (S) PCA; intraoperatively, 0.5mg/kg bolus iv ketamine followed by an infusion of 0,2mg/kg/h until SS end + postoperatively morphine-ketamine iv [M-K] PCA (specially indicated for COT patients).
Statistics: X^2 categorical, t student continuous variables
Results: 502 patients were enrolled: average age 61.07 years, 43,2% (216) women, main reason for SS was spinal stenosis (33,0%, 166). 13% (65) of total patients presented VNS≥4 at H stay. The relationship between VNS ≥ 4 and preoperative patients` characteristics were [% of total patients who presents any specific characteristic– % of patients with specific characteristic who had VNS ≥ 4 patients - p value]: Anxiety syndrome [19.6% (76) - 21.1% (16) - 0.078]; Depression Syndrome [26.75% (98) – 19.4% (19)– 0.052]; major SS [26,0% (130)– 20.8% (27) – 0.002]; COT [26.8% (134)- 17.2% (23)– 0.091]. PAR: 53.1% (266) of patients received T; 25.8% (124) M-K PCA; 18.36% (92) M PCA; 3.79% (19) S PCA. 88,71% (110) of M-K patients were COT. COT treated with MK had lower % of PPC: 14% vs 17,2%. Postoperative complications related to PAR: 3,99% (20) nausea-vomiting (PONV), 1,40% (7) paralytic ileus and 1,40% (7) delirium. T PAR had higher prevalence of PONV. 30,77% (20) NVS≥4 patients presented ER vs 7,3% (32) with NVS<4 . PPC is correlated with unfeasible ER (p<0.001).
Conclusions: SS has high prevalence of PPC, specially major SS. Anxiety, depression and COT could increased PPC. Improve PPC decrease H stay and improve ER.

08AP03-08
Evaluation of the efficacy and safety of implantable intrathecal infusion systems for refractory pain in a Catalan university hospital

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Background and Goal of Study: Chronic pain represents a major public health problem and is the main cause of incapacity in Europe. Cancer-related pain is also a serious problem, with devastating impact on patients and relatives. Both with healthcare and financial burden.
Intrathecal drug administration is justified when systemic treatment doesn't accomplish an adequate control or presents intolerable side effects. This therapy is usually proposed as a last resource. In the last two decades there has been an increase in its use, being right now an important step on refractory pain algorithms, but in our geographical setting there aren't retrospective studies which evaluate its effectiveness and safety.
Materials and Methods: A descriptive, retrospective study was carried out, analyzing all patients with an intrathecal infusion system implanted between January 2020 and September 2022 in our center.
The primary objective was the effectiveness of the therapy, with the numeric pain rating scale (NPRS) at 6 months' time (or the last measure if the patient passed away before) as the main variable.
The secondary objective was the safety of the therapy, analyzing the number and percentage of patients with complications or related adverse effects. Underlying pathology (oncological or not), neuropathic pain criteria, intrathecal drugs used, equivalent morphine dose (before and after the treatment) and demographic data were also collected. Data was analyzed with Excel Spreadsheet Software.
Results and Discussion: A total of 41 patients underwent an intrathecal infusion pump implantation. Mean age was 57 (SD 13) years old, with 51,2% of them females. 30 patients (73%) presented neuropathic pain. 27 (65%) were cancer-related, with a mean Eastern Cooperative Oncology Group (ECOG) performance status at the moment of implantation of 2,4 (SD 0,78). Morphine was the main drug in 95% of the therapies.
Overall, patients presented a decrease, at 6 moths or at the last measured time, of the NRS of 58,7%, (57% for oncological patients and 61,5% for non-oncological patients). There were 4 (9.75%) associated complications registered. Equivalent morphine dose was reduced by 76,9% on non-oncological patients and 40,6% on oncological patients.
Conclusions: Intrathecal therapy is an effective and safe therapy once pain is no longer controlled with less invasive treatments. It reduces pain intensity in a short period of time and decreases opioid dosage, with clearly fewer side-effects.

08AP03-09
Management of cervicogenic headache by injection of hypertonic dextrose solution 5% (prolotherapy type)

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Background and Goal of Study: Cervicogenic headache is a type of headache where the pain originates form the cervical structures. Prolotherapy is a method that uses hypertonic dextrose solution for managing painful and mostly chronic skeletomuscular disturbances and myofascial diseases. The goal of this study was to investigate whether there is a better outcome by treating cervicogenic headache with paracetamol and ibuprofen versus the injection of hypertonic dextrose solution.
Materials and Methods: Forty patients suffering from cervicogenic headache were randomized to treatment by either per os pain killers (paracetamol and ibuprofen) or by injection of hypertonic dextrose solution 5%. The group that was treated with conventional pain killers used the treatment during the episodes of headache. The other 20 patients were subjected to injection of hypertonic dextrose solution 5% in 10 symmetrical points of the neck and upper back in every visit to the Pain Clinic. Visits to the Clinic were one week apart from each other in both cohorts. In every visit, the frequency of headache per week, the duration of headache in hours and the pain intensity with the VAS score 0-10 were assessed.
Results and Discussion: From the results of the study, it appears that therapy with injection of hypertonic dextrose 5% solution shows higher rates of successful treatment of cervicogenic headache, with statistically significant differences between the first assessment at

the first visit and the last assessment at the third visit in all aspects of headache. Reduction by 81.25% of the frequency of attacks per week, reduction by 89.75% of the duration in hours and reduction by 77.84% of the headache intensity were demonstrated between the first and the third visit. Changes were less spectacular in the conventional treatment group: In fact, the treatment with conventional pain killers resulted in 6.25% decrease in the frequency of attacks per week, in 44.61% decrease in the duration of pain in hours and in 26.81% decrease in the headache intensity between the first and third visit. Differences between groups were statistically significant.
Conclusion: In cases of cervicogenic headache, patients treated with the injection of hypertonic dextrose solution 5% have significant improvement in the frequency, duration and intensity of headache. It appears that prolotherapy, by strengthening the ligaments and tendons of the cervical area can target the trigger points that cause the headache.

08AP03-10
Hyperalgesia following Fascia-Iliaca Block

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Background and Goal of Study: Patients attending the Emergency Department (ED) at University Hospital Crosshouse (UHC) with a neck of femur (NOF) fracture are considered for fascia-iliaca block (FIB) regional analgesia (RA), as recommended by the National Institute for Health and Care Excellence (NICE) Hip Fracture Management Clinical Guideline 2011 and Scottish Standards of Care for Hip Fracture Patients.
Rebound hyperalgesia following "wear off" of RA is a documented risk for increased opiate requirement. Rebound pain is poorly understood, typically occurring 6-24 hours post RA. Published data regarding opioid consumption post FIB is limited. We aimed to audit delivery of FIB and investigate opioid use between patients undergoing operative repair of NOF fracture who receive FIB versus those who did not.
Materials and Methods: The Opera digital database identified 35 and 38 patients undergoing operative repair of a NOF fracture, in February and June 2022. Patient notes within paper records and scanned to Clinical Portal were used to identify delivery of FIB. Prescribing data was reviewed using the Wellsky electronic platform. Pre-operative oral morphine equivalent (OME) was calculated using the paindata.org calculator. Inferential statistical analysis performed using Wilcoxon rank sum test and Fisher's exact test.
Results and Discussion: 82.2% of patients with NOF fracture received a FIB (74.3% February, 89.5% June). The pre-operative OME of the FIB group was statistically significantly higher than the group with no FIB (P=0.006). The group with no FIB were statistically older than those who received RA (p=0.071). No patients with RA were referred to acute pain services.
Conclusion(s): The majority of patients receive a FIB. There is a statistically significant increase in pre-operative OME in NOF fracture cohort receiving FIB, for whom increased opioid use confers increased side-effects. Hyperalgesia following RA is increasingly recognised, however proactive strategies to avoid increased opioid usage have not been widely reported. Strategies for management and prevention are needed to ensure the benefits of RA continue to predominate in acute pain patients.

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08AP03-11
Use of opioid IV PCA in critical care setting

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Background: Despite advancement of perioperative care medicine over the last two decades, pain remains one of the undesirable sequelae of any surgery. Pain is associated with triggering of the Autonomic Nervous System to release major endocrine and metabolic responses that eventually contribute to organ dysfunction[1]. Intra Venous Opioid Patient Controlled Analgesia (IV PCA) are widely used in management of post-operative pain and associated with improved patient satisfaction and decreased nursing workload[1].
When comparing Fentanyl to Morphine IV PCA, Fentanyl had lower incidence of side effects such as nausea, vomiting, pruritus, urinary retention and sedation and associated with lower median pain scores on day 1 and 2 post operatively[2].
Studies comparing oxycodone to other opioids are mostly inconclusive, however in one study Oxycodone had superior analgesia to Fentanyl, but it was associated with more nausea, vomiting and dizziness[3].
Material & Methods: A total of 566 patients were extracted from Philips IntelliSpace Critical Care and Anaesthesia on 13/12/2022 for Intensive Care Unit admissions using Structured Query Language (SQL) since 2015.
Results:

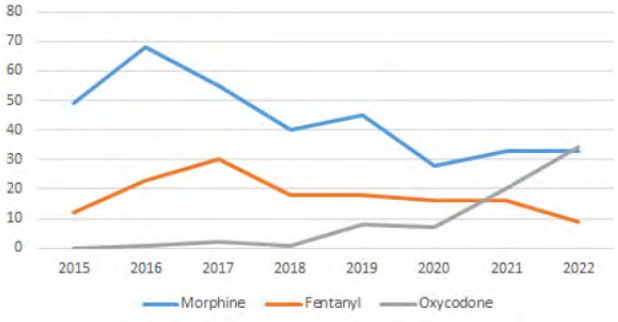

Figure. Use of opioid PCS in critical care setting.

Discussion: This is a retrospective look into the trend of opioid IV PCA use in critical care setting over eight years. Opioid IV PCA is in one of many analgesic options used in our critical care unit as part of multimodal analgesia.
Morphine remains a popular choice for IV PCA although its use has been in decline over the period of study. Use of Oxycodone IV PCA has gained popularity especially over the last two years where it became as popular as morphine while the use of Fentanyl remains fairly constant.
Conclusion: Overall PCA numbers remain similar throughout the 8 year period and oxycodone is gaining popularity in our unit. Further analysis of side effects is planned for quality improvement purposes

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08AP03-12
Short-term outcome of low back pain in the Chronic Pain Treatment Unit

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Background and Goal of Study: Low back pain (LBP) is one of the main reasons for consultation in chronic pain units. Nonetheless, it is a very heterogeneous condition in both its clinical picture and its response to treatment. We aim to describe the response to treatment of LBP patients in their first visit to the Chronic Pain Treatment Unit (UTDC).
Methods: After the approval of the EC of our hospital, we carried out a retrospective study including patients referred to the UTDC for LBP of any origin from July 2017 to February 2018. We excluded patients that had been previously seen in the UTDC and patients referred to the unit in the context of a clinical trial. Data were anonymously gathered from electronic medical records focusing into treatment received and their response.
Results and Discussion: From the 466 patients accepted to the UTDC for LBP, 171 met the exclusion criteria. Then, data were gathered for 295 patients: 52.9% had pharmacological treatment adjusted, 18% received interventionism, 13.9% were discharged due to the absence of a valid therapeutic alternative, 5% received TENS therapy. The remaining 10.2% were referred to other physicians.
In the second visit, 39.5% referred feeling better, 30.8% said pain had not changed, 11.9% said pain was worse, and 17.8% were lost from follow up. 72.9% of patients who had received interventionist treatment referred improvement compared to 40.6% of patients receiving other types of treatment ($p<0.001$).
Pain of 46.6% of patients with anxiety or depression had improved after the first visit, compared to 48.7% of those without these conditions ($p=0.78$). No differences were found between patients with prior Lumbar spine surgery (LSS) whose pain improved (42.2%) compared to those without prior LSS (49.7%) ($p=0.38$). 46.3% of patients with pure LBP showed improvement after interventionism, compared to 49.2% with radiated LBP ($p=0.69$).
Improvement in working age patients: 52.3% of employed active patients, 38.9% of those with a temporary incapacity (TI), 53.8% of those with a permanent incapacity (PI), and 45% of unemployed patients ($p=0.73$).
Conclusions: Interventionism in the first consultation showed higher success rate in improving LBP than conservative treatment. However, candidates should be carefully selected as time and resources do not allow it to be indicated. Although no statistical significance was found, patients with a TI relate less improvement than those occupationally active or with a PI.

08AP04-01
The effect of different modes of postoperative analgesia on pain intensity, blood and salivary cortisol levels

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Background and Goal of Study: Pain management after surgery is a primary requirement for recovery. The aims of the study were to compare the effectiveness and safety of patient-controlled analgesia (PCA) in relation to intermittent bolus administration of morphine after elective abdominal aortic aneurysm surgery, to determine the influence of postoperative pain and different types of morphine administration on blood cortisol (BC) and salivary cortisol (SC) levels, and to determine whether salivary cortisol is a good indicator of stress in surgical patients.
Materials and Methods: This was a randomized, controlled clinical trial. All 60 patients included in the study were randomized in a 1:1 ratio into two groups of 30 patients. The first group (MI) consisted of patients who received morphine intermittently at a dose of 0.1 mg/kg/6h s.c. In the second group (MPCA) there were patients who received morphine by the PCA method - intravenously, 1 push/1mg, interval 6 minutes. In case of need for additional analgesia, patients received metamizole sodium and acetaminophen. The intensity of pain was assessed with the help of the numerating rating scale every hour, starting from the third hour after the operation, in the first 12 hours, and then at the 15th and 18th. On the day after the operation, all patients had their BC measured at 8 am and SC at period 6-8 am.
Results and Discussion: The groups did not differ significantly in terms of anthropometric characteristics and comorbidities. The average pain intensity was not significantly different between the groups until the tenth hour after surgery. In the period between the tenth and the eighteenth hour, the pain was more intense in the MPCA group ($p < 0.05$), and it equalized in the eighteenth hour. The maximum supplemental dose of analgesics (metamizole sodium 5g and acetaminophen 3g) was required by 64.3% in the MI group versus 46.2% in the MPCA group. Hemodynamic instability, i.e., a deviation greater than 30% in relation to basal values, was more prevalent in the MI group (40.0% vs 6.7%, $p = 0.0048$). BC was almost identical by group (MI 509.4 vs MPCA 511.0 nmol/L, $p = 0.1473$). SC was higher in the MPCA group (47.1 vs 116.3 nmol/L, $p = 0.0970$).
Conclusion(s): Pain intensity during the night was higher in the MPCA group. BC was at the upper limit of reference values in both groups. SC was multifold elevated in all patients, especially in patients from the MPCA group.

08AP04-02
Intercostal nerve cryoablation: a new technique to decrease pain and speed up recovery in pectus excavatum surgery

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Background and Goal of Study: Erector spinae plane blocks (ESP), thoracic epidural infusion, and patient-controlled analgesia (PCA) have all been used for perioperative pain management in the Nuss procedure for the repair of pectus excavatum without a consensus on what modality produces the best outcomes. Intercostal nerve cryoablation (INC) is a relatively new modality that involves freezing the nerves to prevent pain during recovery.
Materials and Methods: This retrospective, observational study compared 108 patients who underwent the Nuss procedure at Nemours Children's Hospital in Orlando, FL. Patient charts were evaluated for significant differences in length of stay (LOS), opioid use, and reported pain ratings based on type of analgesia administered: INC (n=30), ESP (n=19), thoracic epidural (n=41), PCA (n=18). Secondary variables included emergency department visits, readmissions, opioid refills, and various anesthetic and operative costs. Analysis of variance was performed on all outcome measures.
Results and Discussion: Average LOS was significantly decreased in the INC group (2.9 days) compared to both the thoracic epidural group (4.7 days, $p<.05$) and the PCA group (3.7 days, $p<.05$). Average cumulative opioid use was significantly decreased in the INC group (50.4 MME) compared to the thoracic epidural group (117 MME, $p<.05$) and PCA group (172.1 MME, $p<.05$). INC did not significantly affect average overall pain when compared to other groups. Operative costs for INC ($22,755) were significantly more expensive than thoracic epidural ($17,151, $p=.001$ and PCA ($14,601, $p=.001$). INC anesthetic charges ($58,843) were more expensive than thoracic epidural ($61,515, $p=.001$) and PCA ($52,735, $p=.001$). However, there was no significant difference in total hospital charges in between groups.
Conclusion(s): This study suggests that INC can be a viable option for reducing postoperative opioid consumption and LOS in Nuss procedure patients. Limitations include retrospective design, small sample size, and patient use of non-opioid pain control medications that may have affected patient reported pain scores. As prior studies have shown inconclusive evidence for the efficacy of INC, additional research would be helpful in assessing its impact.

08AP04-03
Postoperative pain control after spine surgery in long-term opioid therapy patients: an observational retrospective study

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Background and Goal of Study: Long-term opioid therapy patients [LOT] present higher risk of poor pain control [PPC] after spine surgery [SS]. We aim to describe the incidence of PPC, efficacy of postoperative analgesia regimens [AR], hospital length of stay and early ambulation in LOT after SS in our center.
Materials and Methods: We design an observational descriptive study during 2019 and 2020. LOT was defined as treatment with any strong opioid or ≥200mg/24h tramadol 3 months before SS. Demographic and surgery data were collected. Thoracolumbar SS with instrumentation, laminectomy≥3 or scoliosis SS were considered major SS. We analyzed: incidence of PPC (defined as ≥4 score at verbal numerical scale [VNS]) at postoperative anesthetic critical unit [PACU] and hospital stay [H] ; efficacy of perioperative AR; length of H; early ambulation (≤48h after SS).
In our center, LOT have specific analgesic protocol: intraoperatively, 0.5mg/kg bolus of intravenous [iv] ketamine followed by an infusion of 0,2mg/kg/h until SS end; postoperatively morphine-ketamine iv [M-K] patient-controlled analgesia [PCA] plus paracetamol iv 1g/6h and dexketoprofen 50mg/8h iv. However, anaesthetist in charge can also treat LOT with tramadol iv 1mg/kg/6h or morphine iv PCA plus paracetamol and dexketoprofen.
Results and Discussion: 501 patients underwent SS and 135 (26,9%) where LOT: average age of 62,5 years, 62 (45,9%) were women, 55 (40,7%) underwent major SS and 36 (26,7%) had a SS before.
13,3% (18) patients presented VNS≥4 at PACU and 17,2% (23) at H. Regarding AR: 82,2% (111) received intra and postoperative M-K protocol, 9,6% (13) received tramadol and 7,41% (10) followed morphine PCA. Patients receiving M-K AR:11,1% (13) had VNS≥4 at PACU and 19 (14,1%) at H. Although not significantly correlated, it represented a decrease of 16,0% and 17,4% of patients with PPCC, compared to other AR, at PACU and H respectively.
PPC increased H length of stay (p 0,025): 13,9 days (d) in VNS≥4 patients vs 8,1d in VNS<4 patients. PPC was a risk factor of inability to early ambulation: 24,32% (9) VNS ≥4 vs 5,71% (12) VNS<4 patients (p<0,001).
Conclusion(s): Prevalence of LOT is high in SS. PPC is increased with longer H length of stay and delay in ambulation. AR design specifically for LOT could contribute to reduce PPC.

08AP04-04
Intravenous patient-controlled analgesia with nefopam versus nefopam and fentanyl for acute postoperative pain management in patients undergoing laparoscopic colorectal oncosurgery

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Background and Goal of Study: Intravenous patient-controlled analgesia is an accepted and effective strategy for relieving acute pain after laparoscopic colorectal cancer surgery. Opioid administration by this method is associated with nausea/vomiting, sedation and respiratory depression, thus drug combinations or alternative drugs are required to avoid such complications.
The goal of our study is to evaluate the impact of patient-controlled analgesia with nefopam vs nefopam-fentanyl on acute postoperative pain management during first 24h after laparoscopic colorectal cancer surgery, in terms of efficacy and safety.
Materials and Methods: This randomized prospective double-blind controlled study included 82 patients (ASA I-III), aged>45 years, candidates to elective laparoscopic colorectal cancer surgery. They were randomly assigned into 2 groups, each with 41 subjects, group N and Group NF that received iv PCA with nefopam, respectively nefopam-fentanyl for acute postoperative pain control, during first 24h after surgery. In all patients, PCA devices were set to deliver a bolus demand dose of 2 ml, with a background infusion rate of 2 ml/h and a lockout interval of 10 min. For pain intensity exceeding 4 points on numerical rating scale (NRS), iv morphine was administered as rescue analgesia. The primary outcomes were the incidence and the intensity of acute postoperative pain, evaluated by NRS every 6 hours and the morphine consumption, during study. The rate of nausea/vomiting episodes, incidence of sedation and patient satisfaction with postoperative analgesia during study were recorded as secondary outcomes. Data were analyzed using Student's t-test and Fisher test, with a significance level considered for $p<0.05$.
Results and Discussion: Lack of significant difference between groups was detected concerning the incidence and severity of acute postoperative pain, assessed for all time intervals. Total morphine consumption revealed similar values in both groups ($p=0.23$). The occurrence of nausea/vomiting and sedation episodes registered significant lower values in group N vs group NF ($p<0,01$, $p<0,03$). Assessment of patient satisfaction showed statistically favorable scores for group N ($p<0,03$).
Conclusion: According to our data, nefopam seems to be as efficient as fentanyl-nefopam combination when administered by iv PCA for acute postoperative pain control after laparoscopic colorectal cancer surgery, but with the advantage of a better safety profile.

08AP04-05
Trajectories of pain and opioid use up to 12 months after surgery

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Background: Chronic postsurgical pain (CPSP) and associated persistent postoperative opioid prescriptions are considered as a major healthcare problem in some countries. Data from Europe are heterogeneous, e.g., for persistent opioid prescriptions after surgery 2-41% of the patients are affected (1).
Goal of the study: To evaluate trajectories of pain and opioid use from the preoperative phase up to 12 months after surgery in a mixed surgical cohort.
Methods: Ethics approval for analysis of registry data derived from the European PAIN OUT project. Endpoints: Preoperative and postoperative opioid medication (morphine equivalents), long-term use of opioids at 6 and 12 months (M6/M12). Subgroups without or with pre-existing chronic pain (pre-CP), with/without opioids before surgery, and with postoperative chronic pain unrelated to surgery vs CPSP (new ICD-11 definition) at M6/M12 were compared. Statistics: χ^2 test, ANOVA, level of significance $p<0.05$.
Results: Of 2233 patients, 42% suffered from pre-CP at the site of surgery, elsewhere or both. Opioid medication before surgery was reported by 5.6% of the patients, with more frequent use in patients with pre-CP compared to patients without pain (11.9% vs 1.3%; $p<0.001$). Reasons for preoperative opioid medication were back or joint pain, cancer pain, a chronic pain syndrome, or opioid abuse/addiction (0.3%). Postoperative opioid doses were higher in patients with pre-CP compared to patients without pre-CP (mean (95% CI): 21 (19-23) vs. 13 (12-14) mg/24 h; $p<0.001$). At M6 and M12, 4.6% and 3.7% were taking opioids (without pre-CP 1.0%; with pre-CP 6.7%; $p<0.001$). Cessation of opioids at M12 was observed in 56% of the preoperative opioid users. Of previously opioid-naïve patients, 1.2% were new opioid users at M12. However, only 0.8% reported a pain localization corresponding to the type of surgery. The remaining patients suffered from chronic pain unrelated to surgery or cancer-related pain. For the whole cohort, the incidence of moderate to severe CPSP at M12 amounted to 1.7%.
Conclusions: In this European cohort, most patients with persistent opioid use already had pre-CP with some of them taking opioids. Persistent postoperative opioid use in opioid-naïve patients seems to be lower than in published studies, however, opioid prescriptions should be watched closely. More emphasis has to be placed on opioid tapering before and after surgery.
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08AP04-06
Efficacy of acute pain treatment after shoulder joint replacement using N. Suprascapularis stimulating catheter or local anesthetic injections and measuring analgesia nociception index (ANI)

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Background and Goal of Study: Patients after shoulder joint replacement surgery report moderate to severe pain even though postoperative pain is treated with opioids, which have some side effects. Prolonged perineural placement of the stimulating catheter is a novel analgesic modality. The objective was to compare the efficacy of perineural block with a N. Suprascapularis stimulating catheter compared to local anesthetic injection after shoulder arthroplasty.
Materials and Methods: The prospective study was carried out at the Hospital of Traumatology and Orthopaedics Riga, Latvia, from May to December 2022. Overall 10 patients undergoing shoulder arthroplasty surgery where ultrasound-guided stimulating catheter was inserted close to N.Suprascapularis were included in the study. Within the recovery room, the treatment group received 10 minutes long nerve stimulation twice, before the movement of the shoulder and after. The control group received Ropivacaine 37,5 mg injections via a catheter. For the pain assessment the Analgesia Nociception Index (ANI) was used - instantaneous (ANIi) and mean (ANIm). Scale from 0 to 100 (respectively, maximum of nociception/predominance to complete analgesia/predominance of the sympathetic nervous system). Also for subjective pain experience the Numeric Rating Scale (NRS) was used - patients rated pain from 1 (no pain) to 10 (worst pain). For the analysis of data, IBM SPSS 27.0 was used.
Results and Discussion: Mean values after stimulation in the treatment group – before movement ANIm - 62,20 and ANIi - 61, after shoulder movement ANIm - 68,80 and ANIi - 70. In the control group, the mean values were ANIm - 64.60 and ANIi – 64.20. ANI indexes were also compared to pharmacological treatment – there was no statistically significant association ($p < 0.05$) compared to stimulation, in both situations, in rest and after movement. Although NRS were compared in the same way - in both groups there was no statistically significant association ($p < 0.05$).
Conclusion(s): Both groups are equivalent and equally successful in pain relief. Future research would be needed to conduct a more comprehensive analysis of the use of this nerve stimulation method on a daily basis.

08AP04-07
Incidence and risk factors for chronic pain after thoracic surgery: a retrospective study

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Background: Chronic pain after thoracic surgery (CPATS) is a frequent complication that affects the quality of life of patients. Open thoracotomy entails high risk of pain chronification. Video-assisted thoracoscopic surgery (VATS) is a less traumatic option, but his role in CPATS is unclear. Regardless of the surgical approach, there is growing evidence about the influence of other demographic, psychosocial or clinical factors. The aim of this study was to detect the incidence and predictors of CPATS at 6 months, both from thoracotomy and VATS.
Methods: Observational retrospective study conducted in a tertiary hospital. We reviewed electronic medical records of patients scheduled for thoracic surgery from January/16 to January/20. The diagnosis of CPATS was assessed from the follow-up visit at 6 months after surgery. Variables with established relationship with the CPATS and/or its aetiopathogenic plausibility were obtained. Logistic binary regression was applied for the multivariate model. A p value less than 0.05 was considered statistically significant.
Results and Discussion: We analysed 259 patients with an average age of 62.5 years (range 17-86), 36.3% were women and 46.7% vs. 53.3% had VATS and thoracotomies, respectively. The overall incidence of CPATS was 12%; 4.1% for VATS and 18.8% for open thoracotomy.
Multivariate model revealed that severity of postoperative acute pain and a higher number of thoracic drainages at first day were risk factors for CPATS (*Figure 1*). Despite the differences in the incidence of CPATS between surgical approaches, open thoracotomy did not increase the risk of CPATS.

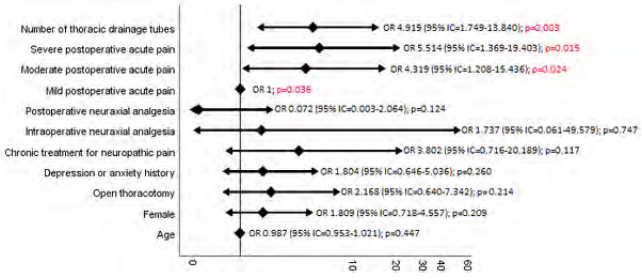

Figure 1. Multivariate model of the risk factors for Chronic Pain After Thoracic Surgery.

Conclusions: The incidence of CPATS was 12% in our center. Patients with higher severity of acute pain and those with higher number of thoracic drainages have greater likelihood of developing CPATS. Open thoracotomy was not a risk factor for CPATS.

08AP04-08
Patient satisfaction with analgesia in the postoperative period: a survey

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Background and Goal of Study: Patients often have a severe pain after surgery, which causes discomfort and stress. Although various studies have been conducted regarding the identification and management of postoperative pain, relatively limited data is available on patient satisfaction with their care. The goal of this study was to understand patient satisfaction with analgesia administered to them in the postoperative period.
Materials and Methods: A prospective study involving patients who underwent different types of orthopedic surgeries was conducted in the Hospital of Traumatology and Orthopaedics, Riga, Latvia from September to November 2022. Patients were interviewed two days after surgical intervention. Satisfaction with analgesia was categorized on scale from 0 to 10, 0 being completely unsatisfied and 10 being completely satisfied. Patients also were asked about the worst and the least pain they felt at rest and during movements. Pain was evaluated using a Visual Analog Scale (VAS). Patients were categorized based on the gender and age group. Statistical analysis was performed using SPSS 27th version.
Results and Discussion: 102 patients agreed to participate in the survey. Mean satisfaction score with analgesia in the postoperative period was 9.32 for female patients and 9.45 for male patients. The worst pain during movement for female patients was 5.97 and 5.16 for male patients. The worst pain during rest for females – 4.94 and male – 4.06. The least pain during movement for female patients – 3.80 and male – 3.19. The least pain during rest for females – 2.75 and male – 1.84.
Looking at mean satisfaction with analgesia in postoperative period by age groups, the lowest score is in the 18-39 age group – 8.33 and the highest in the 80-90 age group being 9.88. The worst pain both at rest and during movement was in the 18–39 age group – 5.50 and 6.33, but the worst pain in the 80-90 age group – 2.88 and 4.75, which is significantly lower.
Conclusion(s): Women have more pain after surgery. Younger adults have more pain and are less satisfied with analgesia. Overall satisfaction with analgesia is very high despite moderate pain after surgery.

08AP04-09
Chronic pain following thoracotomy: It's incidence regarding patient's age, ASA score and type of perioperative analgesia used

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Background and Goal of Study: Chronic pain is common following thoracotomy and can affect quality of life. Post thoracotomy pain syndrome (PTPS) is defined by International Association for the study of Pain (IASP) as pain that recurs or persists along a thoracotomy incision at least two months following surgical procedure. Goal of this study was to investigate the incidence of PTPS 6-12 months after thoracotomy in our institution and its relation regarding age, ASA score and type of perioperative analgesia.
Materials and Methods: After approval from hospital's Ethics Committee, 42 consented patients were included. All patients had undergone a typical posterolateral thoracotomy between June 2021 and July 2022. Patients' average age was 61 years old. All patients were contacted by phone 6-12 months post-surgery and were evaluated using the Douleur neuropathique questionnaire (DN4). PTPS was defined as DN4 score above 3. Regression analysis, ttest and analysis of variance were used in statistical analysis. STATA was used as method for statistical analysis.
Results and Discussion: Among the 42 patients, 6 were ASA I, 20 were ASA II and 16 were ASA III. Mean DN4 score was 1,4 (1,4). Twelve of them received systematic opioids as postoperative analgesia and had a mean DN4 score of 1.3. Twenty one of them received continuous epidural infusion with ropivacaine 2% and fentalyl 2,5μg/ml and had a mean DN4 score of 1.15 and 9 of them received PCA with fentanyl 20μg/ml and had a mean DN4 score of 2.1. No statistically significant difference was observed among the different groups regarding DN4 score (p value 0.3). We observed a statistically significant correlation between DN4 score and age with the older patients having reduced DN4 score than the younger ones (p value 0.01). No statistically significant difference was observed between ASA I, II and III patients regarding DN4 score.
Conclusion(s): In the present study post thoracotomy pain syndrome is not related to ASA group or type of perioperative analgesia. It appears that as patients' age increases it is less likely to present PTPS. Further studies involving larger number of patients are required in order to obtain more accurate data.

08AP04-10
Patient Empowerment and education via Pain App reduce the incidence of chronic postthoracotomy pain

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Background and Goal of Study: Chronic postthoracothomy pain, defined as pain after 3 months postoperatively, is still described in appr. 40 % of patients (1, 2). We evaluated the influence of patient empowermemt/education with a pain App on the incidence of chronic postthoracotomy pain.
Materials and Methods: The present multicenter, open, randomized clinical study was approved by the ethics committee (19-8833-BO). After written informend consent patients received either standard pain protocol of each clinical study centre (Control Group) or standard pain protocol plus patient empowerment and education (App-Group) by pain nurses and access to our pain App up to 6 months postoperatively.
The data collected is evaluated using SPSS. The primary outcome parameter was defined as incidence of pain after 6 months postoperatively. Data were analysed by using t-Test, Mann-Whitney-U-Test and chi-square test.
Results and Discussion: 613 patients were enrolled and randomized in our prospective multicentre study (55.8% male and 44.2% female). Patients were 55.3±12.6 years old. Patients in the App-Group developed less chronic postthoracotomy pain after 6 months compared to the Control-Group (App Group 6.4% vs Control-Group 12**%,** $p<0.05$). We identified younger age (App Group 3.9% vs Control Group 10.0%, $p<0.05$) and female gender (App Group 3.0% vs Control Group 7.9%, $p<0.05$) as subgroups with strongest differences in chronic postthoracotomy pain.
In general, patients in the App Group consumed less non opioid drugs over 6 months postoperatively than patients in the Control-Group (17.9% vs. 23.8%, $p<0.05$)**.** Between groups there was no difference in prescription of opiods (10.1% vs. 8.4%, p=n.s.) and anti-depressant drugs (8.7% vs. 8.5%, p=n.s.).
Conclusion: Patient Empowerment and education via Pain App is superior to standard postoperative pain protocols in reducing postthoracotomy pain.
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08AP04-11
Postoperative pain as an independent predictor for quality of life

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Background and Goal of Study: Postoperative pain is often a considerable burden for the patient, especially in the first 24 hours. Several studies have shown that increased pain leads to a reduced quality of life (QoL) in the long-term outcome as well as a delayed return to normal daily living. This is especially the case when the pain is severe[1].
The aim of this sub-analysis was to investigate in a surgical patient cohort how high the average postoperative pain was and whether this had an influence on the QoL in the long-term outcome.
Methods: This prospective observational single centre study, conducted from 2018 to 2019, included 1097 patients aged 60 years or older and with a planned surgery duration of at least 60 minutes[2].
The sub-analysis presented here is based on the preoperative baseline parameters, including the EQ-5D-5L and EQ-VAS as QoL questionnaires, which were also collected 180 days postoperatively during a follow-up (FUP) call.
Furthermore, the patients' pain was assessed on five postoperative days using the Visual Analogue Scale (VRS) and Numerical Rating Scale (NRS). In order to adjust the impact of postoperative pain on the quality of life in the FUP with other influencing parameters, beta regression models were conducted.
Results: The mean age of the 1021 analysed patients was 72 (±7.3) years. Average NRS significantly reduced from 3.4 (±2.7) to 2.4 (±2.4) from the first to fifth visit day ($p<0.001$). Subjectively assessed overall self-rated health status (EQ-VAS) of patients increased on average from 61 (±22.6) to 66 (±21) points from baseline to FUP ($p< 0.001$).
In addition, the patients' subjective perception of pain and discomfort decreased significantly from baseline to FUP from 2.5 (±1.3) to 2.2 (±1.2) ($p<0.001$). The beta regression models showed that the level of postoperative pain on day 1, in addition to the ASA classification and the surgery risk, had a significant influence on the EQ-5D-5L index and the EQ-VAS 180 days after surgery.
Conclusion(s): Our sub-analysis shows that even a low pain level, among other factors, has an impact on the patients' quality of life in the long-term course. Since patient- and surgery-related factors such as multimorbidity and surgical risk often cannot be changed, major attention should be paid to postoperative pain management in the future to avoid negative long-term effects.
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08AP04-12
Postoperative pain management in patients undergoing open hepatectomy at Srinagarind Hospital

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Background and Goal of Study: Effective pain control is essential for patient recovery, and reduced complications in open hepatectomy. Thoracic epidural analgesia (TEA) is commonly used to provide analgesia. However, TEA remains controversial because of postoperative coagulopathy which could delay the removal of the epidural catheter and increase the risk of serious complications such as epidural hematoma. Currently, there is no consensus among anesthesiologists regarding which technique is superior for pain management in open hepatectomy. This study aims to compare the severity of postoperative pain utilizing various techniques of pain management in patients who undergo open hepatectomy at Srinagarind Hospital.
Materials and Methods: For this retrospective descriptive study, the data were collected from patients who undergo open hepatectomy from January 1, 2016 to December 31, 2020, at Srinagarind Hospital, Khon Kaen University via anesthetic and acute pain service records. The scope of our study includes the severity of pain in various types of postoperative analgesic techniques, their side effects, and complications.
Results and Discussion: A total of 551 cases was included in this study. At 24 hours post-surgery, patients who reported severe pain at rest were as followed IV PCA (intravenous patient-controlled analgesia) group, spinal MO (spinal morphine) +IV PCA group, and TEA group (51.22%, 42.86%, 25.58%; $p<0.001$). Patients who reported severe pain during movement were as followed IV PCA group, spinal MO+IV PCA group, and TEA group (84.15%, 71.43%, 58.16%; $p<0.001$). No significant difference in pain severity was observed in all groups during 24-48 hours post-surgery. Pain severity during movement was significantly lower in TEA group compared to spinal MO+IV PCA and IV PCA group at 48-72 hours post-surgery (38.64%, 25.00%, 17.30%; $p=0.005$). Side effects such as vomiting, pruritus, and over-sedation were more frequent in spinal MO+IV PCA. The incidence of delayed epidural catheter removal due to coagulopathy is 9.69%, and no incidence of epidural hematoma was reported.
Conclusion(s): Pain severity was significantly lower in TEA group during the first 24 hours post-surgery. At 48-72 hours post-surgery, pain severity at movement was significantly lower in TEA group compared to spinal MO+IV PCA and IV PCA group. Side effects of analgesic drugs were more frequent in spinal MO+IV PCA group and no incident of epidural hematoma was reported.

Intensive Care Medicine

09AP01-01
Is an episode of Acute Kidney Injury in ICU associated with an increased risk of subsequent Ventilator Associated Pneumonia?

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Background: Following biological reports that an episode of Acute Kidney Injury (AKI) impairs pulmonary innate immunity (1, 2), it's association with subsequent Ventilator Associated Pneumonia (VAP) has been the topic of several clinical studies (3), each using different, highly specific definitions of VAP. This study aimed to establish whether a significant association exists when using a more pragmatic definition of VAP, combining that of the US CDC and European ECDC.
Methods: In this retrospective case-control study, patients admitted to two adult general ICUs in Edinburgh between 1st June 2015 and 31st May 2016 were screened for diagnosis of either CDC or ECDC VAP. 56 patients were identified and matched 1:2 (Case:Control) on site, sex, age and severity of illness with non-VAP patients from the same population. All patients then had their serum creatinine between ICU admission and VAP diagnosis/ICU discharge screened for retrospective diagnosis of AKI as per the KDIGO criteria. Univariate and multivariate analysis was then performed for association of AKI to subsequent VAP.
Main Results: There was no significant association found at univariate ($p=0.19$) or multivariate ($p=0.26$) analysis.
Conclusions: This dataset suggests that an episode of AKI is not significantly associated with subsequent VAP. This is at odds with most of the research on this topic (1 - 3) and suggests that further study is warranted. I would encourage future researchers to adopt this study's combined CDC/ECDC definition of VAP, to improve external validity by approximating the true clinical burden of VAP better than either single definition.
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09AP01-02
Inhibition of neutrophils by extracorporeal acceleration processes during ECMO or sample treatment

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Background and Goal of Study: ECMO treatment leads to non-physiological blood transport and cell exposition to *g*-forces. Neutrophils (PMNs) are commonly isolated by density gradient separation (DGS) (1) which implements a paralytic inhibition of PMN functions (2).
We hypothesize that *g*-forces influence PMN migration. We compared three groups of blood PMNs (healthy volunteers; vote 16-101-0322) by live cell imaging, categorised by the applied *g*-time (*g*-number*duration) (2).
Materials and Methods: PMNs of the control group (<2k*g*s) were isolated by enhanced sedimentation (10% gelafundin®; B. Braun, GER). A clinical setting was mimicked by a tube and an ECMO pump (Liva Nova, UK) without membrane oxygenator. Therefore whole blood, UFH (PANPHARMA, GER) and pen/strep (Sigma-Aldrich, USA) was diluted with RPMI 1640 (1:9.5; PAN-Biotech, GER) and exposed to the pump for 24h (4L/min; 19k*g*s). PMNs were isolated using RBC depletion (Miltenyi Biotec, GER) and leukospin (pluriSelect, GER) without centrifugation. The third group was collected by a DGS (lympho/leukospin; pluriSelect; 907k*g*s).
We used 3D-μ-slides (Ibidi, GER) for live cell tracking (DMi8, Leica Microsystems, GER). Track length (TL), track speed (TS), track displacement X (TDX) and track straightness of PMNs after 1-6h were compared. IMARIS 9.02 (Bitplane, CH), Excel (Microsoft Corp., USA) and SPSS® (IBM Corp., USA) were used. For statistical analysis normal distribution tests (Kolmogorov-Smirnov), comparison of multiple groups (Kruskal-Wallis) and post hoc tests (Bonferroni) were performed.
All values were highest by application of maximal 2k*g*s and decreased significantly (Table 1):

parameter (medians)	*observation period [h]*	*applied g-time [kgs]*		
		<2	*19*	*907*
TL [µm]	6	122	51**	28**
TS [µm/s]	6	0.19	0.08**	0.04**
TDX [µm]	6	22.1	7.29*	0.26**
straightness [1]	6	0.38	0.25*	0.019**

*Table 1: migration values with respect to applied g-times; *=p<.05, **=p<.001 vs. control (<2kgs).*

Results and Discussion: Our data suggest that *g*-forces applied during DGS or caused by an ECMO have a significant influence on PMN migration correlating to the *g*-time.
Conclusion(s): Only gently isolated PMNs should be used for future analyses. The clinical implications of ECMO therapy on the immune response need to be further investigated.
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09AP01-03
Extracorporeal membrane oxygenation does not lead to sequestration of cefiderocol in an ex-vivo setup

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Background and Goal of Study: It is shown that extracorporeal membrane oxygenation (ECMO) can lead to different pharmacokinetics (PK) of commonly used drugs possibly due to sequestration in the circuit and oxygenator.[1] No data exists for the new cephalosporin cefiderocol.
Therefore, this study uses an ex-vivo setup to show if cefiderocol gets absorbed in the ECMO-circuit (tubes and oxygenator) with the need for dose adjustment.
Materials and Methods: This is an experimental ex-vivo study using a fully functional ECMO-device (Cardiohelp System, Getinge AB, Gothenburg, Sweden). 20L of an albumin-electrolyte-solution with an albumin concentration of 4mg/dL and 1g cefiderocol (aim of 50mg/L) were used to mimic the volume of distribution and expected concentration of cefiderocol in patients. The ECMO ran at 5L/min "bloodflow" and samples were taken at baseline (0), 5, 15, 45, 60, 120, 180 and 240 min. Concentration of cefiderocol was measured using a high performance liquid chromatographyHPLC) method for the quantification of cefiderocol in serum. Simultaneously, 100mL of the same albumin-electrolyte-solution and 5mg cefiderocol were incubated and stirred in a control jar to demonstrate drug stability over the study period.
Results and Discussion: Baseline concentration in the ECMO-setup was 52 mg/L. Concentration after 240 min of ECMO was 53 mg/L. The control samples proved cefiderocol stability over the study period with 100% drug recovery after 240 min.
Our study shows no occurrence of relevant sequestration of cefiderocol in the ECMO-circuit over a period of 3 hours. Therefore, the sole existence of an ECMO-circuit does not require dose adjustments in ECMO-patients. However, other pathophysiological changes that might be a result of ECMO-treatment (e.g. systemic inflammation, reduced organ function) can alter PK and might result in necessary dosage changes. This can be done best by therapeutic drug monitoring.
Conclusion(s): In an ex-vivo setup, cefiderocol does not show adsorption to ECMO-tubes or -oxygenator.
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09AP01-04
Standard piperacillin dosing fails target attainment in most patients with veno-arterial extracorporeal membrane oxygenation (VA-ECMO)

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Background and Goal of Study: Treatment of infections is crucial in patients with veno-arterial extracorporeal membrane oxygenation (VA-ECMO). Often, broad spectrum antibiotics like piperacillin are used empirically to cover pathogens that are common in critically ill patients, e.g. pseudomonas aeruginosa (PA). It is from interest, whether standard dosing of piperacillin leads to sufficient plasma levels.
Materials and Methods: This was a prospective observational study measuring piperacillin plasma levels in VA-ECMO patients. 12 g/d of piperacillin were continuously administered over the treatment period and plasma samples were taken daily for a maximum of 5 samples. A high-performance liquid chromatograph was used for measuring. Plasma concentrations were evaluated based on The European Committee on Antimicrobial Susceptibility Testing (EUCAST) non-species related breakpoint (BP_N; 8 mg/l) and PA breakpoint (BP_{PA}; 16 mg/l) for piperacillin.[1] As recommended for ß-lactams, target plasma levels were defined as 4 to 8 times BP_N/ BP_{PA} with an upper limit of 96 mg/l (= 40 mg/l [32-64 mg/l] / 80 mg/l [64-96 mg/l]).[2]
Results and Discussion: 10 patients were included and 31 measurements taken. Patients were mainly male (n=9; 90%) and obese (body mass index 33±6.4 kg/m²). Mean plasma concentrations were 69.1±36.6 mg/l. 35% of all samples (n=11) were within BP_N target and 23% (n=7) were within BP_{PA} target.
No hints of ECMO related PK changes were noted, but the high variability of plasma levels in critically ill patients was confirmed. A high proportion of patients was either under- or overdosed with standard piperacillin dosing.
Conclusion(s): Standard dosing of piperacillin might lead to under- or overdosing in patients on VA-ECMO. Both, individual empirical dosing, which takes into account the germ spectrum and organ function and therapeutic drug monitoring, can be recommended.
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09AP01-05
Haptoglobin depletion is associated with mortality in patients with ARDS and veno-venous ECMO

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Background and Goal of Study: Haptoglobin (Hp) can scavenge cell-free hemoglobin (CFH) liberated by hemolysis which is frequent in patients with sepsis, the Acute Respiratory Distress Syndrome (ARDS), or during therapy with extracorporeal membrane oxygenation (ECMO). In patients on the Intensive Care Unit (ICU), an association between hemolysis and increased mortality has been observed. In addition, low plasma levels of Hp seem independently associated with mortality. In this study, we analyzed Hp depletion in patients with ARDS and therapy with veno-venous ECMO (VV ECMO). We identified patients at risk by cut-off values of the initial Hp.

Materials and Methods: Retrospective analysis of patients with ARDS admitted to a tertiary ARDS referral center from 01/2007 to 12/2018. All patients with Hp and CFH measurements within the first week of ECMO treatment were included. Hp depletion was defined as a drop of Hp concentration under the threshold of 0.39g/l and patients were grouped accordingly. To adjust for confounders and to identify independent risk factors associated with Hp depletion, baseline characteristics at ECMO initiation were compared between the groups. A cut-off value of an initial Hp concentration associated with significant Hp depletion was calculated with recursive binary partitioning. All significantly different variables were included in a multivariable logistic regression model optimized by backward variable selection according to AIC.

Results and Discussion: In 269 of 435 included patients, Hp depletion (≤0.39g/l) during seven days following ECMO initiation was observed, 166 patients were not affected. The groups differed significantly in the occurrence of septic shock (Hp≤0.39g/l: 67.7% vs. Hp>0.39g/l: 45.4%, p=0.011) and ICU mortality (Hp≤0.39g/l: 59.1%, [95% CI, 53.0-65.0] vs Hp>0.39g/l: 34.9%, [27.8-42.8], p<0.001). The subgroup of patients with Hp measurements at ECMO initiation (n=215) was divided by the calculated cut-off value for the initial Hp of 1.6g/l into groups with a significantly different risk for Hp depletion (initial Hp≤1.6g/l: 74.8%, [95% CI, 65.3-82.4], n=107 vs. initial Hp>1.6g/l: 47.2%, [37.6-57.0], n=108, p<0.001). This initial Hp limit remained significantly associated with the risk of Hp depletion in the multivariate logistic regression model (adj. OR 13.08, [3.10-83.11], p=0.002). Other independent risk factors for Hp depletion included septic shock and peak inspiratory pressure at ECMO initiation.

Conclusion(s): Hp depletion is significantly associated with adverse outcomes in patient with ARDS and treatment with VV ECMO. The cut-off value of the initial Hp plasma concentration associated with significant Hp depletion can identify a patient population that might benefit from Hp-supplementation.

09AP01-06
Intravascular cell free haemoglobin aggravates ventilator induced lung injury in mice

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Background: Mechanical ventilation (MV) is a common intervention in critical care medicine. However, MV itself can cause pulmonary damage, especially when high tidal volumes (HV_T) or high plateau and driving pressures are used. Ventilator Induced Lung Injury (VILI) is enhanced by predisposing host factors such as inflammation, infection or atelectasis, making the lung vulnerable for additional injury by MV. Elevated levels of intravascular cell-free haemoglobin (CFH) are common in many diseases such as sepsis, the Acute Respiratory Distress Syndrome, or after blood transfusion. Although there is growing evidence for the toxicity of CFH, data are scarce on the interaction between CFH and VILI.

Methods: C57Bl6/J mice were ventilated for five hours with either protective low-pressure ventilation (LPV) or injurious MV with high tidal volumes (HV_T) to induce VILI (peak pressures: 9 vs. 30 cmH_2O). One hour after commencement of ventilation, mice received either an intravascular infusion of CFH (0.24g/kg BW) or an equivalent volume of isotonic saline. In addition, one group of mice received an infusion with norepinephrine (NE) to mimic CFH-induced hypertension. Lung edema was quantified by assessment of wet-to-dry-ratio (WtD) and protein content of bronchoalveolar lavage fluid (pcBALF). In lung tissue, IL-6 and TNF-α were measured by quantitative PCR. Tidal volumes and pressure-volume-curves were monitored to evaluate lung mechanics.

Results: While lung edema did not differ between mice receiving LPV+CFH and mice receiving LPV alone, WtD was significantly higher in mice receiving HV_T+CFH compared to HV_T (WtD: p=0.003, HV_T vs. HV_T+CFH). Lung edema in mice with HV_T+NE was greater compared to HV_T alone (WtD: p=0.033, pcBALF: p=0.025) and similar to HV_T+CFH (WtD: p=1.000, pcBALF: p=0.283). Similarly, IL-6 and TNF-α mRNA-levels did not differ between mice with LPV+CFH and mice receiving LPV but increased significantly in mice with HV_T. In addition, mice receiving HV_T+NE showed higher IL-6 mRNA-levels than mice with HV_T+CFH (IL-6: p<0.001). After five hours of HV_T, mice treated with CFH showed significantly impaired lung mechanics compared to mice treated with HV_T alone or mice treated with HV_T+NE (V_T per kg BW: p=0.009, HV_T vs. HV_T+CFH; p=0.019, HV_T+CFH vs. HV_T+NE).

Conclusion: Mice with HV_T show increased impairment of lung mechanics when treated with CFH that appears independent from increased lung edema or inflammatory processes caused by HV_T and hypertension.

09AP01-07
Optimal ventilation time after endovascular treatment under general anesthesia for acute ischemic stroke: a prospective, observational study

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Background and Aim of Study: Optimal ventilation time after endovascular treatment under general anesthesia for acute ischemic stroke is controversial. We aimed to determine whether early (<6 hours) vs middle (6-12 hours) vs delayed (6-24 hours) extubation after endovascular treatment under general anesthesia for acute ischemic stroke is associated with functional outcome at 90 days.
Materials and Methods: During 20 months, we prospectively collected data from patients with a proximal occlusion of the anterior circulation treated with successful endovascular treatment (TICI 2b-3) under general anesthesia and that could be extubated in the first 24 hours. Three groups were established regarding mechanical ventilation time after the procedure. Demographic and clinical parameters were compared between the groups. The primary outcome was distribution on the modified Rankin Scale (mRS) at 3 months.
Results and Discussion: A total of 184 patients after endovascular treatment for acute ischemic stroke were admitted in our ICU during the study period. 114 patients with a proximal occlusion of anterior circulation and successful endovascular treatment under general anesthesia were included and divided into the three groups according to extubation time. There were no differences between the three groups regarding neurological status prior to mechanical thrombectomy and time to recanalization. Early and middle extubation compared to delayed extubation were associated with improved neurological status at hospital discharge, and functional outcome at 3 months (Table 1). We found no difference between early and middle times of extubation.

	Total 114 p	Early extubation 59p. (51,8%)	Middle extubation 34p. (29,8%)	Delayed extubation 21p. (18,4%)	P
Age (years, median, IQR)	79 (70-85)	79 (69-84)	78 (68-86)	79 (76-86)	0,653
NIHSS at admission (mean, SD)	15,4 (5,4)	14,7 (5,5)	15,4 (5,0)	16,9 (5,7)	0,290
Time to recanalization (min, median, IQR)	330 (265-598)	310 (246-486)	402 (309-780)	331 (266-497)	0,054
Duration of mechanical ventilation (hours, median, (IQR)	5:48 (6:04)	3:41 (2:27)	7:15 (2:40)	16:37 (4:20)	
Days of stay in the Hospital (days, median, IQR)	5 (3-8)	5 (3-7)	6 (3-9)	6 (2-11)	0,357
NIHSS at discharge from Hospital (Median, (IQR)	3 (0-8)	3 (0-5)*	3 (0-9)	10 (2-18)*	0,013
mRS at discharge from Hospital (median, (IQR)	3 (2-5)	3 (2-4)*	3 (0-9)	10 (2-18)*	0,049
mRS 3 months post-stroke (median, (IQR)	3 (1-5)	2 (1-4)*	3 (2-4)	6 (3-6)*	0,009
Favorable outcome at 3 months (mRS 0-2) (n(%))	45 (39,5)	31 (52)*	10 (30)	4 (19)*	0,010

*Early compared to delated extubation., mRS: modified Rankin scale (range o (no symptoms) to 6 (death), NIHSS: National Institutes of Health Stroke Scale, TICI 2b-3: scores indicate near-total and total reperfusion grades

Table 1.

Conclusions: Extubation in the first 12 hours after endovascular treatment under general anesthesia for acute ischemic stroke extubation was associated with improved neurological status at hospital discharge and favourable outcome at 3 months compared with delayed extubation.

09AP01-08
Prone positioning as a risk factor for the development of pulmonary barotrauma

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Background and Goal of Study: The goal of this study was to investigate incidence of pulmonary barotrauma in patients treated with prone positioning in the ICU.
Materials and Methods: This retrospective observational cohort study included all adult patients with COVID-19 admitted to ICU from September 1, 2020, to February 28, 2022. All admited patients received some form of respiratory support. Primary outcome was occurence of barotrauma. Data was collected from available electronical medical records. Descriptive statistics was used for demographic data. Mann-Whitney U-test or Chi-squared tests were used for group comparisons as appropriate. P value < 0.05 was considered statistically significant.
Results and Discussion: Among 1051 patients, pulmonary barotrauma occurred in 88 (8.4%) of them: Subcutaneous emphysema in 74 (83%) patients, pneumomediastinum in 68 (77.3%) and pneumothorax in 54 (67.4%) patients. Less common complications were pneumoperitoneum (9.1%) and pneumopericardium (2.3%).
Results are presented in Table 1.

	Prone positioning	Control	P value
N (%)	576	475	
Age, years, median (IQR)	66 (58-73)	70 (62-76)	< 0.001
Sex, M, n (%)	415 (72%)	314 (66.1%)	0.038
Barotrauma, n (%)	58 (10%)	30 (6.3%)	0.029
PaO2/FiO2, mmHg, median (IQR)	75 (61-90)	90 (69-150)	< 0.001
ICU LoS, days, median (IQR)	12 (8-18)	6 (2-10)	< 0.001
Hospital LoS, days, median (IQR)	21 (16-31)	17 (9-25)	< 0.001

ICU – Intensive care unit; LoS – Length of stay;

Table 1. Comparison between prone positioning and control group.

Ventilator induced lung injury (VILI) is well known term and refers to lung damage caused by mechanical ventilation (invasive or noninvasive). Most common mechanisms causing VILI are volutrauma, barotrauma, atelectotrauma and biotrauma. Prone positioning has been used for over 30 years in the management of patients with acute respiratory distress syndrome (ARDS). It improves lung oxygenation by homogeneously distributing alveolar inflation and reduces stress and strain caused by mechanical ventilation therefore decreasing the incidence of pulmonary barotrauma. However, our study showed that there was a higher incidence of pulmonary barotrauma in patients treated with prone positioning.
Conclusion: It is possible that COVID-19 induces lung injury which makes patients more susceptible to VILI.

09AP01-09
Extracorporeal membrane oxygenation patients in peripartum period: maternal and fetal outcome

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Background and Goal of Study: Extracorporeal membrane oxygenation (ECMO) is a widely used rescue treatment to patients experiencing respiratory or cardiac failure, but data on the use of ECMO in pregnant and postpartum patients is still scarce.
In this case series, we describe the clinical outcomes of seven-teen pregnant or postpartum patients that required ECMO support. Our objectives were to characterize maternal and fetal survival in peripartum ECMO and better understand ECMO-related complications that occur in this unique patient population.
Materials and Methods: Data regarding pregnant and postpartum patients treated with ECMO for respiratory or circulatory failure starting January 2020 were collected from seven medical centers in Israel. For all patients, indications for ECMO, maternal and neonatal outcomes, details of ECMO support, and bleeding complications were collected.
Results and Discussion: Seven-teen obstetric patients were treated with ECMO. 11 patients were treated with VV ECMO 5 patients were treated with VA ECMO, one patient was connected to V-V-A ECMO. Two patients were pregnant at the time of cannulation, at both cases the patient were weaned off from ECMO and the pregnancy continued, one patient gave birth at term, and the second patient was delivered at 28 weeks due to pre-eclampsia and respiratory distress. No patient was delivered while on ECMO. In the postpartum cohort, ECMO initiation ranged from immediately after delivery up to 7 days postpartum. 13 out of the 17 women survived to discharge (76 %) and all neonates but one survived (94%). Major bleeding complications requiring surgical intervention were observed in 3 patients (25%).
Conclusion(s): Survival for mother and neonate are very good with peripartum ECMO in a high-volume ECMO centers. Based on these results, ECMO remains an important treatment option for peripartum patients with cardiopulmonary failure.

09AP01-10
Improved oxygenation in prone positioning of mechanically ventilated patients with COVID-19 acute respiratory distress syndrome is associated with decreased pulmonary shunt fraction: a prospective multicenter study

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Background and Goal of Study: Prone position is used in acute respiratory distress syndrome and in coronavirus disease 2019 (Covid-19) acute respiratory distress syndrome (ARDS). However, physiological mechanisms remain unclear. The aim of this study was to determine whether improved oxygenation was related to pulmonary shunt fraction (Q's/Q't), alveolar dead space (Vd/Vtalv) and ventilation/perfusion mismatch (V'A/Q').
Materials and Methods: This was an international, prospective, observational, multicenter, cohort study, including six intensive care units in Sweden and Poland and 71 mechanically ventilated adult patients.
Results and Discussion: Prone position increased PaO2:FiO2 after 30 minutes, by 78% (83 – 148 mm Hg). The effect persisted 120 minutes after return to supine ($p<0.001$). Oxygenation index decreased 30 minutes after prone positioning by 43 % (21 – 12 units). Q's/Q't decreased already after 30 minutes in prone position by 17% (0.41 – 0.34). The effect persisted 120 minutes after return to supine ($p<0.005$). Q's/Q't and PaO2:FiO2 were correlated both in prone (Beta -137) ($p<0.001$) and in supine position (Beta -270) ($p<0.001$). V'A/Q' was unaffected and did not correlate to PaO2:FiO2 ($p=0.8$). Vd/Vtalv increased at 120 minutes by 11% (0.55 – 0.61) ($p<0.05$) and did not correlate to PaO2:FiO2 ($p=0.3$). Ventilatory ratio increased after 30 minutes in prone position by 58% (1.9 – 3.0) ($p<0.001$). PaO2:FiO2 at baseline predicted PaO2:FiO2 at 30 minutes after proning (Beta 1.3) ($p<0.001$).
Conclusion: Improved oxygenation by prone positioning in COVID-19 ARDS patients was primarily associated with a decrease in pulmonary shunt fraction. Dead space remained high and the global V'A/Q' measure could not explain the differences in gas exchange.
Acknowledgements: The Prone Covid-study group: Piotr Harbut, Francesca Campoccia Jalde, Martin Dahlberg, Anders Forsgren, Elisabeth Andersson, Andreas Lundholm, Jaroslaw Janc, Patrycja Lesnik, Michal Suchanski, Pawel Zatorski, Janusz Trzebicki, Tomasz Skalec, Mattias Günther

09AP01-11
Impact of early nutrition on outcomes of critically ill COVID-19 patients on high-PEEP non-invasive ventilation

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Background and Goal of Study: A significant portion of COVID-19 patients developed ARDS needed ICU placement and mechanical ventilatory support. Per our national guidelines, patients failing high flow nasal oxygen therapy, and without contraindications, were put on non-invasive ventilation (NIV) support in spontaneous mode with high PEEP, delivered by total-face mask, with nasogastric tube in place to for feeding and gastric air insufflation relief. Current ESPEN guidelines suggest gradual achievement of energy and protein target of 20kcal/kg and 1.3g/kg for critical patients by day 4. In those patients, both over- and under-feeding are associated with worse outcomes. COVID-19 ARDS patient nutrition was challenging from many reasons: various patient comorbidities, difficult-to-predict energy requirements, hypercapnia, organisational difficulties and staff's varying educational and clinical background. In this study we analysed the achievement of energy and protein targets in first 7 days of ICU stay of COVID-19 patients on NIV and how it affected their clinical outcomes.
Methods: In this sub-study of retrospective analysis of treatment and outcomes of NIV COVID-19 patients in our centre from October 2021 to February 2022, we analysed medical charts of consecutive 106 adult patients. We retrospectively calculated the energy and protein targets for each day, as well as the amount of enteral and parenteral preparations the patients were given, including the glucose solutions and propofol infusions. Analysed clinical outcomes included mortality, length of stay in ICU, lowering of Horrowitz index.
Results and Discussion: Patients were fed enterally, with occasional parenteral supplementation. In most of the patients, adequate intake (20% +/- of target values) was not achieved, while the proportion of over-fed was negligible. The biggest lowering of Horrowitz index (marking the clinical improvement) was in the group that achieved adequate protein intake, however, patients who reached the early targeted caloric intake on day 1 and 4 had higher mortality. Also, patient who received more calories on days 4-7 had a longer ICU stay.
Conclusion: It seems that adequate protein, but not caloric intake in early nutrition of COVID-19 NIV patients correlates with better clinical outcomes. A significant number of patients never achieved targeted intake values, and more efforts need to be put in organisation and education for more efficient clinical nutrition solutions.

09AP01-12
Sedation and analgesia in mechanically ventilated COVID-19 patients: a cohort study of clinical outcomes

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Background and Goal of Study: The SARS-CoV-2 infection is frequently associated with life-threatening organ dysfunctions, often requiring ICU admission and mechanical ventilation. Despite the proven benefits of sedation-analgesia therapies in these patients, such as buffering the sympathetic response, improvement of drive ventilation control, and prevention of patient-ventilator asynchrony, comparative evidence concerning different sedation-analgesia strategies are still scarce. Furthermore, considering the rate of the requirement of vasopressor support, sedation-analgesia strategies conducive to hemodynamic stability (as the propofol-midazolam association) could have a potential benefit in patients' clinical outcomes. We aimed to evaluate the clinical outcomes of mechanically ventilated COVID-19 patients, admitted to ICU care, and submitted to different sedation-analgesia strategies.
Materials and Methods: A single-center prospective cohort study was performed. All adult patients with ICU admission, mechanical ventilation, and SARS-CoV-2 pneumonia were eligible. Analyzed patients were divided into two groups: Propofol-Remifentanil (PR) group and Propofol-Midazolam-Alfentanil (PMA) group. The chi-square test was used for categorical variables and Kruskal-Wallis was used on continuous variables for outcomes assessment between groups. Cox regression models were also obtained.
Results and Discussion: 70 patients (mean age 65 years, 60,1% males) were eligible for the analysis (n=23 in the PR group and n=47 in the PMA group). The PMA group revealed a significantly lower SAPS III value at admission and a higher length of mechanical ventilation time and ICU length of stay when compared to the PR group. However, no differences were appreciated in other demographic and biochemical variables, or in major clinical outcomes, with both groups presenting similar 28-day ventilator and vasopressor free-days and mortality rates. Furthermore, the Cox-regression survival curve was not significantly different (HR 1.9; 95% CI 0.84-4.48, p=0.124), even when adjusted for gender, age, SOFA score at admission, and length of mechanical ventilation time.
Conclusion(s): PR and PMA sedation-analgesia therapies do not appear to have a significant impact on COVID-19 patients' mortality rate or major clinical outcomes, namely vasopressor-free days.

09AP02-01
Can 2-hour indirect calorimetry measurement accurately predict 24-hour energy expenditure in critically ill surgical patients?

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Background and Goal: Measuring energy expenditure (EE) by indirect calorimetry (IC) has become the gold standard for critically ill, ventilated patients, in order to evaluate their nutritional needs, and tailor nutrition(1). Debate remains as to the optimal duration of measurements, or the optimal time of day when to perform IC. This matter is especially important when the availability of this resource is limited(2-3).
Materials and Methods: In this retrospective observational study, we analyzed results of daily continuous IC in 270 mechanically ventilated, critically ill patients, admitted to the surgical intensive care unit in a tertiary medical center, and compared measurements performed at different hours of the day.
Results and Discussion: A total of 51,448 IC hours was recorded, with an average 24-hour EE of 1523±443 kcal/day. Night shift (00:00-8:00) was found to have a significantly lower EE measurements (mean of 1498 kcal/day, 95% CI 1445-1551), than afternoon (16:00-00:00, mean of 1526 kcal/day 95% CI 1473-1577) and morning (8:00-16:00, mean of 1539 kcal/day, 95% CI 1483-1594) measurements. These probably represent different activities that take place in our unit's daily routine. The bihourly time frame which most closely resembled the daily mean was 18:00-19:59, with a mean of 1523±434 kcal/day. Daily EE measurements of the continuous IC at days 3-7 of admission showed a trend towards a daily increase in 24-hour EE, in alignment with the hypothesis that the metabolic needs of patients in this late period of the acute phase are gradually stabilizing(4).
Conclusions: Periodic measurements of EE differ slightly in various hours of the day, but the error range is small and may not have a clinical impact. When continuous IC is not available, a 2-hour EE measurement between 18:00-19:59 can serve as a reasonable alternative.
References:
1. Cooney RN. Determining energy needs in critically ill patients: equations or indirect calorimeters. Current opinion in critical care 2012.
2. Singer P. ESPEN guideline on clinical nutrition in the intensive care unit. Clinical nutrition 2019.
3. McClave SA. Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). Journal of parenteral and enteral nutrition 2009.
4. Preiser JC. Metabolic response to the stress of critical illness. British journal of anaesthesia 2014.

09AP02-02
Kinetic estimated Glomerular Filtration Rate as an effective approach in timely diagnosis prediction of Acute Kidney Injury in critically Ill septic patients

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Background and Goal of Study: The incidence of acute kidney injury (AKI) in the Intensive Care Unit (ICU) is from 20% to more than 50% in septic patients and is associated with both short- and long-term adverse outcomes. Thus, accurate and actionable diagnosis of AKI ahead of time is important to prevent or alleviate renal dysfunction. The purpose of this study was to evaluate the timely performance of Kinetic estimated Glomerular Filtration Rate (KeGFR) in predicting AKI in critically ill septic patients.
Materials and Methods: Our work is a retrospective analysis on septic ICU patients who developed AKI using the data of AmsterdamUMCdb, the first freely available European ICU database. The reference standard classification for AKI was the Kidney Disease: Improving Global Outcomes (KDIGO), based on serum creatinine and urine output (UO). For our prediction of AKI, stages by combination of KeGFR and UO were defined. To calculate the KeGFR, a modified expression by O'Sullivan was used. Classifications were compared by length of ICU stay (LOS), need for renal replacement therapy and 28-day mortality. Predictive performance and time between prediction and diagnosis were calculated.
Results: Our cohort consisted of 2492 patients, 1560 (62.0%) of them were diagnosed with AKI by KDIGO and 1706 (68.5%) by KeGFR criteria. Disease stages had agreement of kappa=0.77, with KeGFR sensitivity 93.2%, specificity 73.0% and accuracy 85.7%. Median time to recognition of AKI Stage 1 was 13.2 h faster for KeGFR, and 7.5 h and 5.0 h for Stages 2 and 3 (Figure 1). Outcomes revealed a slight difference in LOS and 28-day mortality for Stage 1.

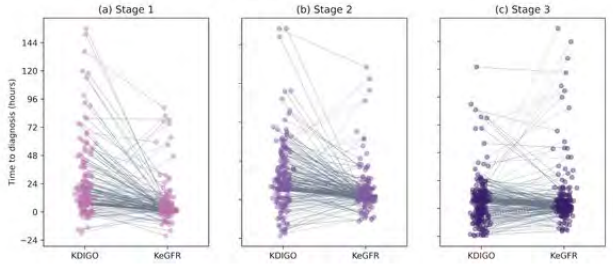

Figure 1. Paired differences between time to diagnosis of AKI by stage between KDIGO and KeGFR in the first 7 days of ICU admission.

Conclusion: According to our study, KeGFR combined with UO criteria showed a distinguished efficiency in predicting the diagnosis of AKI. Compared to KDIGO, deterioration of renal function was identified earlier, most prominently in less severe stages of AKI.
Saving time by early prediction, clinicians may better deal with prevention and alleviation of renal insufficiency in critically ill septic patients.

09AP02-03
Association between body temperature abnormalities and in-hospital mortality of septic ICU patients

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Background and Goal of Study: Numerous studies have shown that hypothermia in sepsis is associated with increased mortality, some indicated that also hyperthermia may be disadvantageous. [1]
However, most commonly body temperature (BT) was measured at ICU admission regardless of treatment initiation time.
This study was aimed to investigate association of BT during antibiotic treatment with in-hospital mortality in septic ICU patients.
Materials and Methods: Retrospective analysis of electronic database MIMIC-IV was performed.[2]
According to Sepsis-3 criteria ICU septic patients who received antibiotic at diagnosis were identified. For each patient time-averaged BT during antibiotic treatment (ABT) was calculated. To examine whether ABT was associated with in-hospital mortality, logistic regression was applied to ABT ranges with adjustment for potential confounders. For data extraction and statistical analysis SQL and SPSS 29.0 were used, respectively.
Results and Discussion: Among 25,956 ICU patients included in the study 3,896(15%) died during hospital stay. Patients were treated with antibiotics for 37(IQR 17-88)h, BT was measured 13(IQR 6-28) times during treatment. U-shaped association between ABT and hospital mortality was observed (Figure.1).

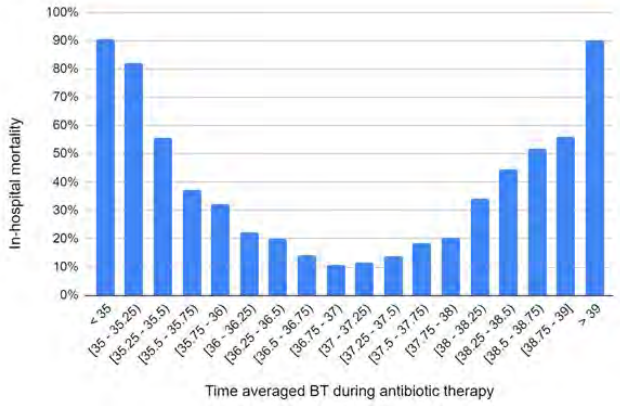

Figure 1.

The lowest mortality was noted for ABT ranges 36.75-37°C: 10.7% and 37-37.25°C: 11.4%. Risk of in-hospital mortality was significantly increased for all ABT ranges other than reference range of 36.5-37.5°C (Tab.1).

Time averaged BT, °C	No. of patients	Crude mortality rate	Crude OR (95% CI)	P	OR (95% CI) adjusted for age and SOFA	P
<35.5	155	76.8%	23.6 (16.2 – 34.3)	<0.01	19.8 (13.4 – 29.3)	<0.01
35.5-36.5	3412	22.6%	2.08 (1.9 – 2.2)	<0.01	1.8 (1.7-2.0)	<0.01
36.5-37.5	19958	12.3%	1		1	
37.5-38.5	2355	21.4%	1.9 (1.7 – 2.2)	<0.01	2.5 (2.2 – 2.8)	<0.01
>38.5	76	63.2%	12.2 (7.7 – 19.5)	<0.01	15.1 (9.2 – 24.6)	<0.01

Table 1. Risk of in-hospital mortality

Conclusions: Both hypothermia and hyperthermia during antibiotic treatment are associated with increased in-hospital mortality of ICU septic patients. Average body temperature of 36.75-37.25°C is associated with the lowest in-hospital mortality.
References:
1. Shen Y, et al. 2020, DOI:10.1186/s13054-020-03263-0.
2. Johnson A, et al. 2022, DOI:10.13026/rrgf-xw32.

09AP02-04
Acylcarnitine profile in survivors of a prolonged versus a short stay in ICU

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Background and Goal of Study: In a previously published study [1], we described an abnormal acylcarnitine (AC) profile in survivors of a prolonged stay in intensive care unit (ICU). However, it is unknown if ICU survivors have a different AC profile after less severe disease and shorter ICU stay. This observational study aimed to compare AC profile of ICU survivors of a prolonged versus a short stay.
Materials and Methods: Consecutive adults who survived an ICU stay < 7days after an elective cardiac surgery between November 2021 and March 2022 were recruited (short stayers, SS). For each SS, 1 to 2 long stayers (LS), matched for gender and age, were recruited among patients enrolled in our post- ICU follow-up program targeting survivors of an ICU stay ≥ 7days. Exclusion criteria were treated HIV infection and ongoing treatment with valproate, cyclosporine or cisplatin. In both groups, AC profile was determined during the week following ICU discharge by liquid chromatography with tandem mass spectrometry.
Results and Discussion: 50 SS (80% men, age 70.9 (65-77.6) years, SAPS II 23 (18-26.7)) survived an ICU stay of 2 (2-3) days and were evaluated 4 (2-5) days after ICU discharge. They were matched to 85 LS (21.2% men, age 68 (63-73) years, SAPS II 40.5 (29-54.5)) who survived an ICU stay of 11 (8-15.5) days. In ICU, 2/85 (2.3%) LS benefited from renal replacement therapy, while 58/85 (68.2%) received propofol. AC profile was assessed 6 (4-8) days after ICU discharge in LS. Their AC profile was significantly different.

The sum of C3, C4 and C5 derivates was higher in LS: 1.520 (1.178-1.974) vs 1.185 (0.932-1.895) μmol/l (p<0.001). The long-chain ACs were lower in LS: 0.830 (0.660-1.105) vs 1.090 (0.935-1.293) μmol/l (p<0.001).

Carnitine (C0) concentration was similar in LS and SS: respectively 50.79 (38.22-62.93) vs 45.58 (39.2-55.75) μmol/l (p=0.072). No carnitine deficiency was observed in either group. Their total AC/C0 ratio was also similar: respectively 0.355 (0.268-0.415) and 0.358 (0.289-0.417) (p=0.391). A ratio > 0.4 (representing, by definition, a disturbed mitochondrial metabolism) was observed in 26/85 (30.6%) LS and in 15/50 (30%) SS (p<0.999).

Conclusion(s): Survivors of a prolonged ICU stay differed from SS after a scheduled cardiac surgery in terms of short-chain and long-chain ACs. Short-chain ACs concentrations were higher in LS, suggesting a higher protein catabolic rate, while long-chain ACs concentrations were lower, suggesting an altered mitochondrial beta-oxidation.

Whether these findings correlate with the impaired exercise tolerance and the related mitochondrial dysfunction observed in ICU survivors should be further explored.

References:

1. Rousseau AF, Schmitz S, Cavalier E, Misset B, Boemer F. Altered Serum Acylcarnitines Profile after a Prolonged Stay in Intensive Care. Nutrients. 2022;14.

Free carnitine (C0) concentration (normal range 14.95-84.34 µmol/l) decreased from 45.89 (35.80-127.5) to 28.73 (20.31-38.93) µmol/l (p<0.001). C0 deficiency was not observed at T0 and in 7/64 (11%) survivors at M3.

The sum of short-chain ACs (C3, C4 and C5) (normal range 0.270-4.071 µmol/l) decreased from 1.310 (0.927-1.829) at T0 to 0.945 (0.709-1.127) µmol/l at M3 (p<0.001). The long-chain ACs (normal range 0.195-1.295 µmol/l) were similar at T0 and M3, respectively 0.812 (0.579-1.065) and 0.825 (0.582-1.020) µmol/l (p=0.845).

The total AC/C0 ratio (normal ≤ 0.4) was 0.33 (0.24-0.39) at T0 and reached 0.39 (0.30-0.56) at M3 (p=0.001). A ratio >0.4 was observed in 16/64 (25%) at T0 and in 32/64 (50%) at M3 (p=0.006).

Conclusion(s): In patients surviving a prolonged ICU stay, occurrence of C0 deficiency increased within the 3 months following discharge. The concomitant decrease in short-chain ACs may suggest a progressive resolution of protein catabolism. On the contrary, the increasing proportion of abnormal AC/C0 ratio may reflect a worsening of mitochondrial function, as suggested by published observations of mid-term exercise intolerance in ICU survivors.

References:

1. Rousseau AF, Schmitz S, Cavalier E, Misset B, Boemer F. Altered Serum Acylcarnitines Profile after a Prolonged Stay in Intensive Care. Nutrients. 2022;14.

09AP02-05
Mid-term acylcarnitine profile evolution in survivors of a prolonged ICU stay

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Background and Goal of Study: In a previous study [1], we observed an abnormal acylcarnitine (AC) profile in survivors recently discharged from in intensive care unit (ICU) after a prolonged stay. Whether such alteration persists over time is unknown. This observational study aimed to describe the mid-term AC profile evolution in survivors of a prolonged ICU stay.

Materials and Methods: Adults who survived an ICU stay ≥ 7days between September 2020 and March 2022 were included if they were enrolled in our follow-up program and if they attended the consultation 3 months (M3) after ICU discharge.

Exclusion criteria were known primary carnitine deficiency and ongoing treatment with zidovudine, valproate, cyclosporine or cisplatin. Serum AC concentrations, determined by liquid chromatography with tandem mass spectrometry, were assessed as routine practice during the first 7 days following ICU discharge (T0) and at the M3 consultation.

Results and Discussion: A total of 64 survivors (69% males, age 63 (50-69) years, SAPS2 33 (26-54)) were analyzed, after an ICU stay of 15 (9-24) days for mixed medical (34/64, 53%) and surgical diseases. During ICU stay, 46/64 (72%) patients were sedated using propofol, and 10/64 16%) were fed at least partly by parenteral route during 7 (4-9) days.

09AP02-06
Prediction of success of spontaneous breathing trial and extubation using heart rate variability indices in patients admitted to neurosurgical intensive care unit

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Background: One of the most challenging problems in ICU is weaning from mechanical ventilation. Cardiopulmonary stress can result in a failed weaning trial. Monitoring the autonomic nervous system provides information about the pathophysiological imbalance within the cardiovascular system.

Goal: To assess the usefulness of heart rate variability indices to predict the success of spontaneous breathing trial and extubation.

Materials and Methods: This is a prospective observational study conducted on 54 intubated and mechanically ventilated neurosurgical patients in ICU over a period of 10 months.

Patients aged 18-65 years,mechanically ventilated for more than 48 hours were recruited. Written informed consent was taken from legal surrogate. Patients on rate controlling drugs, pregnancy, low ejection fraction,who do not consent were excluded.

Decision for spontaneous breathing trial (SBT) taken by the treating intensivist, SBT was attempted.

Parameters-Heart rate (HR), Non invasive blood pressure (NIBP) HRV indices-LF, HF, LF/HF, TINN, 1/RRtri, Total power (TP), Autonomic dysfunction%, (AD%) were recorded using DyAnsys® devices the four timepoints.

Timepoints:

T1-At 48 hours of mechanical ventilation

T2-At the beginning of the first planned SBT

T3-At the end of the first planned SBT

T4-24 hours prior to planned extubation

Statistical analysis: Data collated offline in Microsoft excel spreadsheet and analysed using r software. Interval scale variables were presented as medians and interquartile ranges. Analysis for primary objective was done by creation of binary Logistic Regression model. Results presented as odds ratios with confidence intervals. P value <0.05 were taken as statistically significant.

Results and Discussion:

1. Of the total patients (n=54),31 patients passed the first planned SBT,23 patients failed the first SBT.
2. Out of the 31 patients who successfully passed the first SBT, 28 were successfully extubated and 3 patients were reintubated within 48 hours.
3. HR, NIBP, LF, HF, LF/HF, TINN, I/RRtri were not statistically significant in predicting SBT or extubation.
4. However AD% (AD% >17.5%, p value=0.002, Sensitivity=90%), TP (TP>4444, p value=0.037, sensitivity=74%) at T1 could predict SBT failure.
5. Patients trending towards worsening of sympathetic function before initiation of SBT had chances of SBT failure (T2-T1 difference>5.5, p value=0.03, Sensitivity=94%)
6) Patients having early autonomic dysfunction (AD%>16.5%, p value=0.03, sensitivity=81%) at T1 had higher chances of extubation failure.

Conclusion: Monitoring autonomic function is a simple, repeatable, noninvasive and reproducible test in addition to the standard parameters to predict weaning and extubation in neurosurgical patients. It empowers the intensivist with adequate information to anticipate and formulate plans tailored for individual patients. A larger sample size is needed for in depth understanding of autonomic function in weaning and extubation.

09AP02-07
Electroencephalogram-derived indices for sedation monitoring in the intensive care unit: a systematic review

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Background: ICU patients often require sedation (S) and analgesia for mechanical ventilation (MV). Current observational sedation scales are used to titrate S. Neurophysiology has been proposed to titrate more accurately the depth of sedation. This review aims to assess the correlation between electroencephalogram-derived (ED) indices and S scales in the assessment of mechanically ventilated ICU patients. Additionally, we assessed the ED monitoring effects on the S drugs dosage.

Methods: The databases searched include PubMed, Cochrane Library, Ovid, SpringerLink, and Cible+ from the year 2000 onwards. We included studies comparing any ED monitoring to clinical assessment for adult ICU patients under MV. 15 studies were included (Figure 1 & Table 1). A meta-analysis using the correlation coefficient (the Pearson or the Spearman Rho) was done. It was performed using an inverse variance method and a random-effects model. A mean value of Fisher's z with a 95% confidence interval was computed and a Forest plot (Figure 2 & Table 2) was produced.

Results: The global analysis demonstrated that clinical scales showed significant correlation with ED indices ($R^2 = 0.52$, $p<10^{-4}$ & $R^2 = 0.58$, $p<10^{-4}$). Ramsay score showed a higher correlation ($R^2 = 0.62$, $p<10^{-4}$) than Sedation-Agitation Scale ($R^2 = 0.25$, $p<10^{-4}$ and $R^2 = 0.36$, $p<10^{-4}$). No difference was observed in the dosage of sedatives to the ED monitoring group and the control group. But, there was a significant difference in the amount of sedatives given over time.

Conclusion: All S scales significantly correlated with ED indices. Insufficient evidence was found demonstrating a clear benefit of ED indices over clinical assessment of S in MV ventilated ICU patients due to the limited number of studies and low quality of evidence. However, electroencephalogram-based monitoring could be used as an additional tool when sedative scales cannot be used.

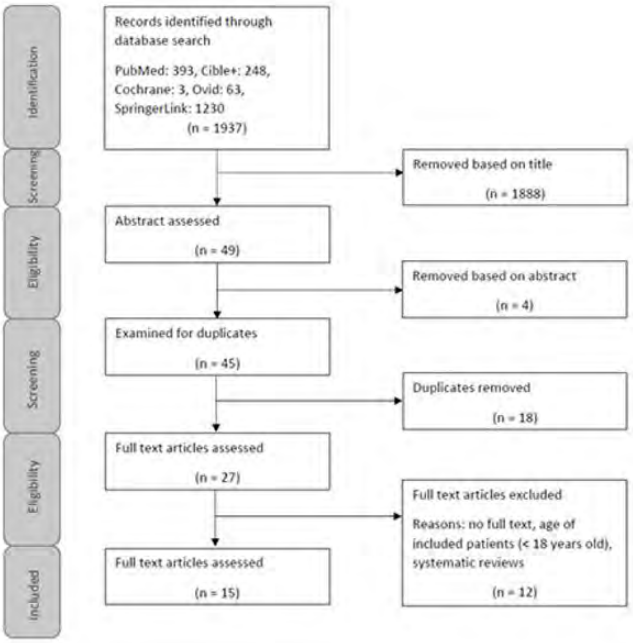

Figure 1. PRISMA flowchart of the literature search and study selection.

Reference	Study type	Study period	Hospital	Number of beds in the ICU	Type of ICU
De Wit et al. (13)	P, CS, SB	NR	NR	NR	NR
Yaman et al. (4)	P, CS	24h	NR	NR	NR
Haenggi et al. (6)	P	NR	Bern University Hospital	NR	NR
Mandello et al. (14)	P, CS	24h	NR	NR	NR
Wang et al. (15)	P, Multicentre validation study, SB	24h	Daxing Teaching Hospital, Beijing Tiantan Hospital, Beijing Electric Power Hospital, Fujian Provincial Clinical College Hospital	NR	General, General, General, Surgical ICU
Consales et al. (16)	P	NR	NR	NR	NR
Mondello et al. (17)	P, CS	24h	NR	NR	NR
Hernández-Gancedo et al. (18)	P	NR	NR	NR	NR
Arbour et al. (19)	P, CS, SB	6-29h, avg. 23h	Christiana Hospital	12	Medical ICU
Haenggi et al. (20)	P	24h or until extubation	Bern University Hospital	NR	NR
Frenzel et al. (21)	P, CS	NR	NR	NR	Surgical ICU
Schneider et al. (22)	P, CS, SB	NR	NR	NR	Surgical ICU
Weatherburn et al. (7)	P, RCT	NR	Alfred Hospital, Melbourne, Victoria, Australia	NR	General ICU
Walsh et al. (23)	P, CS, SB	Up to 72h	NR	NR	NR
Simmons et al. (9)	P, CS	1-4.5h	NR	32	Multidisciplinary

CS = Convenience Sample; NR = Not reported; P = Prospective; RCT = Randomised Control Trial; SB = Single blind

Table 1. Study characteristics.

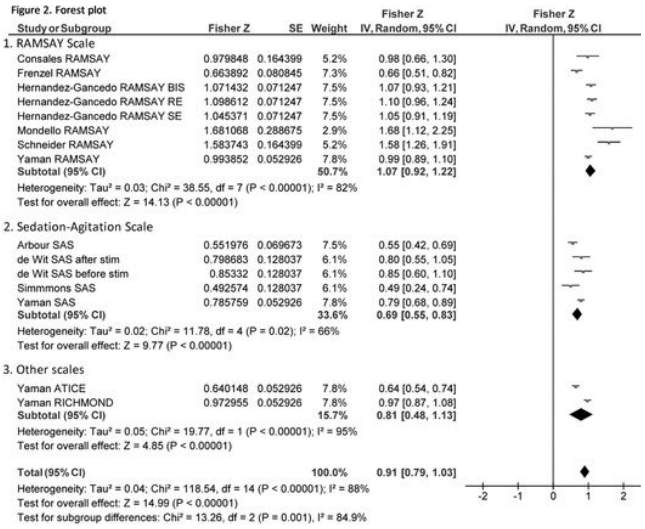

Figure 2. Forest plot.

	Fisher's z	R^2	p-value
Global analysis	0.91 [0.79 – 1.03]	0.52 [0.43 – 0.59]	p<0.00001
Ramsay scale	1.07 [0.92 – 1.22]	0.62 [0.53 – 0.70]	p<0.00001
Sedation-agitation scale	0.69 [0.55 – 0.83]	0.36 [0.25 - 0.46]	p<0.00001
Other scales	0.81 [0.48 – 1.13]	0.44 [0.19 – 0.65]	p<0.00001
Test for sub-group difference – Chi^2=13.29 – p<0.001			

Table 2A. Fisher's z to R^2 conversion - Data as mean [95% CI]

	Fisher's z	R^2	p-value
Global analysis	1.00 [0.79 – 1.22]	0.58 [0.43 – 0.70]	p<0.00001
Ramsay scale	1.07 [0.88 – 1.25]	0.62 [0.49 – 0.71]	p<0.00001
Sedation-agitation scale	0.55 [0.42 – 0.69]	0.25 [0.15 - 0.35]	p<0.00001
Test for sub-group difference – Chi^2=19.49 – p<0.0001			

Table 2B. Fisher's z derived only from Spearman rho to R^2 conversion - Data as mean [95% CI]

09AP02-08
Predictors of mechanical ventilation dependency in elderly intensive care unit patients - a prospective observational study

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Background and Goal of Study: The population is aging, and this phenomenon affects intensive care units. Up to 60% of ICU hospitalized patients require ventilatory support, invasive mechanical ventilation (IVM) being the most frequently used therapy. In elderly ICU patients deciding the optimal timing for extubation is challenging, and clinical predictors are not very accurate.
We aimed to determine the incidence of failed extubations in elderly patients and identify associated factors.
Materials and Methods: In this prospective observational study, 113 patients aged 65 years or older, who required mechanical ventilation for > 48 hr, were screened for weaning success or failure. Exclusion criteria included paraplegia, tracheostomy, or planned non-invasive ventilation (NIV) after extubation. We recorded clinical characteristics and demographic profiles. Blood gas parameters and serum biochemistry, collected 24 hours after attachment to the mechanical ventilator and before weaning, were compared between patients who required reintubation and those who did not. Weaning success means no need for reintubation or non-invasive ventilation for 48 hours after extubation. The primary endpoint was to evaluate the reintubation rate. The secondary endpoint was to identify the predictors of extubation failure. We analyzed collected data using SPSS Statistics 26.
Results and Discussion: We documented 113 extubation attempts, of which 84 (74,3%) were male, with a mean age of 73 (±8) years and a median of 114 [92-211] and 93 [80-174] hours on IVM in the successful and failed group, respectively. Of these patients, 23 (20,3%) required reintubation within 48 hours. Hypoxia (52,1%) and hypercapnia (34,7%) were the primary indications for reintubation. The mean time to reintubation was 26.8 h (median 17.4; 4,6–29,3).
Patient demographic factors and other premorbid and comorbid medical conditions did not significantly influence our study's reintubation rates.
Binomial logistic regression revealed that independent predictors of the need for reintubation were: pH (p =0.03), serum albumin (p=0.01), and PaCO2 rise 12 hours after extubation (p =0.01).
Conclusion(s): The presence of acidemia, hypoalbuminemia at admission, and PaCO2 rise in the initial 12 hours after extubation predict the need for reintubation in elderly intensive care unit patients. Age, in and of itself, is not a predictor of weaning from mechanical ventilation.

09AP02-09
"Power of ventilation" (POV) and flow-controlled ventilation: new target for Ventilator-Induced Lung Injury (VILI)

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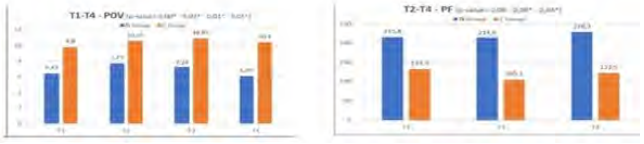
Background and Goal of Study: Mechanical ventilation is required to treat several pulmonary and extra-pulmonary conditions, among which Acute Respiratory Distress Syndrome (ARDS). However it may cause lung damage by itself. Ventilator-Induced Lung Injury (VILI) and ARDS share some common pathophysiological mechanisms. Power of ventilation (POV) estimates energy dissipation by the lung during mechanical ventilation. It synthesizes all mechanisms of VILI in one single parameter. Currently flow-controlled ventilation (FCV) is the only technique able to reduce POV. This is obtained by an active expiratory phase, differently than conventional ventilation modalities. The aim of the study is to evaluate the efficacy of FCV in the reduction of POV, resulting in a lower risk of VILI in ARDS patients.
Materials and Methods: Patients diagnosed with a mild, moderate or serious ARDS, according to Berlin criteria, also Covid-related, were enrolled in the study. Subjects sedated and curarized, who received controlled ventilation by intubation or tracheostomization for at least 24 hours, were included. All patients received 3 hours trial of FCV by means of EVONE®Ventilator (Ventinova Medical). We measured POV by Gattinoni's formula (Energy Calculator V.1.2.7. by P. Hermann) and PO2 FiO2 ratio at five different timepoints: T0 (before the beginning of the trial, during conventional ventilation), T1 (one

hour after the start of the trial), T2 (after two hours), T3 (after three hours, at the end of the trial) and T4 (one hour after the end of the trial, with conventional ventilation).

Results and Discussion: Twelve patients with ARDS were included. Two groups were defined: N (NON COVID ARDS related) and C (COVID ARDS related). The mean age was 69 ± 4,45, the mean BMI was 28,5 ± 2,59 kg/m² and male female ratio was 5/1. The results are presented as mean and standard deviation. P-value was considered significant.

POV (l/min)	N (6)	C (6)	P-value
T0	11,1 ± 4,67	20,21 ± 2,55	**0,001**
T1	6,431 ± 0,88	9,81 ± 2,47	**0,00**
T2	7,73 ± 1,07	10,551 ± 42,28	**0,02**
T3	7,24 ± 1,78	10,85 ± 2,25	**0,01**
T4	6,09 ± 2,24	10,4 ± 2,64	**0,01**

PF RATIO	N (6)	C (6)	P-value
T0	186,16 ± 55,3	112,33 ± 39,4	**0,023**
T2	215,8 ± 75,83	133,37 ± 2,68	**0,08**
T3	214,6 ± 77,18	105,1 ± 26,64	**0,00**
T4	228,3 ± 106,95	122,5 ± 38,18	**0,04**



Conclusion(s): FCV appears to be effective to reduce POV during mechanical ventilation, representing a protective ventilation modality. Furthermore it seems to improve pf ratio in both groups of patients affected bay ARDS.

09AP02-10
Challenges in recruitment to Acute Respiratory Distress Syndrome (ARDS) trials

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Background: Obstacles exist for recruitment of intensive care patients into clinical trials[1]. We explored recruitment rates and reasons for exclusion for ARDS studies at a large University teaching hospital.

Methods: Data were extracted from screening logs and research databases for three ARDS trials (PHIND, SEAL, REALIST) between 12.10.2020 and 31.10.2022. Reasons for exclusion were categorised into consent issues, inclusion criteria no longer fulfilled at the time of randomisation, comorbidities, DNACPR order in place, patient palliated or died and logistic reasons.

Results: 110 screening events were analysed. 22 recruits were achieved. 14 patients were screened for more than one study. Two patients were recruited into two studies. In 88 cases, no recruitment was achieved. Consent issues were the main reason for exclusion (26.1%). Consent was declined in 20 cases; and consent was not provided in 3 cases within the study-specific recruitment window. In 22 cases the patient's clinical situation changed so that the inclusion criteria were not fulfilled any longer. Typically the clinical condition improved, less often palliation or death precluded recruitment. Comorbidities led to exclusion in 10 cases. Logistic reasons led to 9 exclusions.

Discussion: Consent issues and changes in clinical condition were the commonest reasons for exclusion into research studies. Although patients and public stakeholders widely support the consent models in use for patients lacking capacity[2], relatives commonly declined consent for research participation. Clinical changes in acutely ill patients during the consent process commonly exclude patients from study participation.

Conclusion: Despite general acceptance of currently used consent processes[2], relatives often decline participation in ARDS studies. Changes in patients' clinical condition commonly lead to recruitment failure. The use of waived or deferred consent and professional legal representatives may increase recruitment numbers in emergency situations. Reasons why personal consultees decline consent for ARDS studies and how to optimise recruitment windows need to be explored.

References:

1. Pattinson N, et al. J Intensive Care Soc 2017;18(1):36–6.
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09AP02-11
Safeness of Apnea Test for determining of brain death: a retrospective data analysis

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Background and Goal of Study: Apnoea test is a fundamental part of protocol for determining brain death using clinical criteria. Literature on its clinical impact is limited. The aim of this study was to investigate its safeness, evaluating minor or major clinical changes.

Materials and Methods: We performed a single-center retrospective analysis of patients undergoing brain death determination using clinical criteria from January 2019 to October 2022 at University hospital in Messina, Italy. Two apnoea tests are required by Italian law. Hemodynamic and respiratory parameters were evaluated during the tests. Mean arterial pressure, vasopressors dose, serum lactate, PaO2, PaCO2, P/F, heart rate, pH before and after apnoea test were analysed, using paired T-test. The association between SAPS II and delta MAP pre-/post-test, and between SAPS II at the day of brain death and Delta Noradrenaline infusion rate pre-/post-test, were evaluated using Pearson correlation test.

Results and Discussion: Fifty-seven patients were enrolled (56% male). There were significant changes in heart rate during the first test (86.7 ±78.77 vs 90.63 ±20.51 bpm, p= 0.23 (95% CI 0.6076; 7.892), P/F value in both (259.8 ±132.03 vs 201.57±153.37, p=0.23, 95% CI 107.5; 27.52 and 327.35 ± 243.25 vs 211.58 ±141.01, p=0.0017, 95% CI 92.54;22.47), Noradrenaline infusion rate (0.2 ±0.2 vs 0.35 ±0.24 mcg/Kg/min, p=0.0001, 95% CI 0.09402; 0.1884)

We report a case of arrhythmia, 3 cases (2.6% of tests) of hypotension during II apnoea test, requiring introduction of noradrenaline.

There was no correlation between SAPS II vs Delta MAP (r=0.26 -95% CI 0.07884; 0.5469) and SAPS II and Delta Noradrenaline rate infusion (r=0.03 - 95% CI 0.1677, 0.2817).

Conclusions: Apnoea test appears to be safe, but his impact on patients who are undergoing clinical brain death diagnosis is not completely harmless and could potentially affect systemic homeostasis and organ function.

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1. Baik SM, et al. Optimal duration of the apnea test for determining brain death: Benefit of the short-term apnea test. PLoS One. 2022 Jul 28
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Acknowledgements: ICU Team and Chief at Policlinico G.Martino, Prof A. David

09AP03-02
Rhodotorula mucilaginosa fungemia in an infected biloma patient following a traumatic liver injury

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Background: Fungemia due to *Rhodotorula mucilaginosa* is rare and highly resistant to antifungal therapy.
Case report: A 31-year-old immunocompetent man admitted to our ICU sustaining grade IV liver injury with right hepatic vein thrombosis and hemoperitoneum after being involved in a motor vehicle accident. He underwent laparotomy for evacuation of clot. Postoperatively in the ICU, despite on piperacillin-tazobactam and fluconazole, his septic parameters did not improve.
A repeated CT abdomen revealed infected biloma at the devascularised subcapsular region of the liver. Repeated fungal and blood culture revealed *R. mucilaginosa* and *Klebsiella oxytoca* respectively.
After consultation with clinical microbiologist and infectious disease physician, he was treated with IV amphotericin B and IV meropenem for *R. mucilaginosa* and *K. oxytoca* respectively. Percutaneous subdiaphragmatic drain were performed sonographically to drain the biloma. His clinical parameters slowly improved and was able to wean from mechanical ventilation.
Discussion: Biloma is a rare abnormal bilious collection of either intrahepatic or extrahepatic and has the propensity to get infected. Approximately 16% will have bacteraemia at the time of biloma diagnosis. *R. mucilaginosa* is of low virulence, which can be found as normal flora in respiratory, gastrointestinal, genitourinary tracts and skin.
It was previously considered non-pathogenic but during the last few decades, it has emerged as an opportunistic agent and is associated with crude mortality of 20% [1].
Previous antibiotic therapy, parenteral nutrition, and abdominal surgery were found as risk factors of *R. fungemia* [2].

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2. Spiliopoulou A, Anastassiou ED, Christofidou M. Rhodotorula fungemia of an intensive care unit patient and review of published cases. Mycopathologia 2012;174:301–309

Learning Points: In this case we have demonstrated that an immunocompetent host may be susceptible to these infections following an abdominal surgery and commencement of broad-spectrum antibiotic therapy.
Early surgical intervention for source control along with adequate dosing and targeted antifungals are essential to ensure a good outcome.

09AP03-03
Euglycemic diabetic ketoacidosis in a diabetic patient on SGLT2i

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Background: Diabetes ketoacidosis (DKA) is defined by hyperglycaemia, high AG metabolic acidosis and ketosis. Euglycemic diabetic ketoacidosis (euDKA) is defined by relative euglycemia (serum glucose < 200 mg/dL).
SGLT2 inhibitors (SGLT2i) improve serum glucose and cardiovascular mortality, but they are implicated in euDKA.
We report an euDKA after cholecystectomy in a diabetic patient on SGLT2i.
Case report: A 63 year-old man. Hypertension on ACEI, dyslipidemia, ischemic heart disease and DM type II on metformin and SGLT2i.
Two hours after an emergency cholecystectomy he presents tachycardia, tachypnea and malaise. A VBG showed an elevated AG metabolic acidosis: pH 7,13, HCO3 7 mmol/L, anion GAP 23 mmol/L, lactate 1,9 mmol/L, pCO2 21 mmHg, glycaemia 172 mg/dl. He was confused, with signs of dehydration and thirst, without fever, signs of sepsis or pain.
We started 100 mEq bicarbonate 1M i.v bolus and bicarbonate 1/6M infusion, crystalloid fluid resuscitation and insulin 0,05 units/kg/h.
Symptoms and blood gas improved:

- 3 hours later VBG: pH 7,25, HCO3 13,2mmol/L, anion GAP 19mmol/L, lactate 1,6mmol/L, pCO2 26mmHg, glucose 150mg/dl.
- He was less confused, eupneic and feeling better. In the first 6h polyuria (3L) was present.

An acute kidney failure, ethanol or others drugs were excluded. Urinary test revealed 2000 mg/dl (0-10mg/dl) glucose and methyl ethyl ketone (MEK) 80mg/dl (0-5mg/dl). An euDKA induced by SGLT2i dapagliflozin was diagnosed.
Laboratory close monitoring of acidosis was conducted for 24h in ICU. He remained on the ward with iv bicarbonate 1/6M for 2 days and was discharged 3 days later.
Discussion: EuDKA must be present in the differential diagnosis of high AG metabolic acidosis, mainly in diabetic patients. Risk factors are: use of SGLT2i, fasting, surgery, infection, fever. The absence of hyperglycaemia could delay the diagnosis and treatment which could lead into an awful outcome.
Serum beta-hydroxybutyrate is the most recommended diagnostic tool, but it is not available in our hospital, so we use urine MEK. Treatment should be provided as soon as possible, starting with crystalloid fluids resuscitation and insulin.

Reference:
1. Bonora BM, Avogaro A, Fadini GP. Euglycemic Ketoacidosis. Curr Diab Rep.2020 July;20(7):25.

Learning Points: EuDKA must be considered in the differential diagnosis of a metabolic acidosis in patients with DM and risk factors. SGLT2i must be stopped 24h before elective surgery to prevent euDKA(1).

09AP03-04
Citrate induced lactic acidosis in a patiente with septic shock – case report

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Background: When providing Renal Continous Replacemente Therapy (CRRT) an anticoagulation strategy is mandatory, consisting of non fraccioned heparin (systemic) or regional anticoagulation with citrate (RAC) (1). Usually the last one is the first option, preventing the formation of cloths in the circuit, without increasing the risk of hemorrhage; however, it is not exempt of complications, like calcium disorders or metabolic alkalosis.
Case report: A 72-year old male patient is admitted for a scheduled left hemicolectomy. On the sixth day after surgery he presents with worsening general state and hypotension, so he is admitted to our ICU, with the diagnosis of bacteremia-associated septic shock. He was hemodynamically unstable, despite initial fluid administration, requiring noradrenaline at 0.6 mcg/kg/min and vasopressin at 0.6 UI/h. During his first 24 hours he developed oliguria, so CRRT was started, using the oXiris filter (adsorptive membrane). Anticoagulation with citrate was chosen.
Twelve hours after the patient presents progressive lactic acidosis (peak lactate of 15 mmol/L) and an elevated anion gap (17 mEq/L). Liver failure was then suspected (increased hepatic enzymes) and anticoagulation changed for non-fractioned heparin. After stopping the citrate, the acidosis resolved, and the lactate felt to 2.3 mmol/L.
Discussion: Patients with hepatic failure can have alterations in citrate metabolism, leading to sever lactic acidosis and low calcium levels; correct identification of the patients who are at risk of complications (liver enzymes >1000 UI/L or patients with cardiogenic shock and serum lactate > 8 mmol/L) allow to choose the best anticoagulation strategy. It is mandatory to monitor electrolytes (including total calcium/ionic calcium relationship) (2). RCA should be suspended if citrate accumulation is suspected (unexplained anion GAP increase , worsening of metabolic acidosis and total calcium/ionic calcium relation > 2.5)
References:
1. Schneider et al. Complications of regional citrate anticoagulation: accumulation or overload? Critical Care 2017 21:281
2. Bai et al. Citrate versus heparin anticoagulation for continuous renal replacement therapy: an updated meta-analysis of RCTs. Intensive Care Med. 2015 Dec;41, 2098-110
Learning Points:
- Electrolyte monitoring in RCA is important to detect complications
- In selected patients, a strategy with NFH might be the best option.
- If citrate accumulation is suspected, RCA should be stopped.

09AP03-05
Multifocal mycotic aneurysms complicating bivalvular bacterial endocarditis

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Background: Mycotic aneurysms (MA) are a known complication of infective endocarditis (IE). Intracranial mycotic aneurysm occurs in less than 5% of patients with IE, with only a minority of developing multiple aneurysmal loci. Intracranial MA is associated with a high mortality, 20% if unruptured but up to 80% if ruptured. 1,2. We describe a case of subarachnoid haemorrhage (SAH), multi-focal peripheral MA, in bivalvular IE.
Case report: A 68 year old man with a 6 month history of lethargy, weight loss and night sweats of uncertain aetiology presented to Intensive Care with a seizure and reduced consciousness. CT head revealed a left SAH. A systolic murmur, enlarged spleen and splinter haemorrhages were noted. Transthoracic echo demonstrated destruction of both aortic and mitral valves consistent with IE. He developed a compartment syndrome in his right forearm, and a MA of his ulnar artery was later found and repaired. He underwent successful mitral and aortic valve replacements. He also developed MA of common femoral and proximal external carotid arteries which required surgical repair after valve replacements. The patient survived and has made a full recovery.
Discussion: Mycotic aneuyrsm pathogenesis is believed to be due to vascular adventitial inflammation, leading to weakening of areas of vessels, most frequently in the cerebral circulation, the visceral arteries and less commonly, peripherally.3 Management can complex or conservative with prolonged courses of antibiotics, endovascular management or surgical debridement. Peripheral MA need to be considered for presentation of peripheral pain.
References:
1. Peters RJ, Harrison T, Lennox JL. A dangerous dilemma: management of infectious intracranial aneurysms complicating endocarditis. The Lancet. Infectious diseases 2006;6:742-8
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3. Kuo I, Long T, Nguyen N, et al Ruptured Intracranial Mycotic Aneurysm in Infective Endocarditis: A Natural History. Case Reports in Medicine 2010:168408
Learning Points:
- An intracerebral bleed may be a presenting condition for patients with undiagnosed IE.
- Peripheral MA can occur and may produce a compartment syndrome if they rupture so should be considered with prompt imaging and treatment to prevent neurological sequalae.

09AP03-06
Nutrition management in a severe case of hyperemesis gravidarum complicated by central pontine myelinolisis

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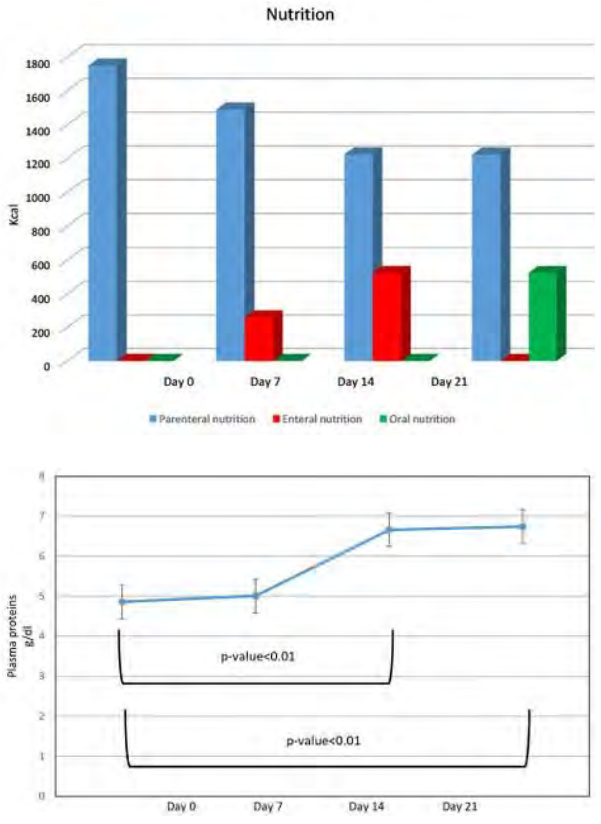
Background: Hyperemesis gravidarum is a syndrome characterized by intractable nausea and vomiting during the first trimester of pregnancy, with severe nutritional deficiency. One of its worst possible consequences is central pontine myelinolisis.
Case report: A 5 weeks pregnant (29 years old) was admitted to our ICU with diagnosis of hyperemesis gravidarum with cerebral pontine myelinolisis detected by a cerebral MRI. At ICU admission she weighed 61 kg (weight loss≈12%) and laboratory tests showed these values: Sodium 140 mmol/l, Potassium 2.9 mmol/l, Calcium 8.3 mmol/l, Phosphorus 2.7 mmol/l, Albumin 2.43 g/dl, Plasma proteins 4.8 g/dl, Triglycerides 224 mg/dl and Nitrogen balance 2.3 g/dl (mNUTRIC SCORE=6). During Non-Invasive Ventilation she started electrolytes correction and parenteral nutrition (SmofKabiven). 25 kcal/kg/die were calculated by Harris-Benedict equation.
At 3rd day respiratory failure got worse and the pregnant was intubated and mechanically ventilated. The enteral nutrition was started (Fresubin Hp Energy), combined with parenteral one; at 7th day the tracheostomy was performed and she started the respiratory weaning.
At 21st day the woman was in spontaneous breathing(mNUTRIC SCORE=2) and she started the oral nutrition after one week of physiotherapy treatment for dysphagia and psychokinetic therapy. The normal morphological development of fetal growth parameters was detected by ultrasound follow-up.



Discussion: During the ICU patient's recovery, parenteral, enteral and oral nutrition were differently combined; however indirect calorimetry couldn't have been use for a precise calculation of resting energy expenditure.
Learning Points: Daily nutrition treatment was based on sedation, vomiting, nausea and variation of electrolytes and nitrogen balance. However, the indirect calorimetry should allowed for accurate measure of resting energy expenditure.

09AP03-07
Monkeypox-associated encephalitis: a diagnostic and therapeutic challenge

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Background: The most frequent neurological symptomatology in monkeypox is headache. Encephalitis is a major neurological complication with very few published cases and without studies evaluating a specific treatment at present (1).
Case Report: A 49-year-old male began with sore throat, fever and headache. 5 days later, he presented disorientation, agitation, and a few small erythematous plaques with scabs on his extremities. He was admitted at ICU to control that agitation and get completed the study. His magnetic resonance imaging presented an alteration of white matter signal intensity in thalami. Lumbar puncture revealed high protein level and leukocyte count increased at Cerebral spinal fluid (CFS). Negative CSF serology and PCR including Monkeypox. Erythematous plaque exudate, urethral, pharyngeal and anal exudate were positive for Monkeypox.
Methylprednisolone and immunoglobulins treatment was started since the beginning because parainfectious autoimmune was considered. Tecovirimat treatment was began after the results of CSF, despite the negative PCR because absence of detectable nucleic acid in the CSF is not uncommon at viral infections(2). There was a neurological improvement since the Tecovirimat.
The patient evolved satisfactorily with no subsequent neurological alterations.
Discussion: Currently, there is no specific approved medication for Monkeypox infection, although it exists for smallpox (both of them orthopoxviruses). The use of Tecovirimat seems to be useful in cases where encephalitis or encephalomyelitis is present with appropiate outcomes(3).
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Learning Points: Encephalitis is a rare neurological complication and very few published literature. That complication does not usually appear at the first infection days.
Tecovirimat presents a good treatment results for monkeypox encephalitis.

09AP03-08
Severe septic shock in a patient with intestinal perforation secondary to undiagnosed gastrinoma

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Background: Gastrinoma is a very rare neuroendocrine tumour that produces non-specific symptoms which are also present in other pathologies. This means a delay in the diagnosis of the disease of almost 5 years, when the tumour is metastatic in 80% of the cases. It is therefore very important to diagnose and suspect it in those patients with possible clinical symptoms because surgical treatment in most cases is curative.
Case Report: We present the case of a 35-year-old man who came to the emergency department with abdominal pain hours later of the administration of an endopic capsule for the study of diarrhea of 6 years of evolution. Since March 2021, the patient had undergone surgery twice for intestinal microperforations without any apparent cause being diagnosed. All the studies performed had been negative, so this condition was attributed to a possible malabsorptive disorder. Hours after hospital admission, the patient began to present severe shock symptoms and anemia. ICU was called for hemodynamic stabilization before performing a CT scan where a new intestinal perforation was observed. The patient required intensive shock resuscitation with vasoactive drugs (noradrenaline, adrenaline) and broad-spectrum antibiotherapy was initiated. The study of intestinal biopsies showed the presence of cellularity compatible with neuroendocrine tumor. Studies showed the presence of hypergastrinemia, and with these data the patient was diagnosed with gastrinoma. Then, a study of the extension of the disease was performed with a PET-CT scan which ruled out the presence of metastasis. Two months later the patient underwent intestinal resection surgery as definitive treatment of the gastrinoma.
Discussion: The history of several intestinal perforations in the same place with no other apparent diagnosis and the symptoms of chronic diarrhea lead us to think of pathologies such as Zollinger-Ellinson syndrome or a tumour. The differential diagnosis is very important since the treatment of gastrinoma with surgery supposes the resolutionof the disease.
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Learning Points: The presence of hypergastrinemia with multiple intestinal perforations at nearby points with no other apparent cause should lead us to think about the possibility of the existence of a neuroendocrine tumour.

09AP03-09
Spontaneous pure acute subdural haematoma as the initial manifestation of acute lymphoblastic leukaemia - a case report

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Background: Spontaneous non-traumatic acute subdural haematoma (SDH) is a rare condition with an incidence rate of 3-5% associated with neoplasm, aneurysm and AVM, along with high mortality and morbidity. On the other hand, intracranial haemorrhage (ICH) is the second most common complication of haematological malignancies. While ICH is often identified later on, it is rare for ICH to be the presenting sign. We report a case of spontaneous acute SDH as the initial presenting symptom of an acute lymphoblastic leukaemia.
Case Report: A previously healthy 55-year-old male was found unconscious in bed, without a history of head trauma. On initial examination has had GCS 4, anisocoria with dilated left pupil, unresponsive to light. Brain CT disclosed acute SDH of the left-brain hemisphere, brain oedema, without visible bone fracture. Initial laboratory data showed pancytopenia, elevated D-Dimer, LDH and fibrinogen and normal coagulation tests. The patient was stabilised in the ICU, was given 1g of TXA and platelet count was corrected with 24 units of platelets. An emergency craniotomy and evacuation of the SDH was performed soon after with the continuation of analgosedation for 72 hours after the end of the procedure. Bone marrow aspiration and bone biopsy was done (hypoplastic bone marrow with atypical blast cells) and the diagnosis of B-ALL was revealed. Prophylactic antibiotic, antiviral and antifungal treatment was initiated, with daily control and correction of blood cells and coagulation parameters, including factor XIII. Rasburicase, an agent for tumour lysis syndrome was indicated. Control CT scan showed ischemic regions in the right temporal and parietal region. Unfortunately, the patient's neurological status did not recover, he remained unconscious with GCS 4. Despite this, active haematological treatment (HOVON-100 protocol) was started with the consent of the family.
Discussion: Publications reported the mortality rate of acute SDH up to 79%, where worse outcomes may be associated with a higher age, lower GCS at presentation and delay in surgical treatment. ICH continues to be a significant cause of major morbidity and mortality in patients with acute leukaemia.
Learning Points: Despite the low incidence, this case highlights the importance for clinicians to be aware that pure SDH may be an initial presenting symptom of ALL and therefore early recognition of concomitant SDH and ALL and treatment of this life-threatening condition is crucial.

09AP03-10
Euglycemic diabetic ketoacidosis (EDKA) in intensive care unit: a rare complication of sodium-glucose cotransporter inhibitor

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Background: Euglycemic diabetic ketoacidosis (EDKA) is an uncommon and life-threatening diabetic emergency recently associated with the sodium-glucose cotransporter-2 inhibitors (SGLT2i)[1]. EDKA is characterized by euglycemia (glucose < 250 mg/dL) in presence of severe metabolic acidosis and ketonemia. It also presents a diagnostic challenge for physicians, often resulting in delayed diagnosis[2].

Case report: A 72-year-old male with a medical history of poorly controlled diabetes mellitus type 2 (with chronic retinopathy), was admitted to the hospital following hip fracture. On the second day, he debuted with an impaired level of consciousness (Glasgow scale 8/15), tachypnea and tachycardia. Arterial blood gas was ordered which revealed pH of 7.19, PCO2 of 21 mmHg, and HCO3 of 9 mmol/L. After assessment by the intensive care specialist and stabilization with fluid therapy with bicarbonate, we carried out more analysis and reassessed the drug prescription during the hospitalization; omeprazole, analgesics, dapagliflozin and insulin therapy. Surprisingly, his ketonemia levels were 6.9 mmol/L, but his blood glucose levels were consistently below 250 mg/dL. A multidisciplinary approach was used that allowed us to discover this rare complication associated with treatment with SGLT2i. The initial management consisted in a continuous intravenous infusion of insulin (0.5Ui/kg/h) accompanied by fluid replacement with dextrose 5%. Many potassium supplementations were necessary to maintain levels up to 3.3 mEq/L. After 24 hours and serial blood gas controls, the insulin infusion was withdrawn, after verifying the correction of the acidosis. Finally, the patient didn't require hemodynamic and ventilatory support measures.

Discussion: The mechanism for SGLT2i-induced EDKA is still unclear and the treatment requires a multidisciplinary team. Early diagnosis and initiation of treatment can significantly improve morbidity and mortality. Only a few case reports and small reviews discuss this pathology in ICU.

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Learning points:

1.EDKA should be part of the differential diagnosis of increased anion GAP acidosis.

2.Early treatment is essential.

09AP03-12
Sevoflurane sedation in ICU for septic shock: a case report

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Background: After the recent pandemic, various studies have been highlight the role of inhalation agents as sedative drugs. It could be useful for septic shock too.

Case report: A 69-year-old patient with cardiovascular and pulmonary history underwent urgent cholecystectomy due to septic shock with subsequent admission to ICU five days without complications.

On the same day of discharge, he presented a sudden dyspnoea. Transthoracic echocardiography showed severe ventricular dysfunction. Due to the respiratory failure, orotracheal intubation was required and was transferred to ICU.

The patient was admitted with multiple organ failure, PaO2/FiO2 ratio 80 and fever. Sedated with propofol, nitric oxide was started, a lung recruitment manoeuvre was performed, and neuromuscular blocker perfusion was started. He was hemodynamically unstable, with severe coagulopathy and acute renal failure so replacement therapy was started; the blood test showed infection parameters so we initiate ceftazidime-avibactam and tigecycline.

After 24 hours of admission, the patient was evolving unfavourably, x-ray showed right lung condensation; high doses of propofol and neuromuscular blocker was needed. It was decided to sedate with sevoflurane, monitored with Massimo.

The fourth day of admission, presented clinical stability that allowed a sedation window. Cardiac index improved and PaO2/FiO2 ratio was >300. On the fifth day, the patient was extubated and after 9 days patient was discharged to the hospital room.

Discussion: By one hand, sevoflurane allows a decrease in airway resistance. It showed an improvement in the respiratory parameters [1], and allowed adequate sedation and shortened the aweaking and extubation time. On the other hand, propofol may lead to greater hemodynamic instability. Furthermore, this patient had severe ventricular dysfunction and sevoflurane has myocardial protective effect[2].

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Learning points: Sevoflurane has anti-inflammatory effects and allows a decrease in airway resistance. We apply this goal-guided drug as another treatment in a patient with multiple organ failure with very satisfactory results.

09AP03-13
Severe hyperlactatemia in a septic patient on CRRT with regional citrate anticoagulation: a case report

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Background: Regional citrate anticoagulation (RCA) has become the standard of choice in continuous renal replacement therapy (CRRT) of critically ill patients with acute kidney injury (AKI). Nonetheless, there are certain scenarios where its use has been controversial, such as severe hyperlactatemia or liver failure (1). Furthermore, complications like citrate accumulation have been reported, although their incidence is rare.

Case report: We report the case of a 63-year-old male who presented with increasing levels of lactate during his stay ICU with a diagnosis of respiratory sepsis after a hip fracture surgery. CRRT with RCA was initiated on day 4 due to AKI. Lactate levels increased progressively from 3.5mmol/L on day 5 up to 15mmol/L with increased anion gap metabolic acidosis on day 7, without increase of acute phase reactants. Liver compromise with 2.24mg/dL total bilirubin and need of 50% glucose drip to maintain glycemia was observed. Total/ionized calcium ratio was <2.5. CRRT was stopped, resulting in lactate clearance to 1.9mmol/L with metabolic alkalosis and need of 5% glucose drip within hours. Serum citrate intra and post CRRT was 630μmol/L and 140μmol/L respectively.

Discussion: Citrate accumulation is a complication of CRRT with RCA that can occur in patients with hyperlactatemia and liver failure as increased anion gap metabolic acidosis, nevertheless the total/ionized calcium ratio was <2.5 (2). The Cori cycle produces lactate in muscle from glucose and is activated by citrate among others. Serum citrate can reach up to 1070μmol/L in patients on CRRT with RCA (3). High production of lactate and low glucose levels in patients with impaired liver function could be explained by increased activation of the Cori cycle in patients with high serum citrate, reducing glucose consumption and lactate production when citrate levels decrease to normal.

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Learning points:

- Raise awareness on RCA-related complications
- Insight on lactate and citrate metabolism

09AP04-01
Early postoperative hypoalbuminemia predicts mortality and "days alive and out of hospital" after orthotopic heart transplantation

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Background and Goal of Study: Postoperative hypoalbuminemia is frequent after cardiac surgery and results from blood loss, dilution or capillary leak amongst others (1). In patients undergoing heart transplantation (HTX) preoperative liver impairment and consequent hypoalbuminemia is associated with increased mortality, but the role of early postoperative hypoalbuminemia is unclear (2). This study investigated associations between early postoperative hypoalbuminemia and 1-year mortality as well as "days alive and out of hospital" (DAOH) after HTX.

Materials and Methods: This retrospective cohort study included patients who underwent HTX at the University Hospital Duesseldorf, Germany between 2011 and 2021. The main exposure was serum albumin concentration at ICU. The primary endpoints were mortality and DAOH within one year after surgery. Albumin levels were compared between survivors and non-survivors using unpaired t-tests. Receiver Operating Characteristic (ROC) curve analysis, logistic regression models and linear regression models with adjustment for the "Model for End-stage Liver Disease" (MELD) score and the Index for Mortality Prediction After Cardiac Transplantation (IMPACT) were performed.

Results and Discussion: Out of 231 patients screened, 212 were included into analysis (mean age 55 ± 11 years, 73% male). One-year mortality was 19.7% (40 patients) and median DAOH were 298 (229-322). Postoperative serum albumin was higher in survivors as compared to non-survivors (3.3 ± 0.5 g/dl vs. 2.8 ±0.6 g/dl; p<0.0001). ROC analysis showed good discrimination for mortality by postoperative serum albumin after HTX [AUC = 0.74 95% CI: 0.66-0.83]. According to Youden Index, the cut-off for serum albumin at arrival ICU and mortality was 3.0 g/dl. In univariate analysis DAOH were lower in patients with albumin below cutoff [Albumin >3.0 g/dl: 310 (268-326) days vs. Albumin < 3.0 g/dl: 253 (0-305) days]. After adjustment for MELD and IMPACT score multivariate logistic and linear regression showed independent associations between hypoalbuminemia and mortality / DAOH with odds ratio of 4.57 [95%CI 2.23-9.35] and unstandardized regression coefficient of -73.47 [95%CI -101.23 - -45.70], respectively.

Conclusion(s): Postoperative hypoalbuminemia <3.0 g/dl is associated with 1-year mortality and poor DAOH after HTX. The role of early postoperative albumin substitution as therapeutic approach needs to be investigated.

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09AP04-04
Characterization of the efficacy of furosemide depending on albumin function

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Background and Goal of Study: Albumin binding of furosemide forms the basis for its transport to the kidney and subsequent tubular secretion, which is a prerequisite for the effect of furosemide[1]. Accordingly, high albumin concentrations should result in higher efficacy of furosemide. However, study results on the combination of furosemide in conjunction with albumin and on the efficacy of furosemide in hypoalbuminemia did not confirm this hypothesis[2].
The aim of this study was to determine the efficacy of furosemide not only in relation to concentration, but also to take albumin function into account.
Materials and Methods: In a prospective and non-interventional clinical observational trial, blood and urine samples from 30 critically ill patients receiving intravenous furosemide therapy were evaluated. Albumin binding capacity (ABiC) determination allowed conclusions to be drawn about the binding site-specific loading state of albumin by quantifying the unbound fraction of the fluorescent marker dansylsarcosine. In addition, assessment of total concentration of furosemide in plasma and urine as well as the concentration of free furosemide fraction in plasma was performed by high-performance liquid chromatography-mass spectrometry. Efficacy of furosemide was evaluated by the ratio of urine excretion to fluid intake.
Results and Discussion: In patients with an ABiC $\geq$ 60% free furosemide fraction was significantly lower compared to patients with a lower ABiC, urinary furosemide concentration was higher, and a significantly higher proportion of infused furosemide was excreted renally. ABiC was positively correlated with the increase in urine excretion to fluid input ratio after initiation of furosemide therapy.
Conclusion: ABiC could serve as a marker for individual response to furosemide and could be used to generate patient-specific therapeutic regimens. In view of the relatively low number of patients in this study, the relationship between furosemide efficacy and albumin function should be investigated in larger studies in the future.
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2. Kitsios, D., et al, Co-administration of furosemide with albumin for overcoming diuretic resistance in patients with hypoalbuminemia: A meta-analysis. J Crit Care, 2013

09AP04-05
The effects of continuous renal replacement therapy on interleukin 6, Hepcidin and Ferritin in critically Ill patients with COVID-19

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Background and Goal of Study: SARS-COV2, potentially, produces a cytokine storm and a disproportionate inflammatory response. The overwhelming cytokines like interleukin 6 (IL-6) and others, negatively impact survival causing multiple organ dysfunction, iron overload and death. Renal Replacement Therapy (RRT) has been used to remove circulating cytokines. The aim of the study is to assess the effects of RRT on cytokines and the products of inflammation, as well as to establish if early versus late treatment influences intensive care unit (ICU) stay and mortality.
Materials and Methods: This prospective study included adults admitted to the ICU at the Emergency Hospital Cluj-Napoca, Romania. Patients were critically ill and confirmed with SARS-COV2 infection and were followed for 28 days from admission. Blood parameters were determined before and after RRT including IL-6, Hepcidin (Hep), Ferritin, Transferrin Saturation (TS), C-reactive protein (CRP), Neutrophil/Lymphocyte ratio (NLR).
Primary outcome was change in blood parameters before and after RRT.
Secondary outcome was ICU mortality. The patients were divided in two groups, Early – RRT within first 7 days of admission and Late – RRT thereafter. Parametric data was analyzed with paired t-test and nonparametric data with Wilcoxon test. Results were presented as mean of differences (MnOD) for parametric and median of differences (MdOD) for non-parametric data. Kaplan-Meier analysis was used for median days of survival and hazard ratio (HR).
Results and Discussion: IL-6 and Hep decreased by MdOD of 80.65 pg/mL for IL-6 (CI -998 to -4.9; p=0.0029) and -78.7 pg/mL (CI -185 to -48.4; p=0.002) for Hep. Ferritin increased by MdOD of 925 mg/dL (CI -437 to 10727; p=0.042). Although TS, CRP and NLR increased, neither were statistically significant. MnOD were 22.83% ($\pm$42.26; p=0.088) for TS, 0.56 mg/dL ($\pm$13.14; p=0.88) for CRP and 2.76 ($\pm$13.61; p=0.43) for NLR.
Finally, the median survival in early treatment was 7 days compared to 4 days in late RRT with a HR of 1.9 in the latter, but not statistically significant (p=0.29).
Conclusion(s): RRT seems to be efficient at eliminating IL-6 and Hep which could have increased the TS. In theory, the latter is also possible due to a wider clearance of cytokines which create alternative pathways for Hep production. Our results also suggest that an early RRT might yield a benefit, but this needs further studying.

09AP04-06
Association of oxygenation levels after successful mechanical thrombectomy under general anesthesia and 3-months functional outcome in patients with acute ischemic stroke: an observational study

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Background and Aim of Study: The effects of oxygenation levels on patients with acute ischemic stroke treated with mechanical thrombectomy is unknown. We aimed to determine whether the oxygenation level (PaO2 <150mmHg vs PaO2 ≥150mmHg) in ventilated patients after successful mechanical thrombectomy under general anesthesia for acute ischemic stroke is associated with 3-months functional outcome.

Materials and Methods: We prospectively collected data from patients with a proximal occlusion of the anterior circulation treated with successful mechanical thrombectomy under general anesthesia for 21 months.

After the procedure, patients were admitted to the ICU for delayed extubation. Two groups were established regarding partial pressure of oxygen (PaO2 <150mmHg vs PaO2 ≥150mmHg) measured in a blood arterial gas analysis on admission to the ICU. Demographics, clinical factors, and neurological status (NIHSS scale and modified Rankin Scale, (mRS)) were compared between the two groups.

Results and discussion: 184 patients after endovascular treatment for acute ischemic stroke were admitted in our ICU during the period study. 70 patients with unsatisfactory mechanical thrombectomy, or occlusion of the posterior circulation were excluded from the analysis.

There were no differences between the groups in relation to demographics, clinical factors, neurological status at hospital discharge and functional outcome at 3 months. (Table 1).

Clinical Data	Total 114 patients	PaO2 < 150mmHg 52p. (45,6%)	PaO2 ≥ 150mmHg 62p. (54,4%)	P
Age (years, median, IQR)	79 (70-85)	78 (69,25-85)	79 (70,75-85,25)	0,999
NIHSS at admission (median, IQR)	16 (11,75-19)	17 (11,25-19,75)	15 (11,75-19)	0,357
Time to recanalization (min, median, IQR)	330 (265-598)	370 (278-830)	325 (253-448)	0,061
Duration of mechanical Ventilation (hours, median (IQR))	5:48 (6:04)	6:27 (6:41)	4:51 (6:21)	0,031
Days of stay in the Hospital (days, median, IQR)	5,5 (3-8)	6,5 (3,25-10)	5 (2,25-7)	0,049
NIHSS at discharge from Hospital (Median, IQR)	3 (0-8)	3 (0-11,75)	3 (0-6,25)	0,931
mRS at discharge from Hospital (median, IQR)	3 (2-5)	4 (2-5)	3 (2-4)	0,871
mRS 3 months post-stroke (median, IQR)	3 (1-5)	3 (1-5)	3 (1-4,25)	0,820
Favorable outcome at 3 months (mRS 0-2)(n(%))	45 (39,5)	18 (34,6)	27 (43,5)	0,344

**PaO2<150mmHg compared to PaO2>150mmHg.,mRS: modified Rankin scale (range o (no symptoms) to 6 (death), NIHSS: National Institutes of Health Stroke Scale, TICI 2b-3: scores indicate near-total and total reperfusion grades.*

Probably, early extubation after performing the thrombectomy (5-7 hours), and the fact that we have studied only patients with successful thrombectomy and reperfusion, have influenced not to find differences between the two groups studied.

Conclusions: In patients with acute ischemic stroke in the anterior cerebral circulation treated satisfactory with mechanical thrombectomy under general anesthesia, we found no association between 3-months functional outcome and levels of oxygen post-procedure.

09AP04-07
Superoxide disumutase mediated response to oxidative stress following severe traumatic brain injury

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Background and Goal of Study: Severe traumatic brain injury (sTBI) is an acquired brain injury caused by external force. The initial injury triggers further pathophysiological events such as excitotoxicity, oxidative stress and hypoxia, collectively termed as secondary brain injury. The acute treatment focuses on mitigating the secondary brain injury mainly by monitoring and managing elevated intracranial pressure (ICP). Whether other aspects of secondary brain injury could be monitored and managed remains a topic for research. Here we aim to characterize superoxide dismutases (SOD) in cerebrospinal fluid (CSF) after sTBI. SOD enzymes perform the initial step in removing superoxide and thus are crucial in anti-oxidative response.

Materials and Methods: CSF samples were collected daily following the insertion of external ventricular drainage in patients with sTBI. Signed informed consent was obtained from a family member and study was approved by the Ethical committee. CSF samples and protein lysate of neuroblastoma cell line SH-SY5Y were analyzed by western blot using antibodies against SOD1, SOD2 and SOD3.

Results and Discussion: A total of 64 CSF samples were collected from 9 sTBI patients during the first 10 days after injury. We detected SOD1 in SH-SY5Y cells and sTBI samples with a total of 43 CSFs samples being SOD1 positive but containing SOD1 at different levels, with predominant expression during the first 5 days after injury. SOD2 and SOD3 were analyzed in 2 patients providing 13 CSFs. None of these CSFs were found to be SOD2 positive in contrast to SH-SY5Y cells. SOD3 was detected at high levels in all 13 analyzed CSFs but not in SH-SY5Y cells. These results confirm SOD3 as a known extracellular protein. Moreover, failure to detect SOD2 in CSF might indicate that analyzed CSFs did not contain cellular debris since SOD2 is located in mitochondria. A somewhat surprising finding was detection of SOD1 in two thirds of CSFs, given the fact that SOD1 is a cytoplasmic enzyme. Further characterization should reveal whether extracellular SOD1 has anti-oxidative activity and thereby contributes to the well-known SOD3 anti-oxidative activity in the extracellular space.

Conclusion(s): This is a pilot study showing that SOD1, a ubiquitously expressed protein located in cytoplasm, is readily detectable in CSFs early after sTBI. The main limitations of the study are low number of patients and lack of SOD1 protein quantification.

09AP04-08
Mean Platelet Volume to Lymphocyte Ratio (MPVLR) as a predictor of mortality in brain injured patients: preliminary data

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Background and Goal of Study: Prognostic role of several haematological indices in various diseases is well known, but the role of Mean Platelet Volume to Lymphocyte ratio (MPVLR) and Neutrophil to Lymphocyte ratio (NLR) in predicting brain injured patients outcome still needs to be outlined.
In this study MPVLR and NLR have been investigated to assess their prognostic role in ICU brain injured patients outcome.
Materials and Methods: From May 2021 to December 2022 hemogram at admission and clinical history of adult ICU brain injured patients were collected. MPVLR was calculated. All the patients were followed up to their discharge from ICU in order to evaluate their mortality or survival.
Study population was retrospectively divided in two groups:
Group 0 = survived;
Group 1= not survived.
Different ratios were calculated from hemograms, including MPVLR and NLR. Also SOFA score and APACHE score were evaluated.
Results and Discussion: 57 patients were enrolled: mean age was 62±18 years, 37 patients (65%) were male. Diagnosis at admission was: TBI 35%, ICH 28%, SAH 14%, Epidural hematoma 2%, Subdural hematoma 14%, AIS 7%. 24 patients died in the ICU (42%), while 33 (58%) survived.
Mean MPVLR at admission was 44,32 ± 37 in survivors and 104,42 ± 91 in non survivors (p=0,000), while mean NLR was 13,10 ± 8 in Group 0 and 18,33 ± 29 in Group 1(p=0,093).
Mean SOFA score at admission was 5,67 ± 1,59 in survivors and 6,04 ± 1,94 in non survivors (p=0,436), while mean APACHE score was 19 ± 3,95 in Group 0 and 20,67 ± 3,19 in Group 1(p=0,287).
Conclusions: At the time of admission in ICU hemogram should be evaluated and MPVLR should be calculated as we can consider MPVLR a good independent predictor of mortality in brain injured patients using our preliminary data.

09AP04-09
Fluid balance targets in ICU: how useful are they?

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Background and Goal of Study: Critically ill patients who become fluid overloaded have increased rates of morbidity and mortality. We aimed to improve fluid management within our intensive care unit by increasing the rates at which a daily fluid balance target was documented in the patient notes.
Materials and Methods: The study was performed at University Hospital Hairmyres, a district general hospital outside Glasgow. Data was collected on patients admitted to a combined HDU and ICU over two 3 week periods, before and after a presentation on fluid balance was delivered at a local ICU multidisciplinary team meeting. Data for each patient was collected throughout their stay in intensive care and fluid balance was recorded over a 24hr period. 7 level 3 patients with a combined 16 24hr periods were included in the first 3 weeks of data collection, followed by 15 level 2 and 3 patients with a combined 52 24hr periods studied in the second 3 weeks. Microsoft excel was used to calculate mean averages and unpaired t tests and chi square tests were used to determine statistical significance.
Results and Discussion:

	Initial round of data collection	Data collection post MDT presentation
Number of 24hr periods with fluid target recorded (P = 0.05 to 0.10)	2/16 (12.5%)	19/52 (36.5%)
Average volume above daily fluid target (P = 0.0215)	Positive 2750 mls	Positive 1139 mls

Results subsequently showed that if a fluid balance target was recorded in the notes, the average fluid balance for that 24hr period was around 1 litre less than patients without any fluid balance target recorded (negative 410mls vs positive 564mls respectively, P = 0.0373). This project was limited by small numbers in the initial round of data collection and subsequently level 2 patients were included, creating a difference between the two groups studied. Although this project shows a statistically significant association between recording a fluid balance target and a less positive 24hr fluid balance, this does not prove causation.
Conclusion(s): Simple measures such as raising awareness through presentation can result in an increase in rates of fluid balance target recording. This change in practice was associated with a significant reduction in the volume of fluid given to patient's over a 24hr period, showing the importance of this area of documentation for critically ill patients. Further work would include repeating data collection after fluid balance target reminders were included in the local daily ward round proforma.

09AP04-10
The influence of therapeutic plasma exchange on the inflammatory response in septic shock: results from the EXCHANGE trial

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Background and Goal of Study: Sepsis and septic shock, defined by a profound immune dysregulation, are among the leading causes of death in the ICU. Despite advances in understanding the underlying pathophysiology and multiple randomized controlled trials (RCT), no specific treatment exists to date. Therapeutic plasma exchange (TPE) represents a promising adjunctive treatment approach to rebalance immune homeostasis. A recently published RCT demonstrated a rapid hemodynamic improvement after TPE possibly caused by the removal of harmful mediators and the replacement of protective plasma proteins.

The aim of this study is to further characterize the underlying immunomodulatory effects and to identify biomarkers that may predict treatment response to TPE.

Materials and Methods: After written informed consent was obtained, 53 patients in early septic shock (<24h duration) and a norepinephrine (NE) dose of ≥0.4 μg/kg/min were randomized 1:1 to receive standard of care (SOC) or SOC + one single TPE. TPE was immediately performed after randomization. Serum samples were collected at randomization and 6h post randomization. Acute-phase proteins (CRP and Pentraxin3(PTX3), inflammatory mediators (IL-4, IL-6, IL-8, IL-10, TNF-α, IL-2Rα) and damage-associated molecular patterns (DAMPs) (cell-free DNA (cfDNA), HMGB1) were determined via multiplex analysis or ELISA.

Results and Discussion: TPE led to a significant reduction in acute-phase protein levels (CRP p=0.0008, PTX3 p=0.0008) while no difference was observed in the SOC group. TNF-α-, IL-6- und IL-8-levels were significantly reduced in both groups, however no significant difference was observed between groups except for IL-2Rα (p=0.02). cfDNA und HMGB1 levels were significantly decreased in the TPE group compared to the SOC group (p=0.004, p=0.03). Treatment responders, defined as a decrease in NE dose of ≥ 50% 6h post randomization, displayed significantly increased cfDNA levels and decreased IL-8 levels compared to non-responders.

Conclusion(s): TPE is associated with the elimination of inflammatory mediators such as acute-phase proteins and DAMPs that may explain the recently observed hemodynamic improvement in septic shock patients. Increased cfDNA levels in combination with decreased IL-8 levels may represent a dual biomarker approach to predict treatment response.

09AP04-11
Ability of CO_2 kinetics parameters to predict fluid responsiveness during the increase of vasomotor tone in a rabbit model of hemorrhage

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Background and Goal of Study: Volumetric capnography (Vcap) has been proposed as a novel, non-invasive tool to assess cardiac output (CO) changes and fluid responsiveness. The increase in vasomotor tone attenuates dynamic preload indicators' ability to assess fluid responsiveness. We analyzed CO_2 kinetics during hypovolemia and an increase in vasomotor tone. We hypothesized that CO_2-based parameters would predict fluid responsiveness during the increase of vasomotor tone.

Materials and Methods: 6 anesthetized and mechanically ventilated rabbits were studied during normovolemia (BL), after progressive blood withdrawal (10 mL/kg, BW), and during phenylephrine infusion (BW+PHE). Aortic (AoF) and inferior vena cava (IVCF) flows were measured through a lumbotomy incision. Central venous and abdominal aortic (AoP) pressures were measured. VCap was obtained by a CO_2 mainstream (Treaton) clipped onto a pediatric digital flowmeter sensor (Sensirion). Both signals were recorded online by a dedicated device designed in our laboratory (SAMAY S24, 200 Hz) which displayed the different CO_2 parameters.

We assessed the vasomotor tone by the total peripheral resistance (TPR=mean aortic pressure/mean AoF) and arterial compliance (C=stroke volume/pulse AoP). We estimated stroke volume, pulse pressure variations (SVV, PPV), physiological dead space (VDphys, Bohr equation), and minute ventilation to minute exhaled CO_2 ratio (MV/VCO_2).

Data was expressed by mean±SE. We used ANOVA with the Tukey test as post-hoc, and a P value <0.05. The study was approved by the Institutional Animal Care and Use Committee (Nº 070153-000638-20).

Results and Discussion: Baseline PPV and SVV increased significantly during hemorrhage, with a decrease in AoF and IVCF (P <0.05). PHE infusion induced a significant TPR increase and C decrease in bled animals with a significant decrease of dynamic indices.

BW condition increased MV/VCO_2 (P <0.05) and decreased VCO_2, end-tidal ($PetCO_2$), mean expired CO_2 ($PECO_2$), and alveolar ($PACO_2$) PCO_2 (P =0.059). PHE infusion did not change the VCap parameters compared to BW. VDphys did not change significantly beyond experimental conditions.

Conclusion(s): VCap parameters could predict fluid responsiveness during hemorrhage under increased vasomotor tone induced by PHE administration. The IVCF decrease could reduce the supply of CO_2 to the lungs, which, in turn, decreases $PetCO_2$, $PACO_2$, $PECO_2$, and CO_2 excretion without significant change in alveolar dead space.

09AP04-12
Remote photoplethysmography and automated capillary refill time technique for peripheral perfusion assessment between COVID-19 and Septic shock patients

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Background: Assessment of microcirculation during fluid resuscitation of septic shock patients mainly relay on the serum lactate level and routine clinical bed-side tests (as CRT). New techniques for evaluation of tissue perfusion have been developed -remote photoplethysmography (rPPG) and automated objective capillary refill time measurement technique (aCRT).

The Goal of Study: Was to assess changes in peripheral perfusion during fluid resuscitation using remote photoplethysmography and automated capillary refill time in ICU patients with bacterial septic shock and severe Covid-19 patients.

Materials and Methods: Patients with positive passive leg raising test (PLRT) were initially resuscitated with crystalloids (10ml/kg over 60min).Hemodynamic variables, manual capillary refill time (mCRT) and aCRT parameters (T90 –time when 90% of capillary refill is over, Tst –time when capillary refill is fully over), peripheral perfusion index (PPI) detected using rPPG were collected before and after PLRT and after volume expansion (VE)

Results and Discussion: A total of 34 patients were divided into 2 groups:COVID-19 (n=18) and bacterial septic shock (n=16). In COVID-19 mean PPI increased during PLRT by 7% (from 43+/- 27

to 46.5+/-29.1), by 15% after VE(from 43.0+/-27.8 to 49.5+/-22.6), while in septic shock PPI increased during PLRT by 18%(from 28.3 +/-20.9 to 33.6 +/-25.3),by 28% after VE(from 28.3+/- 20.0 to 36.3+/-25.8). Mean mCRT in COVID-19 decreased by 22% during PLRT (2.57+/- 0.59 to 1.98 +/-0.68),by 22% after VE (from 2.57+/-0.59 to 1.98+/-0.78), while in septic shock decreased by 31% during PLRT (from 1.85+/-0.64 to1.29+/-0.38),by 32% after VE (from 1.85+/-0.64 to 1.26+/-0.29).
Mean aCRT T90 in COVID-19 decreased by 32% during PLRT (from 1.74 +/-1.16 to 1.17+/-0.79),by 17% after VE (from 1.74+/-1.16 to1.45+/-1.06), in septic shock decreased by 41% during PLRT (from 1.93+/-1.03 to 1.38 +/-0.79),by 8% after VE (from 1.93 +/-1.03 to 1.78+/-0.66). Mean Tst in COVID-19 decreased by 21% during PLRT (from 3.33 +/-1.59 to 2.63 +/-1.37),by 10% after VE (from 3.33+/-1.59 to 3.03+/-1.44), in septic shock decreased by 25% during PLRT (from 3.74+/-1.24 to 2.81+/-1.22) by 2% after VE (from 3.74+/-1.24 to 3.69+/-1.12). In COVID-19 lactate level decreased by 10% after VE (from 2.0+/-0.7 to 1.8+/-0.8), in septic shock by 18% (from 2.3+/-1.6 to1.9+/-1.2).
Conclusion: rPPG and aCRT are techniques potentially applicable to assess microcirculation during fluid resuscitation in critically ill patients.

09AP05-01
Impact of sedation method on mortality and clinically relevant outcomes

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Background and Goal of Study: Sedation is frequently used in intensive care units (ICUs) to prevent arouse and delirium associated harm, relieve anxiety, and reduce the stress of being mechanically ventilated. Since agitation and anxiety occurs in about 30%-80% of patients being treated in the ICU settings, sedation is a highly sought strategy for ICU patients.
The aim of this study was to comprehensively assess published randomized and non-randomized peer-reviewed studies which compared volatile (VA) and intravenous (I/V) anesthetics for ICU sedation, with the hypothesis that the type of sedation may have an impact on mortality and other clinically relevant outcomes.
Materials and Methods: Studies comparing VA versus I/V anesthetics used in the ICU settings were independently systematically searched in PubMed, Medline, Google Scholar, Russian Science Citation Index and Cochrane databases. 15 studies (1520 patients of predominantly surgical profile needed VA sedation for less than 96 h) were included.
Results and Discussion: VA had no impact on all-cause mortality (very low quality of evidence, Odds Ratio=0.82 [0.60-1.12], p = 0.20). VA were associated with a reduction in duration of mechanical ventilation (very low quality of evidence, Odds Ratio=−0.46 [−0.88 to −0.04)], p = 0.03), increase in ventilator-free days (very low quality of evidence, Odds Ratio=0.46 [0.28-0.64], p < 0.001). VA also reduced postoperative level of cardiac troponin (low quality of evidence, Odds Ratio=−0.52 [−0.84 to −0.20], p = 0.001), time to extubation (moderate quality of evidence, Odds Ratio= −1.59 [−2.26 to −0.91]; p <0.001) and awakening (very low quality of evidence, Odds Ratio=−1.30 [−2.54 to −0.06]; p = 0.04). No differences were observed in length of ICU stay (moderate quality of evidence, p=0.93), length of hospital stay (low quality of evidence, p=0.69), and need for catecholamines (very low quality of evidence, p = 0.5).
Conclusion(s): Volatile sedation vs propofol causes the increase in ventilator-free days acompined with reduction of time to extubation and the drop of troponin release in both medical or surgical ICU patients. The shortening of awakening was proofed only for surgical ICU patients.

09AP05-02
Potential pro-angiogenic role of large extracellular vesicles (L-EV) derived from in vitro differentiated regulatory anti-inflammatory macrophages (Mreg)

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Background: Human monocyte derived anti-inflammatory macrophages (regulatory macrophages, Mreg) bear pro-angiogenic potential in-vitro[1]. Extracellular vesicles (EV) are known to be released by numerous different cell types and transport active molecules that participate in cell communication[2]. Interestingly, during the in vitro differentiation of Mregs, large extracellular vesicles (L-EV) with unknown characteristics and functions are released.
Aim of this Study: Gain insights into the possible participation of Mreg-derived L-EV in in-vitro endothelial remodeling and angiogenesis.
Materials and Methods: Peripheral blood monocytes from healthy donors (N=9) were in-vitro differentiated into Mreg and the released L-EV were isolated from the culture supernatants by differential centrifugation. Automated cell/particles analysis as well as flow cytometry was used for L-EV and Mreg characterization. Angiogenesis proteome profiling arrays were performed to characterize the intravesicular protein composition. The impact of L-EV on wound healing and angiogenesis were evaluated in-vitro using endothelial scratch and tube formation assays. MMP activity was evaluated by gelatin zymography.
Results: Mregs release about 1.5 L-EV/Mreg into the culture medium. Specific markers revealed close similarities between Mreg and L-EV regarding their cell surface marker composition. However, compared to Mreg, fewer L-EV were positive for CD31 (P<0.01), CD206 (P<0.05), CD103 (P<0.01) and CD45 (P<0.05). Several pro-angiogenic proteins were highly expressed in L-EV: e.g. angiogenin, CXCL16, MMP-8, PF4, Serpin E1, Serpin F1, TIMP-1, Thrombospondin-1 and MMP-9. The latter also revealed high enzymatic activity

when analyzed using gelatin zymography. From a functional point of view L-EV positively influenced in-vitro wound healing ($P<0.05$) and several angiogenesis/tube formation parameters (i.e. master segments, $P<0.05$; meshes, $P<0.05$; segments, $P<0.05$).

Conclusion: We show for the first time that L-EV with regenerative and pro-angiogenic potential can be reproducibly isolated from in-vitro cultured human regulatory macrophages. We propose that L-EV may exert similar effects in-vivo and could represent a therapeutic option for the treatment of chronic wounds and ischemia-associated diseases.

References:

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2. Paolicelli R.C. et.al. *Neuroscience* **405**, 148-157 (2019).

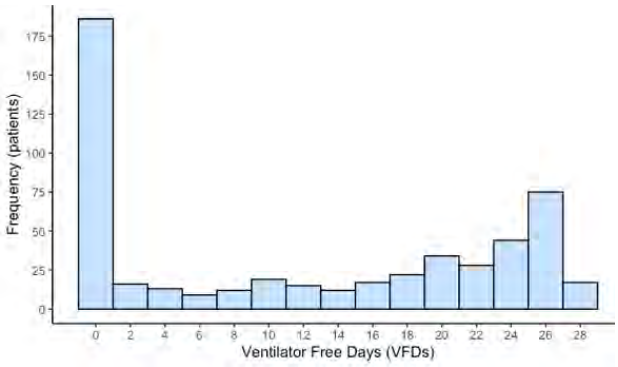

Figure. Days alive and ventilator free through POD28

09AP05-03
Post-operative days alive and ventilator-free in critically ill tube-fed patients requiring anesthesia care: a retrospective cohort study

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Background and Goal of Study: Data on postoperative ventilator-free days is needed to inform the design of studies assessing the effects of preprocedural fasting on postoperative pulmonary outcomes in critically ill tube-fed patients. To date, such data is scarce. We aimed to quantify days alive and ventilator-free in a heterogeneous cohort of ICU patients.

Materials and Methods: We conducted a retrospective cohort study using a dataset of adult patients at Massachusetts General Hospital who underwent non-emergency, non-GI tract, non-airway procedures with anesthesia during ICU admission between 2016 and 2022. Data were extracted from medical records. Patients in the dataset received mechanical ventilation within 12 hours and tube feeding within 48 hours before surgery.

Days alive and ventilator free at postoperative day 28 after the index procedure were defined as:

1. 28 minus the last day of mechanical ventilation in survivors;
2. 0 in non-survivors or if mechanically ventilated on day 28.

Duration of preoperative fasting was defined as the time difference between the last documentation of non-trophic tube feeding and start of anesthesia care.

Results and Discussion: Our final sample included 526 patients, with a median (Q1, Q3) age of 59 (47, 67) years, who underwent a total of 736 procedures during their ICU admission with a median duration of stay of 29 (15, 64) days. The median preprocedural fasting time was 13 (10,18) hours.

Median number of days alive and ventilator-free at postoperative day 28 was 12 (0, 24) and the frequency distribution is presented in the Figure. 139 (26.4%) patients died before or on day 28 and 58 (11%) were ventilated on day 28.

Conclusion(s): Our study demonstrates that critically ill tube-fed patients who undergo procedures commonly require prolonged postoperative mechanical ventilation and, likely, tube feeding. Such prolonged critical illness in combination with multiple procedures indicates potential for clinically impactful nutritional loss with repeated preprocedural fasting.

09AP05-04
Proof of concept: use of a virtual reality game in rehabilitation of stroke patients in a tertiary hospital neuro intensive care unit (NICU) in Singapore

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Background: Patients with stroke make up the biggest proportion of admission to NICU. There are minimal physiotherapy (PT)-led rehabilitation activities currently in NICU. There is a potential to improve this by introducing virtual reality rehabilitation (VR) games for early mobilisation within the ICU. AHA/ASA recommends "range-of-motion activities, motor challenges and seated activities" *within 24 hours after stroke* to prevent deconditioning and orthostatic intolerance. We hypothesize that the use of VR games in stroke patients in NICU would improve their muscle strength and frequency of physiotherapy.

Objectives:

1. To estimate a change in muscle strength by Medical Research Council (MRC) grading
2. To assess the residual disability post-ICU discharge using Modified Rankin Score (MRS) and Functional Status Score for ICU (FSS-ICU)

Methodology: 20 patients with a diagnosis of stroke of pure motor/sensory type affecting the limbs, Glasgow Coma Scale (GCS) 14–15, Richmond Agitation Sedation Scale (RASS) -1 to +1 were recruited. Eligible patients would use VR games to improve movement of upper and lower limbs daily under supervision of PT. The same PT reviewed the patients to assess MRC and FSS-ICU upon transfer out of the unit. The total number and duration of VR rehab sessions were recorded.

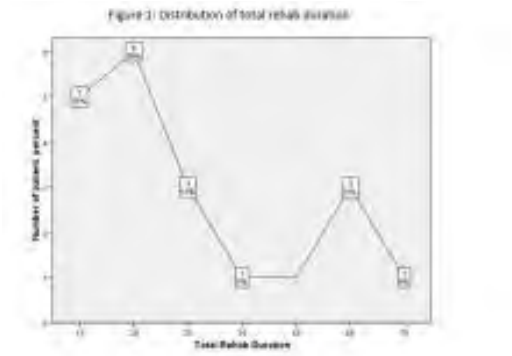
Results: 15 patients (75%) received 1 VR rehab in ICU, whereas 6 (30%) and 1 (5%) patient received 2 and 3 sessions, respectively. A total of 7 (35%), 9 (45%), and 4 (20%) patients received the first rehab session for 15, 20, and 25 minutes, respectively. On average, the total rehab duration was 27.5 minutes (figure 1).

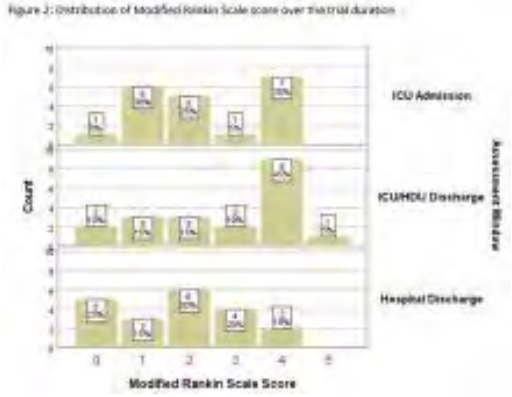
Majority of the patients (95%), returned to their premorbid status of physical mobility.

12 patients (60%) had improvement in MRS score at hospital discharge.

9 patients (45%) had improved motor strength of shoulder while 7 (35%) had improved motor strength of knee.

FSS-ICU increased significantly at ICU discharge and hospital discharge (Table 1).





Characteristic	Admission at ICU, mean (SD)	ICU/HDU discharge, mean (SD)	P value	Hospital discharge, mean (SD)	P value
Parametric estimation*					
Modified Rankin Scale score	2.35 (1.39)	2.4 (1.54)	0.168	1.75 (1.33)	0.055
Motor strength of shoulder post-stroke based on MRC grade (right)	4.45 (0.69)	4.60 (0.84)	0.183	4.75 (0.44)	0.055
Motor strength of shoulder post-stroke based on MRC grade (left)	4.55 (0.82)	4.50 (0.76)	0.998	4.65 (0.59)	0.429
Motor strength of knee post-stroke based on MRC grade (right)	4.55 (0.61)	4.63 (0.49)	0.423	4.75 (0.44)	0.214
Motor strength of knee post-stroke based on MRC grade (left)	4.65 (0.93)	4.60 (0.68)	0.998	4.70 (0.57)	0.998
Footfloor stress score for ICU (FSS-ICU)	29.80 (5.29)	26.25 (6.48)	0.010	21.05 (4.28)	<0.001
Nonparametric estimation**					
	Admission at ICU, median (IQR)	ICU/HDU discharge, median (IQR)	P value	Hospital discharge, median (IQR)	P value
Modified Rankin score	2 (1 - 4)	3 (1.5 - 4)	0.172	2 (0.75 - 3)	0.042
Motor strength of shoulder post-stroke based on MRC grade (Right)	5 (4 - 5)	5 (4 - 5)	0.081	5 (4.75 - 5)	0.058
Motor strength of shoulder post-stroke based on MRC grade (Left)	5 (4 - 5)	5 (4 - 5)	0.655	5 (4 - 5)	0.414
Motor strength of knee joint-stroke based on MRC grade (Right)	5 (4 - 5)	5 (4 - 5)	0.414	5 (4.75 - 5)	0.106
Motor strength of knee post-stroke based on MRC grade (Left)	5 (4 - 5)	5 (4 - 5)	0.683	5 (4.75 - 5)	0.655

*P values are obtained from paired t-tests comparing the follow-up assessment scores with admission
**P values are obtained from paired Wilcoxon signed rank test comparing the follow-up assessment scores with admission

Functional status score for ICU (FSS-ICU)					
	Admission at ICU, mean (SD)	ICU/HDU discharge, mean (SD)	P value	Hospital discharge, mean (SD)	P value
Parametric estimation*					
Rolling	5.80 (1.32)	5.90 (1.21)	0.541	8.25 (1.55)	0.001
Supine to Sit Transfer	6.80 (1.69)	7.25 (1.41)	0.035	8.25 (0.64)	<0.001
Sit to Stand Transfer	6.80 (1.21)	7.25 (1.37)	0.145	8.15 (1.09)	<0.001
Sitting Edge of Bed	6.35 (1.07)	6.20 (1.19)	0.772	8.90 (0.31)	0.013
Walking	2.15 (2.43)	3.65 (2.41)	0.007	5.35 (2.01)	<0.001
Nonparametric estimation**					
	Admission at ICU, median (IQR)	ICU/HDU discharge, median (IQR)	P value	Hospital discharge, median (IQR)	P value
Rolling	6 (4.75 - 7)	6 (5 - 7)	0.317	7 (7 - 7)	0.005
Supine to Sit Transfer	6 (4 - 8.25)	6.5 (6 - 7)	0.041	7 (6 - 7)	0.001
Sit to Stand Transfer	6.5 (4 - 8)	7 (4 - 8.25)	0.098	8.5 (7.75 - 9)	0.001
Sitting Edge of Bed	7 (6 - 7)	7 (6.75 - 7)	0.999	7 (7 - 7)	0.317
Walking	1 (0 - 4)	4 (2 - 5.25)	0.008	5 (5 - 7)	<0.001

*P values are obtained from paired t-tests comparing the follow-up assessment scores with the first assessment
**P values are obtained from paired Wilcoxon signed rank test comparing the follow-up assessment scores with first assessment

Conclusion: Virtual Reality for early rehabilitation of stroke patients in the NICU is viable and shows promise.

Reference:

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09AP05-05
The role of curcumin on lipopolysaccharide-induced inflammatory cell activation and acute lung injury

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Background and Goal of Study: Over-activation of inflammatory cells involving macrophages and neutrophils are associated with multiple organ failure under those conditions. Thus, nontoxic molecules that regulate inflammatory cells may provide a novel therapeutic strategy.

Materials and Methods: In this study, we measured the production of tumor necrosis factor-alpha (TNF-α) and macrophage inflammatory proteins-2, and activation of extracellular signal-regulated kinases (ERK)1/2, c-JUN N-terminal kinase (JNK) and p38 in murine monocytic cell line RAW264.7. We also evaluated the effects of curcumin in a murine model of lipopolysaccharide (LPS)-induced acute lung injury.

Results and Discussion: We found that curcumin inhibited the production of TNF-α and attenuated phosphorylation levels of ERK1/2 and JNK, but not p38, in RAW264.7 cells stimulated with LPS. Curcumin also attenuated the production of TNF-α and the phosphorylation of ERK1/2 in the lungs of mice administered intratracheal LPS. Curcumin reduced the wet/dry weight ratio, histological severity, and neutrophil accumulation in the lungs and improved mortality after LPS treatment.

Conclusion(s): Curcumin attenuated LPS-induced lung injury by suppressing TNF-α production as well as ERK1/2 and JNK activation in macrophage stimulated with LPS.

09AP05-06
Incidence, risk factors and prognosis of patients who develop acute kidney injury (AKI) in the postsurgical intensive care unit

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Background: Acute kidney injury (AKI) used to be defined as the increase in creatinine and/or the reduction in diuresis, both serving as markers of glomerular filtration rate (GFR). It is estimated that AKI affects 30-60% of critically ill patients, an important cause of morbidity and mortality in the short and long term. Recently published studies highlight that up to 41.2% of these patients do not recover renal function, neither before hospital discharge, nor in the following years. Our aim was to evaluate the incidence, risk factors, prognosis, and mortality of patients who develop AKI during their postsurgical intensive care unit stay.

Materials: After obtaining the approval of the ethics committee, we carried out a retrospective study including patients admitted to the ICU of the Hospital Universitario de GC Dr. Negrín from January 1,

2020 to March 31, 2020. Patients with chronic kidney disease (CKD) were excluded. All demographic variables and those corresponding to admission that could influence the development of renal failure were collected. The clinical evolution of the patients was evaluated, as well as the permanence of renal failure at 6 months, one year, and two years.

Results and Discussion: Of the 206 patients included (55.8% male, 64.6 ± 13.9 years old), 41.2% developed AKI: AKIN I 24.3%, AKIN II 9.2%, AKIN III 7.8%. Of those classified as AKIN III, 4.9% required renal replacement therapy (RRT). Development of AKI was more frequent in patients with arterial hypertension ($p=0.026$), diabetes mellitus ($p=0.019$) and ischemic heart disease ($p=0.01$). The use of catecholamines and invasive mechanical ventilation were also associated with the development of AKI ($p<0.0001$).

Of those patients who suffered AKI during their ICU stay, 10% remained with AKI at the end of their stay. Development of AKI during their stay in the ICU was associated with an increase in mortality before discharge ($p<0.0001$), at one year ($p<0.001$) and at two years ($p<0.0001$). Patients who required RRT died in the ICU or prior to leaving the hospital. Therefore, it was impossible to evaluate the permanence in RRT after hospital discharge.

Conclusion: Development of AKI is associated with the presence of cardiovascular risk factors and with the severity of the disease that led to admission to the ICU. The higher the degree of AKI development during admission to the ICU, the worse prognosis. Optimizing cardiovascular risk factors preoperatively may prevent the occurrence of AKI.

09AP05-07
Using local requirements to inform the design and implementation of an AI-driven predictive model of deterioration: a case study

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Background and Goal of Study: There has been significant work on building predictive models for in-patient deterioration but most are not implemented. These projects generally do not build the research objectives around the practical requirements of the end users. Here, we aimed to predict ICU admission for two purposes: predicting aggregate bed demand and assisting the deteriorating patient team (PERRT) with identifying patients likely to need ICU admission alongside prioritising their worklist.

Materials and Methods: To smooth implementation and make the model useful in clinical practice, we planned to involve PERRT at all stages of building, validating and implementing the model prototype. We ascertained PERRT's requirements pre-emptively: that predictions are live, predict 24h in advance, are built into a utilisable dashboard and cover all adult inpatient beds in the hospital.

We used live data from a major inner city teaching hospital, processing data including patient specific observations, bloods, demographics, admission type and in-patient referrals. Summary statistics formed the model input. We compared the performance of different models including using the National Early Warning Score (NEWS2) by itself (most recent NEWS score in a logistic regression), ensemble models including gradient boosted decision trees (XGBoost) and random forests, and a neural network. As requested by PERRT we aimed to reduce false positives by iterating over the model. We trained the final model on 193834 individual patient days, with a 64:15:21 chronological train-test-validation split.

Results and Discussion: We found that XGBoost performed best, outperforming the nationally validated NEWS2 (AUROC 0.832 and 0.587 respectively). We implemented this model and regularly delivered the predictions to PERRT. The web app allowed users to interact with individual predictions and relevant data including recent observations and bloods. We used feedback via the NHSX DTAC guidelines to validate and guide design of a future final model.

We found that initial referral type and admission type, surrogates for patient mobility and ward strain, NEWS score and age contributed most to the predictions.

Conclusion(s): We showed that it is feasible to build an AI-based model according to local requirements, to deliver individualised live predictions of ICU admission to clinical teams with clinical utility, and complete this project within 9 months from design to implementation.

09AP05-08
Evaluation of compliance in use of CAM ICU in delirium assessment

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Background and Goal of Study: Delirium accounts for a higher percentage of organ dysfunction commonly seen in ICU [1]. It usually manifests as sudden onset of confusion with alternating mental status associated with inattention, disorganized thinking and/or altered consciousness. Prevalence varies from 34.4% to 46.3% in critically ill patients and more common in mechanically ventilated patients accounting for 80% [2]. CAM ICU has been validated and widely used for structured delirium assessment. Improper and lack of use of CAM ICU has led to missed diagnosis and underestimation of delirium(3). The essence of continuous education and retraining in use of CAM ICU tool cannot be overemphasized. The objective is to evaluate compliance in the use of CAM ICU to assess delirium.

Materials and Methods: This audit evaluated the compliance in the use of **CAM ICU tool** for assessing delirium in the ICU in PHB. Retrospective study of 70 patients admitted to the ICU from 01/10/ 2020 to 31/12/ 2020. Patients were selected based on inclusion and exclusion criteria. Data retrieved and analysed and assessed against the NICE guidelines 2010 on the management of Delirium. Staff were trained with educational videos on CAM ICU assessment and followed by a reaudit.

Results and Discussion: Delirium was appropriately assessed using CAM ICU in 62% of the patients and after the educational videos intervention CAM ICU assessment has improved to 65%. There was decrease in inappropriate unable to assess (UTA). Incidence of Delirium was 37.8%. The initial audit identified a gap in knowledge as regards the use of CAM ICU and was addressed by a simple video on CAM ICU assessment. A reaudit has shown improvement but a lot still need to be done.

Conclusion(s): This audit showed the ICU is not meeting the national standard of screening of patients for delirium using CAM ICU. Continuous education and retraining of staff on the use of CAM ICU will increase screening, diagnosis and appropriate treatment of delirium.

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09AP05-09
COVID-19 associated Paediatric Inflammatory Multisystem Syndrome (PIMS-TS) in intensive care: retrospective cohort trial (PIMS-TS INT)

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Background and Goal of Study: In the spring of 2020, a new disease similar to Kawasaki disease and toxic shock syndrome began to appear.[1] It was manifested by different clinical symptomatology and different severity of disease.[2] The association with COVID-19 was assumed because this disease began to appear following a previous SARS-CoV-2 infection.[3]
The aim of this trial was to describe the initial clinical presentation, diagnostics, therapy and clinical outcome of pediatric patients PIMS-TS admitted during the study period to one of the 3 university hospital PICUs.
Materials and Methods: The trial was designed as a multicentric retrospective cohort trial. The study involved patients from three different hospitals from two countries (Czechia and Austria). All patients younger than 19 years of age who were admitted to the PICUs with a diagnosis of PIMS-TS between May 2020 and May 2022 were enrolled in the study. Demographic, epidemiological data, initial clinical presentation, diagnostics, treatment and patient clinical outcome including cardiological functions were collected.
Results and Discussion: 180 patients were admitted to the PICUs with a diagnosis of PIMS-TS. The most common symptoms on admission were fever (81.6 %, n=147) and rash (70.6 %, n=127). Acute respiratory failure had 21.1 % of patients (n=38). Vasopressor support was used in 20.6 % (n=37) of cases.
Overall 96.7 % of patients (n=174) were initially tested positive for SARS-CoV-2 IgG antibodies. No patient died during hospital stay and 28 days follow-up.
Conclusion: We identified initial clinical presentation and organ system involvement of PIMS-TS including laboratory manifestations and treatment in patients admitted to the one of the 3 university hospital PICUs.
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09AP05-10
Ultrasound as a method of checking the nasogastric tube

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Background and Goal of Study: Nasogastric tube (NGT) placement is a common and simple procedure. However, its malposition can lead to devastating complications. Therefore, it is important to guarantee normoposition as soon as possible. Chest X-ray is the "gold standard" test. Ultrasound is emerging as a potentially useful test as it is non-invasive, cheap, fast and available, but with limited evidence yet. We aim to evaluate the reliability of ultrasound as a verification method of the
normoposition of NGT.
Methods: After obtaining the approval of the ethics committee, we carried out a prospective observational, including patients admitted to the intensive care unit with NGT, or in whom reassessment of the normoposition of the NGT was necessary. Abdominal ultrasound was performed by an anaesthesiologist, specifying the visualization or not of the NGT in the stomach. Then, normal placement was confirmed by X-ray. The number of NGTs correctly identified with ultrasound, its comparison with X-ray as a diagnostic test, and possible confounding factors were studied.
Results and Discussion: During recruitment, 52 patients were included (65.4% male, age 62 ± 12, BMI 27 + 9), mostly ASA III (42.3%) and post-surgery (92.3%). The purpose of NGT was feeding in 53.8% and drainage in 46.2%. X-ray confirmed that the NGT was infra-diaphragmatic in 92.3% of cases. Ultrasound was able to confirm the position of the NGT in 78.8% of patients, obtaining an area under the curve (AUC) 0.656 (IC95% 0.350 – 0.963) (sensitivity 0.81 and specificity 0.50). Difficulties for the ultrasound were found in 67.3% of patients: laparotomy (36.5%), invasive mechanical ventilation (30.7%) and obesity (17.3%). In those patients in whom the normal position of the NGT could not be demonstrated with ultrasound, a higher prevalence of the described difficulties was found (p=0.21). No differences were found between the ultrasound verification and the type of NGT (p=0.36), the ultrasound approach (trans-splenic or epigastric, p=0.73) or the BMI (p=0.32).
Conclusion(s): Ultrasound may be useful in screening for normal positioning of the NGT, especially when chest X-ray is not available. It may not be a good test in patients with difficulties, such as those who have undergone laparotomy, obese, or under mechanical ventilation. Our study did not achieve sufficient statistical power probably due to the small sample size.

09AP06-01
Iatrogenic diaphragmatic rupture: case report

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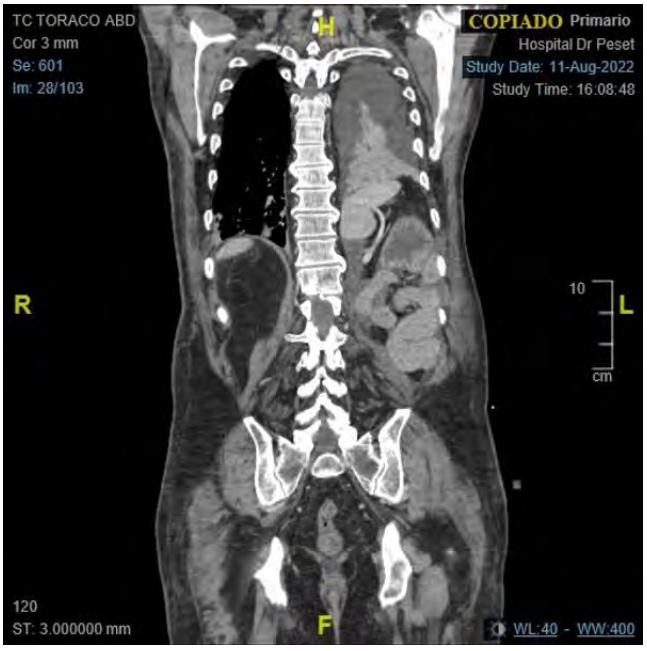
Background: Iatrogenic diaphragmatic hernias have been reported as a rare but serious complication during abdominal surgery. Diaphragmatic hernias are well reported in the medical literature; however, iatrogenic diaphragmatic rupture is rarely documented after abdominal surgery in which the diaphragm is not part of the surgery[1].
Case report: A 67-year-old male patient, ASA II, who was admitted to the intensive care unit of the Hospital Doctor Peset in Valencia, after block resection of a retroperitoneal mass, left hemicolectomy, and left nephrectomy because of retroperitoneal tumor; without any surgical incidents. During the first postoperative day, the patient reported dyspnea and chest pain. The lung ultrasound shown an intrathoracic gastric chamber and the result of CT scan was: "posterolateral defect of the left diaphragmatic dome with spleen herniation and stomach". Emergency surgical intervention was performed in order to repair the leakage. The main complication after that was a nosocomial pneumonia who was successfully treated, and the patient was discharged 10 days after.
Discussion: Iatrogenic diaphragmatic hernias have been reported after nephrectomy, although the cause of iatrogenic diaphragmatic hernia is difficult to assess. Studies have speculated that the diaphragm could be inadvertently injured because of the contact with electrical devices[2].
Diaphragmatic hernia has not a pathognomonical clinical presentation and added to its low incidence causes a delay in its diagnosis. In the emergency onset, diagnostic delay means an increase mortality. Surgical treatment is the first attempting in order to resolve it[3].
The morbidity and mortality rates of this condition depends on the severity of the associated injuries and the delay in its diagnosis.



Reference:
1. Hernia 12(2008) 655–658; [2] Int J Surg Case Rep. 2020;67:169-172; [3] Surg Case Rep. 2018 Aug 20;2018(8).

Learning Points: Post-surgery diaphragmatic rupture is a very uncommon condition. Primary prevention is essential. It has to be suspected as a possible complication after abdominal surgery in our differential diagnosis of dyspnea or chest pain to avoid delayed treatment.

09AP06-02
Isolated massive Pulmonary Embolism (PE) in a patient who underwent elective gynecomastia surgery within 1 month of contracting COVID-19 infection - successfully treated with medical therapy alone

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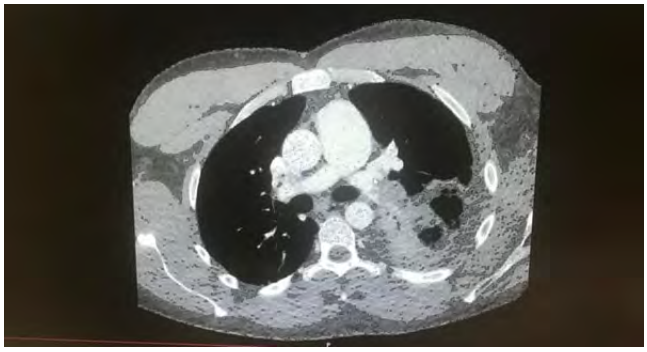
Background: Development of thrombosis in patients undergoing elective surgeries after contracting COVID has been concerning and there has been debate on when is it safe to perform surgeries on them. Here we present a rare case of a patient who developed isolated Pulmonary embolism (PE) after 1 week of having elective gynecomastia surgery and had COVID 22 days back.
Case report: Patient was admitted to the hospital with shortness of breath, palpitations and chest pain since 3 days. He had normal hemodynamics and SpO2 of 93% on room air. Initially pain killers and O2 via nasal cannula were given. ECG had S1Q3T3 pattern and ECHO showed decreased RV systolic function. D dimer was high and DVT was excluded on USG. CTPA revealed PE in left and right pulmonary arteries. Heparin infusion was started but next day the severity of symptoms increased. Radial arterial line was inserted and he was thrombolysed with Alteplase. He started to improve progressively and after 4 days a repeat CT showed regression of PE. After 1 week heparin was discontinued and Rivaroxaban 15 mg twice a day was started orally. Echo showed improved RV size and function. He showed remarkable improvement with SpO2 of 97% on room air. Patient was discharged after 13 days in hospital in a stable condition with a advise to take Rivaroxaban for 3 months.
Follow up after 1 month: He had normal Echo and no other complaints.



Discussion: According to studies, the risk of PE is <1% in post surgical patients who recently had COVID. In this case, symptoms and positive findings of investigations clinched the diagnosis. Triad of inflammation, endothelial injury and thrombosis is a probable underlying mechanism leading to PE.

Reference:
Anaesthesia 2022; **77**: 3–6: SARS-CoV-2 infection and venous thromboembolism after surgery: cohort study
Learning Points: 1. Isolated PE in a postoperative case with a recent infection with COVID is rare but with a high index of clinical suspicion and proper investigations an early diagnosis can be made. 2. Preventive strategies like posting elective surgeries at least 7 weeks after getting COVID and using appropriate drugs for prevention and management of PE are recommended.

09AP06-03
Isolated type 2 respiratory failure in myasthenia gravis along with pheochromocytoma-rare presentation

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Background: Myasthenia gravis is a spectrum of autoimmune disease which is characterized by weakness and fatigability due to autoantibody mediated loss of functional acetylcholine receptors. Most of the patients who develop respiratory symptoms during the late course of the myasthenia crisis. This case presented with isolated type 2 respiratory failure, with hypertensive crisis diagnosed as Pheochromocytoma.
Case report: 65 year old female patient who is a known hypertensive and diabetic for past 15 years presented with progressive breathlessness, headache ,neck pain ,vomiting and diarhoea . Her blood pressure was 220/114mmhg with pulse rate of 80, oxygen saturation of 97 % in room air and respiratory rate of 28/min. Chest x ray was clear .Her routine total counts,USG KUB,CT KUB normal and procalcitonin 0.10ng/ml . Patient desaturated and tachypnoeic with Pco2 98mmhg needs NIV support. CT chest showed right middle lobe atelectasis. On trial of weaning from NIV patient showed inability to do incentive spirometer and deep breathing exercise. Chest xray had diaphragmatic raise but all other muscle power were normal. Suspecting MG acetyl choline receptor antibodies test was done(7.22 nmol/l-posttive >0.50 nmol/l) and treated with pyridostigmine 180mgs/day ,prednisolone 30mg/day, intravenous immunoglobulin at 0.4mg/kg/day for 5 days .She was evaluated for her fluctuatiig blood pressure and no evidence of congestive cardiac failure in echocardiography or pulmonary thromboembolism in CT. Treated with nitroglycerin infusion ,labetolol and telmesartan. On suspecting pheochromocytoma urine vanillyl mandelic acid was checked -12.13mg/24 hrs(normal<8mg/24hrs) ,Metanephrine level in urine was 354.56 mcg/day(normal 33-109).Patient was weaned from Non Invasive ventilation and blood pressure to 140/88mmhg .
Discussion & Learning: Respiratory failure can be a complication during the late course of MG , known as a myasthenic crisis. However, isolated respiratory failure as the presenting symptom, as in the present case, is very unusual with other condition of Pheochromocytoma.
Patients with MG can initially present with acute type2 respiratory failure with gastroenteritis and If hypercapnic respiratory failure occurs in patients with no underlying pulmonary disease, should consider performing ach receptor antibody test .Two different condition can coexist and if required appropriate test should be undertaken.

09AP06-04
Description of the pulmonary ultrasound pattern in the immediate postoperative period of double lung transplantation

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Background and Goals: One of the main complications in the double lung transplantation (DLT) is the primary graft dysfunction (PGD). For its diagnosis chest X-ray are usually required. Lung ultrasound (LU) has become a useful tool for the identification of the lung pattern.
The goals are to define the LU pattern in adult patients in the early postoperative period of DLT and to study whether the described patterns correlate with the usual clinical diagnosis of PGD.
Materials and Methods: Observational and descriptive study. We included patients over 18 years who have undergone DLT and who were admitted to the ICU of the Hospital La Fe.
A LU was performed in the first 12 h, at 24 h, and 48 h after admission following the BLUE LU protocol, by fields, the lung score (LS) was obtained. 72 h after surgery, the analytical, gasometrical data, radiological report and the diagnosis of the patient was consulted.
Results and Discussion: Data was taken from 39 patients between November 2020 and December 2022.
20 of the patients were diagnosed with PGD (51.28%). The incidence was 12 cases (30.77%) at 12 h, 5 cases at 24 h (18.52%) and 3 at 48 h (16.64%).
The average LS in the overall sample was 4.72 at 12 h, 4.76 at 24 h, 4.81 at 48 h and 4.81 at 72 h. In the PGD subgroup, the average LS, it was 4.81 within the first 12 h, 4.81 at 24 h, 4.81 at 48 h and 4.81 at 72 h.
To assess the differences between the average LS in those that developed PGD and those who did not, we use the non-parametric Mann-Whitney U test. This analysis showed no statistically significant differences in both groups.
A non-parametric Wilcoxon signe-rango test was performed to compare the average LS in successive days within the PGD group, and no statistically significant differences were found. A pattern was the most prevalent, in the overall sample and in the PDG subgroup.
The LS in the PGD subgroup was found to be slightly higher than that of the overall sample during the first 12 h and at 24 h. No differences were observed at 48 and 72 hours.
Conclusions: LU is a useful test to detect the interstitial pattern. We have not found correlation between PGD and LS. Moreover, in patients that develop PGD, no evidence was found for the correlation between the LS and the development of the clinical status of the patient. However, the lack of evidence can be due to the insufficient sample size, and it is important to increase its statistical strength to unlock possible evidence.

09AP06-05
Extracorporeal membrane oxygenation to treat acute respiratory failure due to hemorrhagic alveolitis in a patient with acute myeloblastic leukemia: striking or waiting strategies?

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Background: ECMO support for severe ARDS is nowadays widely used with important results on overall survival, reported in ELSO registry near to 55% at 90 days, and today ECMO teams force the use of this extreme technique to several populations but there is a lack of data on hematological patients.
Case report: A 39 years-old woman without a history of previous diseases but a new diagnosis of acute myeloblastic leukemia (AML) was admitted to intensive care unit (ICU) for worsening hypoxia and respiratory acidosis for hemorrhagic alveolitis, as shown by chest computed tomography (CT), presenting an ARDS with P/F < 100 in spontaneous breathing treated with non-invasive ventilation via full-face mask.
Meanwhile chemotherapy was started and led to a severe bone marrow aplasia (PLTs <1000 cell/mm^3) that was managed with multiple blood and platelets transfusions. So, it was decided to delay any invasive approaches.
After 14 days ARDS worsened but bone marrow recovered PLTs > 100.000 cell/mm^3, leading us to start invasive mechanical ventilation, with low positive end-expiratory pressure (PEEP 4 cmH_2O) and a low tidal volume (TV 320 mL) and immediately $ECCO_2R$ therapy was added.
No improvement was achieved, and veno-venous ECMO by femoral-jugular cannulation was achieved, with a full protective lung ventilation using ultra-low tidal volumes (near to 2 mL/kg), with prophylactic intravenous sodic heparin.
After 2 weeks of ECMO, we started a gradual weaning, and removed ECMO after two days. no ECMO-related complications were registered.
Patient started weaning from mechanical ventilation and reached 12 hours of spontaneous ventilation in oxygen therapy, however the patient at least died for AML recurrence after 90 days from admission.
Discussion: ECMO is used as a rescue therapy in patients affected by severe respiratory failure with life-threatening hypoxia and respiratory acidosis non-responsive to other maneuvers.
However, immunosuppression and coagulopathies of hematological malignancies are considered as relative contraindications for ECMO. On the other side, long-lasting respiratory failure represents another relative contraindication to extracorporeal support.
In consideration of severe hemorrhagic manifestations, we preferred to keep firstly a conservative approach, starting a late extracorporeal support after bone marrow recovery.
ECMO could be a valid option to improve the survival of hematological patients with severe ARDS and thrombocytopenia, even if high incidence of recurrency.
Reference:
Abrams, D. *et al.* Thrombocytopenia and extracorporeal membrane oxygenation in adults with acute respiratory failure: a cohort study. *Intensive Care Med.* 42, 844–852 (2016).
Learning Points: Specific strategy for management of these patients is needed and actual thread is individualized approach avoiding collateral effects.

09AP06-06
Esophageal prosthesis vs. Eso-Sponge therapy in the treatment of anastomotic dehiscence after Ivor-Lewis esophagectomy: a case report

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Background: Suture dehiscence of the esophageal surgery anatomosis is a complication observed in around 5-30% of treated patients[1].
Possible treatments include endoscopic clipping, placement of endoluminal prostheses, surgical treatment with cervicotomy, and insertion of a polyurethane sponge connected to a suction system[2].
Case report: A 53-year-old male, smoker, diagnosed with squamous cell carcinoma of the esophagus and treated with adjuvant therapy, was scheduled to elective Ivor Lewis esophagectomy.
Five days later, our patient began septic shock due to suture dehiscence, with paraesophageal collection and bilateral pleural effusion, and we decided to place an esophageal prothesis and pleural drains. After 10 days, clinical and imaging deterioration with right hydropneumothorax and the persistence of the esophageal leak. We placed the Eso-sponge. 12 days later, CT showed radiological improvement with right hydropneumothorax and esophageal defect reduction. After 19 endoscopic sponge changes every 4 days and the need to reduce the VAC therapy suction from -125mmHg to -90mmHg due to gastrointestinal bleeding, a neoformed wall with complete cannulation was created and the patient could be fed orally without digestive symptoms.
Discussion: Dehiscence of the esophageal anastomosis has a mortality rate of close to 20%[1]. Even though prostheses are the most used treatment, recent evidence shows a higher success rate with the Eso-Sponge (86.4% vs. 60.9%) and shorter treatment times (26.5m days vs. 36)[3]. Although the costs are higher, they can be balanced with the reduction in hospitalization days and complications.
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Learning points: Eso-sponge can be an effective treatment in cases of large esophageal dehiscences, even in the long term and in fragile patients, when prostheses have not been successful.

09AP06-07
Low flow extracorporeal CO2 removal to allow lung-protective ventilation

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Background: Invasive mechanical ventilation (MV) is lifesaving in severe acute respiratory failure but can cause ventilation-induced lung injury (VILI). Advances in extracorporeal CO2 removal (ECCO2R) technologies may facilitate more protective lung ventilation in acute respiratory distress syndrome (ARDS).
Case report: We report on a 72-year-old man 8 years after lung transplantation who presented with SARS-COV2 infection. He was admitted to the intensive care unit (ICU) for ARDS, requiring MV. The initial artery gasometry after intubation was: pH 7,20 PaFi ratio 100 PaCO2 80; then we decided to prone position. The ventilator's settings best optimized were under pressure control: peak pressure 32, best PEEP 10, FiO2 50%, respiratory rate 29. With this, we got to improve oxemia (160 mmHg; PaFi ratio 320) but worsened respiratory acidosis (pH 7,06) with hypercapnia (PaCO2 96 mm Hg). After 20 hours of prone position, the situation was similar, so we decided to supinate and start an extracorporeal CO2 removal (ECCO2R) called PrismaLung+ , integrated on a continuous renal replacement therapy platform.
After one hour of treatment with the PrismaLung+, PaCO2 decreased to 50 mmHg and pH increased to 7.35, while maintaining lung protective ventilation with peak ventilator pressure 23 mmHg, PEEP optimal 9, FiO2 40% and respiratory rate of 15. The next forty eight hours, respiratory improvement continued, there were no incidents related to ECCO2R device and the patient kept in supine position. But finally the patient died by hemodynamic instability due to septic shock secondary to bacterial superinfection.
Discussion: Acute respiratory distress secondary to SARS-COV2 infection is generally characterized by hypoxemia and less common hypercapnia. In this case, after one cycle of prone position, hypoxemia improved a lot but hypercapnia got worse. The ventilator's settings were optimized but were not protective and could cause VILI. We decided to use a minimally invasive ECCO2R to achieve a lung protective ventilation and we got it.
Reference:
Combes A, Brodie D, Aissaoui N, Bein Th et al. Extracorporeal carbon dioxide removal for acute respiratory failure: a review of potential indications, clinical practice and open research questions. Intensive Care Med 2022; 48: 1308-1321.
Learning Points: ECCO2R devices may allow lung-protective ventilation in severe hypercapnic respiratory failure unresponsive to medical treatments and mechanical ventilatory support

09AP06-08
The role of Echocardiography for differential diagnosis in hemodynamic shock based on left ventricle outflow tract velocity-time integral measurement: a case report

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Background: Transthoracic echocardiography (TTE) offers real-time bedside diagnosis and hemodynamic monitoring in ICUs. TTE may be superior to arterial pulse contour analysis (APCA) for stroke volume (SV) monitoring in critically ill patients. A case of a severe septic shock patient where the role of TTE was key for differential diagnosis.
Case report: A 60-year-old male was admitted to ICU for septic shock secondary to a scrotal abscess secondary to a scrotal trauma requiring multiple abscess drainages. Severe Septic Shock required up to 1,5mcg/kg/min of noradrenaline and 0.03 IU/min of vasopressin, presenting poor distal perfusion and oliguria secondary to an Acute Kidney Injury AKIN 3 on furosemide infusion. APCA (FloTrac/Vigileo system) was falsely showing a Cardiac Index (CI) a 4,5l/min/m2 and Systemic vascular resistance (SVR) of 634 dyn.s.cm5. A TTE was performed, showing apical and medial anterior and anteroseptal hypokinesia. The CI measured by TTE was 1.4 l/min/m2 (LVOT Velocity time integral (VTI) of 13cm and HR of 60 bpm). Furthermore, E/E' ratio was 12. TTE monitoring suggested a mixed shock, septic and cardiogenic. Stress cardiomyopathy was the most likely diagnosis. Hence, dobutamine at 5mcg/kg/min was initiated allowing us to withdraw vasopressin and decrease the dose of noradrenaline to half. Despite broad-spectrum antibiotics and multiple surgeries for controlling the source of infection, the patient developed Fournier's gangrene. In addition, ventilator-associated pneumonia was also developed requiring tracheostomy, and eventually dying from multiorgan failure.
Discussion: The finding of stress cardiomyopathy associated with septic shock changed our strategy in this patient in which the only use of noradrenaline was leading to hypoperfusion. APCA was supra-estimating SV in this patient, whereas TTE was crucial in improving the capillary refilling time by the initiation of dobutamine. TTE is a real-time, bedside, non-invasive, and reliable method for SV monitoring. We suggest using TTE routinely for the differential diagnosis of hemodynamic shock using the LVOT VTI for Stroke Volume monitoring.
Learning Points: APCA is not reliable for CI monitoring in patients with high doses of vasopressors. TTE has evolved to become one of the most versatile modalities for diagnosing and guiding treatment in hemodynamic shock patients.

09AP06-10
Pseudo-locked-in syndrome after emergent surgery in a type A aortic syndrome: a case report

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Background: Stroke occurs in 5-10% of patients with type A aortic syndrome (TAAS). It may appear as debut or in the postoperative period and the involvement is more frequently hemispheric than vertebro-basilar due to supra-aortic trunk anatomy. Given the great variety of possible clinical manifestations and the critical state of these patients, an early diagnosis is usually difficult, although it is very important considering the significant influence that stroke may have on patient's prognosis.

Case report: 44-years-old male, admitted to the emergency department with transfixing thoracic pain and shortness of breath. Chest CT scan showed TAAS and he underwent a Bentall-Bono emergent surgery, staying hemodynamically stable during the intraoperative and then being transferred to the ICU. A neurological window was performed during the first hours and showed no alterations. A few minutes later, he presented with a self-limiting episode of generalized rigidity with gaze deviation that evolved into arreactive bilateral mydriasis and no reactivity to painful stimuli. Cranial CT was performed showing a top basilar ischemic stroke. It was decided to perform a thrombectomy, achieving a TICI 3 reperfusion. The following days, the patient continued paralyzed and without eye opening but began to answer questions by slightly nodding and shaking his head. A brain MRI showed bilateral thalamo-mesencephalic ischemic involvement. A neurological evaluation diagnosed a pseudo-locked-in syndrome with preserved consciousness, compatible with MRI findings.

Discussion: This case shows the importance that stroke has in conditioning not only vital but also functional prognosis in patients suffering from TAAS. Recent surgery contraindicates the use of thrombolysis and leaves thrombectomy as the only therapeutic option, limiting recovery in many cases, especially if small vessels are involved.

Moreover, it raises an ethical conflict because, even though the patient was paralyzed and seemed to be unconscious, his consciousness was preserved and he should be able to participate in the decision-making process regarding his treatment.

Reference:

1. Gaul C, et al. Neurological Symptoms in Aortic Dissection: A Challenge for Neurologists. Cerebrovasc Dis 2008;26:1-8.

Learning points: Stroke is a relatively frequent complication in patients with TAAS, but its early diagnosis is difficult. There are unusual presentations that can have catastrophic consequences on functional prognosis.

09AP06-11
Air where it doesn't belong

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Background: Cricoid fracture is rare and the main concern is airway obstruction.[1] Due to the frequently associated emphysema, bed rest, analgesia, and sometimes antibiotics are recommended.[2,3]
To our knowledge, this is the first reported case of a cricoid fracture diagnosed postoperatively (it is mostly associated with blunt trauma).[1]

Case report: A 75-year-old male, with a known history of vocal cord palsy due to thyroid cancer and a previous tracheotomy underwent an exploratory cervicotomy: the goal was its eventual removal; with the larynx adherent to the posterior planes and being difficult to mobilize, it was decided to maintain the tracheotomy (*in situ)*.
The patient was admitted to the ICU for postoperative surveillance and developed extensive subcutaneous emphysema. The CT revealed extensive cervico-facial emphysema dissecting the deep para-pharyngeal and carotidal planes with subsequent compression and collapse of the airway as well as an extension to the middle and posterior mediastinum and subcutaneous cervico-pectoral emphysema, as well as a communitive fragmentation of the cricoid cartilage. He was started on antibiotics and occlusive dressing. The CT 5 days later showed improvement of the emphysema.

Discussion: Cricoid fracture is rare, especially in the postoperative period. Its management precludes tight surveillance in case of a spontaneous breathing patient; many authors recommend an invasive airway for preventive purposes. This case also required careful monitoring due to the risk of further complications related to the pneumomediastinum.[2]

References:

1. Oh, JH et al (2007).”Isolated cricoid fracture associated with blunt neck trauma”.Emerg Med J.24(7):505.doi:10.1136/EMJ.2007.048355
2. Kouritas ,VK et al (2015).”Pneumomediastinum”.*J Thorac Dis*.7(Suppl 1):S44.doi:10.3978/J.ISSN.2072-1439.2015.01.11
3. Ebina, M et al (2017).”Management of spontaneous pneumomediastinum: Are hospitalization and prophylactic antibiotics needed?”*Am J Emerg Med*.35(8):1150-1153. doi:10.1016/J.AJEM.2017.03.017

Learning points: Although extremely rare, cricoid fracture may occur after laborious surgeries which may cause extensive subcutaneous emphysema and pneumomediastinum
Postoperative surveillance is essential, especially without an invasive airway due to the risk of obstruction.
Antibiotic use is debatable and its administration should be individualized

09AP06-12
Fat embolism syndrome in polytrauma patient

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Background: Fat embolism syndrome (FES) is a typical little-known pathology of polytraumatized patients, with high mortality and no treatment. It is necessary to know the real incidence of this syndrome to find adequate treatment.
Case Report: A 58-year-old man arrives at the hospital after a traffic accident with multiple fractures in his right femur: of the neck and of the middle third and the distal third of the femoral diaphysis. He stays conscious and oriented, hemodynamically stable with a SpO2 of 100%. Hemoglobin of 10 mg/dL, platelets of 12000, and normal coagulation. Fractures are surgically stabilized by traction.
After 24 h in the critical care unit, the patient presents sudden arterial hypotension (85/45 mmHg), supraventricular tachycardia (145 bpm) and signs of dyspnea (SpO2 80%). Analytically hemoglobin drop to 7 g/dL and platelets to 16000. Orotracheal intubation is performed with FiO2 of 1, as well as fluid, packed red blood cells, platelets, and vasopressors administration.
Thinking about FES, a CT scan is performed, evidencing a depletion defect in the saddle-shaped pulmonary arteries. After 48 hours of clinical maintenance, the patient starts to improve proceeding to extubation 96 hours later. After 7 days, osteosynthesis and intramedullary nail insertion are performed without incident.
Discussion: Fat embolism is defined as the appearance of a fat clot in the circulation. It is a quite common entity after trauma surgeries, but it is only a few that end in FES characterized by respiratory distress syndrome, neurological symptoms, and petechial rash, in that order. As we can see, it is usually related to long bone fractures, especially when there are multiple ones. In current studies, we can see how the real Incidence is higher than we expected due to a clinical misdiagnosis.
Gurd and Wilson criteria give us the diagnosis, although the importance of brain magnetic resonance imaging and chest CT in the first four hours after neurological disease, are emphasized. Regarding the treatment, early long bone fracture fixation is known to be the most major step as a preventative treatment, however, aliskiren and losartan are being studied as protectors of lung damage.
Reference:
Timon C, Keady C, Murphy CG. Fat Embolism Syndrome - A Qualitative Review of its Incidence, Presentation, Pathogenesis and Management. Malays Orthop J. 2021 Mar;15(1):1-11.
Learning Points:
- Brain imaging test importance.
- Involvement of the renin-angiotensin axis.

09AP07-01
The occupancy and utilisation of observation beds at Mercy University Hospital, Ireland

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Background: At Mercy University Hospital(MUH), there is a 6 bedded ICU with no provision for a HDU. To tackle capacity needs in MUH, ward level observation (obs) beds have traditionally been used. Obs beds are unique to MUH and cater for a variety of patients at ward level. Obs bed use is guided by MUH policy and/or the discretion of the treating physicians/surgeons. The aim of this service evaluation was to review the current obs beds use at MUH and ensure this is compliant with best practice care.
Method: A prospective study of obs bed patients at MUH was conducted for 4 weeks. The following data was recorded anonymously: reason for admission to hospital and obs bed; co-morbidities; patients' primary team; infusion or oxygen requirements; obs and total length of stay (LOS). Descriptive statistics was performed to analyse data with respect to breakdown of medical and surgical patients; level of care(LOC); LOS.
LOC was defined according to HSE definitions of organ support with ward level care such as iv antibiotics or non-mechanical supplemental oxygen as level 1; single organ failure such as non-invasive mechanical ventilation indicating level 2 care; and two or more organ failures such as vasopressor support and delirium indicating level 3 care.
Results: Data was acquired from 85 obs bed patients, of which 57 were surgical and 28 medical. The mean LOS for surgical obs patients was 3.6 days. Medical obs patients had a higher mean LOS of 8.4 days. In the surgical patients, 84.2% received level 1 care, 14.0% level 2 care and 1.7% level 3 care. The median surgical LOC was 1. In the medical patients, 35.7% received level 1 care, 53.6% level 2 care and 10.7% level 3 care. The median medical LOC was 2. Overall, obs bed use was 68.2% for level 1 care; 27.1% for level 2 care and 4.7% for level 3 care.
Conclusion: This service evaluation shows a varied use of obs beds across MUH. Common reasons for admission include major surgery, vasopressor or oxygen need and co-morbidities. There was a high proportion of obs bed use for patients that were receiving care more compatible with HDU/ICU level care.
Overall, 27.1% obs patients had HDU needs whilst 4.7% had ICU needs. This shows an unmet need for higher level care at MUH. There may be inequitable access to intensive care services within MUH which is mitigated by the obs beds use. Whilst this facilitates ongoing patient care, it masks underlying service limitations and is not in keeping with best practice medicine.

09AP07-02
Interchangable use of intensive care beds and high dependency beds in a co-located Neuroscience Intensive Care Unit (NICU) in Singapore: a pilot change in workflow to reduce turnover time

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Background and Goal of Study: Neuroscience Intensive care Unit (NICU) in Singapore is a co-located Intensive Care Unit (ICU) and High Dependency (HD) Unit. Traditionally, patients were nursed either in an ICU bed or a HD bed. When a HD patient's condition deteriorated, the patient would have to be physically moved to a ICU bed and managed by a different team. This delays treatment and increases turnover time.
Materials and Methods: The purpose of this project is to improve efficiency by reducing turnover time in the ICU while maintaining patient safety, promoting teamwork and reducing cost of delays in the ICU.
The intervention is to reduce turnover time (TOT). This requires education to establish a standard workflow and staffing ratios. Havelock's theory of change is used to cultivate synergy and team engagement. Fishbone diagram, and strength, weakness opportunities, threats (SWOT) analysis were used as quality improvement tools to identify causes of delays and to guide improvement.
Turnover time (TOT) is defined as time when patient leaves the ICU room to the time the next patient can be admitted. The following activities are included in
TOT: physically transporting the patient to the new bed location and cleaning the existing ICU room. Every minute wasted correlates to financial loss and longer waiting times.
Data was collected from the pilot test using the Plan, Do, Study, Act (PDSA) cycle over 6 months.
Results and Discussion: The TOT turnover time was reduced from 39 min to a post intervention TOT of 5 minutes. This improved efficiency in turnover time minimised delays to treatment for patient. There was also a reduction in workload for terminal cleaning and bed downtime. There was a reduced need for nurse-nurse handover of the same patient.
Conclusion(s): This pilot project to improve efficiency by reducing turnover time in NICU has been successful and will be rolled out to other ICUs within the hospital. This can improve patient, physician and nursing satisfaction, promote teamwork and reduce the cost of delays to patient treatment.
References:
Finkleman, A. (2016) Imlementing healthcare quality improvement : Core competencies for quality care (pp419-442)
Lane, A (1992) Using Havelock's model to plan unti-based change Nursing management 23(9), 58-60
Acknowledgements:
NICU team

09AP07-03
Optimizing alarms in Intensive Care Unit: a prospective cohort study

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Background: An inappropriate setting of the alarms in ICU (systolic, diastolic and mean arterial, SpO_2, CVP and HR) might be associated to non – desirable and potentially dangerous consequences in patients admitted to the ICU and in health care professional (‚alarm fatigue syndrome') [1,2] . This study aims to describe the impact of modifying alarm setup on their activation and to detect other beneficial modifications.
Materials and Methods: This is a prospective cohort study designed in two phases: first, an observational phase and then a second phase after modifying several parameters of certain alarms. The data recorded were captured by the monitorization system during both phases.
Results and Discussion: In phase I, 82.595 alarm records were obtained, from which 25.063 (30.3%) records were not duplicated or erroneous. In phase II, 44.120 alarms records were obtained, from which 10.257 (23.2%) records were not duplicated or erroneous. We observed a decrease of 59.1% in alarm records compared to phase I ($p < 0.01$) (figure 1). We observed an inverse correlation between the duration of the alarm and the chronicity of the patient ($p = 0.049$) as well as a direct correlation between hourly distribution and activation of the alarm, being more frequent after 15:00h ($p < 0.01$) and a direct correlation between the presence of a contact-precaution of the patient and the activity of the alarm ($p = 0.017$). After the modification of the level of these alarms we observed a considerable reduction on their activation. Most of medical and nurse intervention occurs during the activation of alarms.

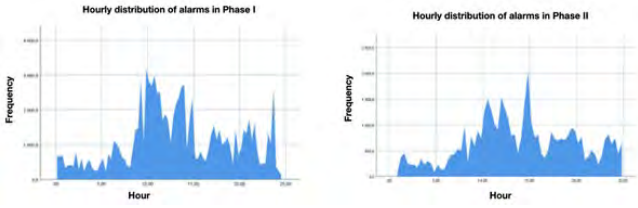

Figure 1. Hourly distribution of alarms in each Phase of the study.

Conclusion(s): Through the optimization of the limits and duration of the alarms, and the adequation of the monitorization material and a trained interdisciplinary personal it is possible to reduce their activation (especially those without clinical relevance).
References:
1. Devlin JW, Weinhouse GL. Earplugs, Sleep Improvement, and Delirium: A Noisy Relationship. Crit Care Med. 2016 May;44(5):1022-3.
2. Ruskin KJ, Hueske-Kraus D. Alarm fatigue: impacts on patient safety. Curr Opin Anaesthesiol. 2015 Dec;28(6):685-90.

09AP07-04
Paraoxonase-1 as biomarker of sepsis-associated acute kidney injury after major abdominal surgery

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Background and Goal of Study: Acute Kidney Injury (AKI) after major abdominal surgery is independent predictor of perioperative and long-term morbidity and mortality. Low paraoxonase-1 (PON-1) activity is found in both cardiac surgery-related AKI and sepsis. However, its role in sepsis-associated AKI (S-AKI) after major abdominal surgery is yet unexplored. The goal of this study is to evaluate PON-1 as diagnostic, predictive and prognostic biomarker of S-AKI after abdominal surgery.
Materials and Methods: Fifty-three surgical patients with sepsis after major abdominal surgery were compared to 50 surgical and 50 medical controls without sepsis matched by age, gender, comorbidities and type of surgery. Blood and urine samples were collected from the septic patients in admission to Intensive Care Unit (ICU) and 24 h, 48 h, 72 h and 96 h later and once from controls. PON-1 activity, Kidney Injury Molecule-1 (KIM-1) and serum and urine Neutrophil Gelatinase-Associated Lipocalin (NGAL), levels were measured. Diagnostic, predictive and prognostic value of these biomarkers was assessed using Area Under Receiver Operating Characteristic Curve (AUC-ROC).
Results and Discussion: Patients with S-AOB (n = 37) had significantly lower PON-1 activity compared to septic patients without S-AKI, surgical and medical controls (Median [25^{th} – 75^{th} percentile]: 93.0 [36.2 – 133.7] vs. 114.5 [70.0-282.0] vs. 277.0 [188.0 – 491.0] vs. 363.0 [244.0 – 920.25] U/L, respectively). PON-1 was, compared to KIM-1, serum and urine NGAL, superior diagnostic biomarker of S-AKI (AUC-ROC (95% C.I.): 0.902 (0.842 – 0.962) vs. 0.530 (0.376 – 0.683) vs. 0.716 (0.538 – 0.894) vs. 0.729 (0.582 – 0.875), respectively). Low PON-1 activity on admission to ICU could predict S-AKI development after admission to ICU, unlike KIM-1 and serum and urine NGAL (AUC-ROC (95% C.I.): 0.963 (0.879 – 1.046) vs. 0.775 (0.564 – 0.986) vs 0.573 (0.176 – 0.970) vs. 0.768 (0.553 – 0.982), respectively). Measured biomarkers were not statistically significant predictors of either S-AKI progression to renal replacement therapy or improvement of renal function.
Conclusion(s): PON-1 is a promising diagnostic and predictive, but poor prognostic biomarker of S-AKI after major abdominal surgery.

09AP07-05
Intensive care admission and outcomes of high-risk surgical patients in Brazil: a single-centre cohort study

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Background: Although surgeries for high-risk patients in low- and middle income countries (LMIC) are increasing in number and complexity, there is neither evidence that intensive care unit (ICU) admission positively impacts outcomes, nor universal criteria for it. Moreover, there are few data describing high-risk surgical population allocation panorama in LMIC, where critical care resources are limited. Validated risk assessment tools at this setting, like the Ex-Care model, might support ICU indication for the most vulnerable patients. We aimed to describe association between ICU allocation, Ex-Care model risk stratification classes and mortality in a LMIC scenario.
Methods: Retrospective cohort of high-risk inpatients operated at a Brazilian hospital between July 2017 and January 2020. Data were obtained from electronic medical records. We examined association with 30-day mortality for two groups, allocated at ICU vs. post-anaesthetic care unit (PACU). We also assessed outcomes regarding patient's Ex-Care model risk classes (predicted 30-day mortality - Class III: 5.0-9.9%; Class IV: ≥ 10%).
This model was developed within the same hospital, and comprises four variables: age; ASA-PS; surgical severity and nature (elective or urgent). It has high discriminative power for postoperative in-hospital death within 30 days.
Results and Discussion: Among 1431 high-risk patients, 250 (17.47%) were referred to ICU. In-hospital 30-day mortality was 28% in ICU vs 8.9% in PACU. There was no independent effect of ICU allocation on mortality (RR 0.91; 95% CI 0.68-1.20). Very high-risk patients (Ex-Care classes III and IV) had strong association with mortality (RR 2.11; 95% CI 1.54–2.90) and were more frequently admitted to ICU (23.3% vs 13.1%).
Conclusion: Patients clinical status, and not allocation in ICU itself, was determinant for mortality in high-risk surgical patients. Ex-Care risk model might be an auxiliar instrument to support ICU indication for very high-risk patients in a low-resource scenario.
References:
Gutierrez CS, Passos SC, Castro SMJ, et al. Few and feasible preoperative variables can identify high-risk surgical patients: derivation and validation of the Ex-Care risk model. Br J Anaesth. 2021;126(2):525–32.
Stahlschmidt A, Passos SC, Cardoso GR, et al. Enhanced peri-operative care to improve outcomes for high-risk surgical patients in Brazil: a single-centre before-and-after cohort study. Anaesthesia. 2022;77(4):416–27.

09AP07-06
Burnout among trauma and critical care clinicians during the conflict in Ukraine: preliminary data from the CERTAIN for Ukraine initiative

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Background and Goal of Study: The current conflict in Ukraine has placed significant stress on its healthcare providers, increasing the risk of burnout among clinicians caring for injured and critically ill. The aim of this study was to assess the prevalence of burnout among Ukrainian critical care clinicians.
Materials and Methods: This cross-sectional study was conducted between September and December 2022. Participants of the Checklist for Early Recognition and Treatment of Acute Illness and iNjury (CERTAIN) for Ukraine initiative, a multimodal trauma critical care knowledge-exchange collaborative supported by the Society of Critical Care Medicine, were invited via a private Viber™ group and email to complete an anonymous survey. Demographic, practice data and a Maslach Burnout Inventory: Human Services Survey for Medical Personnel (MBI-HSS MP) translated to Ukrainian were collected and compared to the MBI sample scale. Data were collected via REDCap software.
Results and Discussion: Of the 110 participants who started the survey, 88 completed it. The majority were women (56.8%) aged 20-29 (32, 34.0%) and 30-39 years (29, 30.9%), married (63%) with at least one child (56.4%). Most were civilian medical personnel (80.7%) with a wide range of clinical experience, and the majority reported treating frontline causalities (63.6%). Anesthesiologists were the largest group represented (71.3 %), followed by intensivists (19.5%). The majority reported a 40-60 hour work week (52.3%), although 22.7% stated that they worked 70 to > 80-hour hours. 78.2% reported working far from the war zone, and 63.6% reported their clinical practice had significantly changed due to the conflict. Of the respondents, 18.2% reported their hospital being a military target. The average MBI results were 31.3 for emotional exhaustion (SD 10.8), 9.8 for depersonalization (6.2), and 34.9 for personal accomplishment (7.9). These preliminary data show that emotional exhaustion and depersonalization are increased compared to the MBI sample scale.
Conclusion(s): Burnout is high in the domain of emotional exhaustion and moderate in the areas of depersonalization and personal accomplishment in this cohort of Ukrainian clinicians. In addition to identifying opportunities to improve work hours and safety, future interventions should be targeted at identifying and alleviating the sources of emotional strain to sustain clinician performance in this challenging and demanding practice environment.

09AP07-07
Percutaneous tracheotomy – too little, too late? Comparing COVID vs non-COVID ICU. A retrospective single-center study

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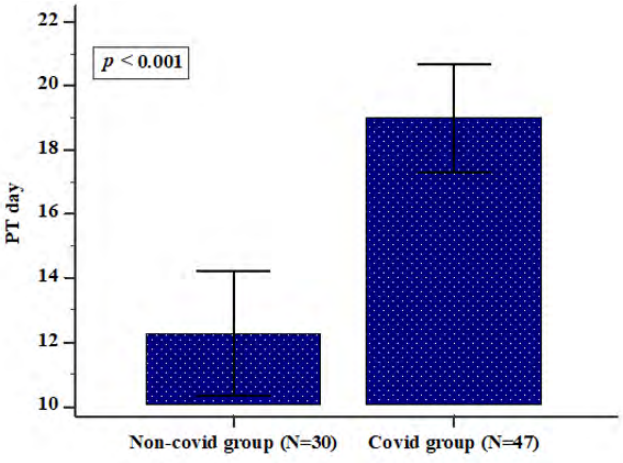
Background and Goal of Study: The aim of our study is to find differences when it comes to PT in COVID and non-COVID ICU and how do they affect the outcomes.
Materials and Methods: This retrospective study was conducted at the University Hospital of Split, Department of Anesthesiology, in the period of two years, on two locations; COVID ICU and ICU. In total there were 77 patients, divided into two groups; COVID group, (47 patients) and non-COVID group (30 patients).Statistical analyses were done using the statistical software MedCalc. The normality of distribution was estimated using Kolmogorov-Smirnov test. Comparison of quantitative data between groups was conducted using students t-test or Mann-Whitney U test while the comparison of qualitative data was conducted using chi-square test.
Results and Discussion: The aim of our study was to assess differences between PT performed in COVID and non-COVID ICU, when were they perfomed and does it make any difference in the outcomes. This single-center study showed that in the non-COVID ICU PT were performed significantly earlier.Treatment of COVID patients distinguish significantly from the non-COVID ICU patients; in COVID primarily there is a lung injury, requiring prone position, often manipulation with ventilation and airway, while in non-COVID ICU patients the necessity for mechanical ventilation is mostly as a support to an intensive treatment. However, when it comes to the outcomes, there is no significant differences between two investigated groups.Furthermore, there is no significant difference in the outcomes when the day of PT is considered.We found no significant difference considering these parameters.



Conclusion: Although the PT was performed earlier in the non-COVID ICU group, we showed that there is no significant difference between two investigated groups when it comes to the outcomes. Furthermore,there is no difference in the outcomes between groups regarding the day of PT.Some of the reasons are small number of patients,generally good outcomes,etc. This study shows potential in future investigation and motivation for early tracheotomy, in order to achieve better outcomes and less complications.

09AP07-08
Unplanned surgical admissions to ICU - a quality marker?

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Background and Goal of Study: The definition of a planned surgical ICU admissions is one anticipated before surgery begins, where an ICU or HDU bed is booked in advance, aiming to prevent postoperative complications in an identified higher-risk patient. Unplanned admissions following elective surgery should be infrequent and would usually be associated with unanticipated intraoperative adverse events.

We interrogated the dataset from our mixed medical/surgical ICU to identify the incidence and types of procedures associated with unplanned admission.

Materials and Methods: Data covering the five-year period July 2017-June 2022, was exported from an ICU Admissions dataset (Philips Intelliview) and for the same period the total theatre workload was collected as the denominator. The type and level of ICU support was recorded using the UK Intensive Care Society (ICS) definitions, then compared with national figures from the UK Intensive Care National Audit & Research Centre (ICNARC).

Predicted mortality and actual outcomes were compared. Where differences occurred, Chi-square test was used to determine statistical significance

Results and Discussion: During the five-year study period there were a total of 56,038 surgical theatre cases and 3046 ICU admissions. There were 1413 surgical admissions to ICU (2.52% of all theatre cases), of which 357 (11.7% of all ICU admissions, 0.64% of all theatre cases) were unplanned.

During the same period ICNARC reported the UK-wide unplanned ICU admission rates to be 20.9% of all ICU admissions. This was nearly twice the rate of our unplanned admissions. ($p < 0.0001$).

By surgical sub-specialty and based upon overall theatre cases, colo-rectal surgery had the highest proportion of unplanned admissions (63 of 2991 theatre procedures, 2.1%). General Surgery had an unplanned admission rate of 1.37% and Trauma & Orthopaedics had a rate of 0.48%

Severity scoring predicted 32 deaths by 30 days amongst the unplanned admissions; 24 deaths were recorded (SMR 0.75)

Conclusion(s): The proportion of unplanned admissions seemed remarkably high, yet the outcomes were better than predicted. With good communication and planning, the rate of unplanned admission should probably be lower, and this will be a focus of a local Quality Improvement Project moving forward.

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09AP07-09
Impact of Sars CoV-2 infection on anxiety and depression disorders in ICU patients

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Background and Goal of Study: The Covid-19 pandemic had dramatic consequences representing a real challenge not only on a physical but also on a psychological level. In patients hospitalised for SARS CoV-2 infection during the pandemic emergency, anxiety-depressive symptoms were common. Anxiety disorders, stress, insomnia, depression, and feelings of anger often occured during the Coronavirus disease but also afterwards. Aim of the study is to evaluate the prevalence of anxiety and depression symptoms during hospitalization for Covid and the persistence of these disorders in the post-discharge period from the ICU.

Materials and Methods: The assessment of psychological disorders was carried out through individual interviews and administration of self-assessment questionnaires: State trait anxiety inventory (Y1 and Y2) used to discriminate state anxiety and trait anxiety and Beck Depression Inventory (BDI-II) to measure the depressive state articulated in its peculiar aspects (sleep, appetite, suicide, pessimism).

Baseline

Variable	Total (N)		Absent	Mild	Moderate	Total	P- value
Age	24 (100.0)	Means (SD)	66.3 (11.3)	69.6 (5.3)	68.0 (NA)	67.1 (10.0)	0.823
Sex	24 (100.0)	Female	3 (16.7)	1 (20.0)	1 (100.0)	5 (20.8)	0.136
		Male	15 (83.3)	4 (80.0)	0 (0.0)	19 (79.2)	
Hospitalization	24 (100.0)	Respiratory failure	15 (83.3)	3 (60.0)	1 (100.0)	19 (79.2)	0.439
		Sepsis	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	
		Hemodynamic instability	2 (11.1)	0 (0.0)	0 (0.0)	2 (8.3)	
		Trauma	0 (0.0)	1 (20.0)	0 (0.0)	1 (4.2)	
		Other	1 (5.6)	1 (20.0)	0 (0.0)	2 (8.3)	
State anxiety	24 (100.0)	Absent or mild	0 (0.0)	0 (0.0)	1 (100.0)	1 (4.2)	<0.001
		Moderate	11 (61.1)	3 (60.0)	0 (0.0)	14 (58.3)	
		Severe	7 (38.9)	2 (40.0)	0 (0.0)	9 (37.5)	
Trait anxiety	23 (95.8)	Moderate	3 (16.7)	2 (50.0)	1 (100.0)	6 (26.1)	0.089
		Severe	15 (83.3)	2 (50.0)	0 (0.0)	17 (73.9)	

Follow up

Variable	Total (N)		Absent	Mild	Total	P- value
Age	10 (100.0)	Means (SD)	69.8 (4.6)	66.0 (2.8)	69.0 (4.4)	0.313
Sex	10 (100.0)	Female	1 (12.5)	1 (50.0)	2 (20.0)	0.843
		Male	7 (87.5)	1 (50.0)	8 (80.0)	
Hospitalization	10 (100.0)	Respiratory failure	5 (62.5)	2 (100.0)	7 (70.0)	0.784
		Sepsis	0 (0.0)	0 (0.0)	0 (0.0)	
		Hemodynamic instability	1 (12.5)	0 (0.0)	1 (10.0)	
		Trauma	1 (12.5)	0 (0.0)	1 (10.0)	
		Other	1 (12.5)	0 (0.0)	1 (10.0)	
State anxiety	10 (100.0)	Absent or mild	0 (0.0)	1 (50.0)	1 (10.0)	0.091
		Moderate	5 (62.5)	1 (50.0)	6 (60.0)	
		Severe	3 (37.5)	0 (0.0)	3 (30.0)	
Trait anxiety	9 (90.0)	Moderate	1 (14.3)	1 (50.0)	2 (22.2)	0.915
		Severe	6 (85.7)	1 (50.0)	7 (77.8)	

Results and Discussion: 24 patients admitted to ICU were enrolled in the study. Patients diagnosed with mental retardation, dementia, cognitive decline, and patients who refuse to take the tests were excluded from the study. Data are presented as media±DS, p-value <0.05 have been considered significant. There was no significant change in anxiety and depression score or prevalence over time.

Age, gender, diagnosis, were not associated with anxiety symptoms. Chi-squared test shows a relationship between state anxiety and depressive condition during hospitalization (5% significant test), but not in follow-up (10% significant test), while there seems to be no association between depression and the remaining variables considered (age, gender, cause of hospitalization and trait anxiety).

Conclusion(s): These preliminary data show that no significant differences were observed in ICU survivors between levels of anxiety and depression between baseline and follow-up. There is an association between state anxiety level and depression and a slight association between depression and trait anxiety.

09AP07-10
Evaluation of postoperative ICU indication criteria used by anesthesiologists: a national survey

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Introduction: The lack of ICU beds in Brazil is a limiting factor in the surgical treatment of patients with postoperative ICU indication. In addition to the delay in the surgical intervention on patients with potentially treatable diseases, the unnecessary postoperative ICU indication impose an additional cost to the health system. Hence, it is important to stratify with the most objectivity, which patients have high surgical risk and would really benefit going to the ICU. The surgical risk of a patient is set by the surgery complexity and the preexisting comorbidities.

Background and Goal of Study: The goal of study was to evaluate how the postoperative ICU indication is performed by graduated anesthesiologists in Brazil.

Material and Methods: Transversal observational study; a Survey research was performed with Brazilian Anesthesia Society. The data was obtained through a questionnaire developed using the REDCap. The voluntary acceptance to participate in the survey was considered informed consent, since it was a quantitative study without any use of secondary sources or medical records. The data from REDCap was transferred to statistics software and the results are shown as frequencies.

Results and Discussion: We got 1083 anesthesiologists answers and most of them had at least 18 years of experience. About 43% acted mainly in private hospitals, 25% in public and 30% in both. At least 47% of the responders frequently had their surgeries suspended due to lack of rearguard ICU beds and 79% said to not use subjective criteria to indicate postoperative ICU, however, about 66% work with no care protocols of ICU indication to guide them. At last, 95% considered the presence of comorbidities, a factor important in their ICU indication, and 90% the complexity of surgery.

Conclusion: The lack of ICU beds was notable by the high percentage of canceled surgeries generating social and financial impacts on the health system. Although most of the participants said they use objective criteria to indicate postoperative ICU, only 2 indicators (ASA and Lee Score) are widely known between them. The most responders indicate postoperative ICU based on preexisting comorbidities and age. Most of the anesthesiologists are unaware of flowcharts to orientate their decisions in their hospitals. Thereby, a national guideline to help the postoperative ICU indication would be of great importance to optimize the public and private health resources.

09AP07-11
ICU Admission rates with Alcohol-Related Liver Disease - The impact of COVID lockdown

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Background and Goal of Study: Over the past decade there has been a nearly 50% increase in UK hospital admissions with alcohol-related liver disease (ARLD) (1). Subjectively, ICU admission rates with ARLD appear to be rising at a greater rate. Following the first COVID lockdown in Spring 2020, we perceived a further sharp increase in ALRD admissions.

We analysed a dataset from two medium-sized Intensive Care Units over an eight-year period, to determine if the actual numbers and subtypes of liver admissions confirmed our impressions.

Materials and Methods: Admissions were defined as liver-related if the patient had an admission diagnosis with the keywords 'varices' 'hepatitis', 'cirrhosis' or 'alcohol' or a past medical history of cirrhosis, portal hypertension, or encephalopathy. Liver admissions were further sorted as acute alcohol related, chronic ARLD and non-alcoholic liver disease.

The incidences of ARLD admissions before and after COVID were compared and statistical significance determined with Chi-square test

Results and Discussion: Over the period January 2015-July 2022, there were 9907 admissions across the two units. 612 (6.18%) were identified as having a significant Liver-disease component, of which 288 (47% of liver cases, 2.9% of all admissions) were classed as predominantly alcohol-related. The numbers of alcohol related admissions before and after the first COVID lockdown is shown in the table below.

	Acute Alcohol related	Chronic Alcohol related	All ARLD Admissions	Non-ARLD Admissions	Totals
Pre-COVID (2015-June 2020)	69	113	182 (2.47%)	7182	7364
Post-Lockdown (Jul 2020 - Jun 22)	22	84	106 (4.17%)	2543	2543
P value			<0.0001		

Conclusion(s): The numbers of UK alcohol-related ICU admissions had been increasing steadily by around 5% per year since 2010. Since the first COVID lockdown, we have seen a further marked increase of nearly 70% in the rates of alcohol-related liver disease admitted to our ICU, with an overall 30-day mortality of 46%.

This study demonstrates a second pandemic since the first lockdown of 2020, of accelerated alcohol-related liver disease leading to ICU admission. We suspect further studies will show this trend reflected internationally.

Reference:

1. https://www.gov.uk/government/statistics/liver-disease-profiles-january-2022-update/liver-disease-profiles-january-2022-update

09AP07-12
The ten-year review of liver disease patterns on ICU admissions and workload in a non-specialist centre

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Background and Goal of Study: Over the past decade there has been a steady ~5% increase annually in UK hospital admissions with alcohol-related liver disease (ARLD) (1). The impact of these hospital admissions on ICU admission rates and workload during this period has not been clear.

We analysed a large dataset of patients admitted to two Intensive Care Units in the same trust over the last ten-years, to determine the numbers of cases, subtypes of liver admissions, the outcomes and the workload impact of ARLD on our ICU.

Material and Methods: Admissions were defined as liver-related if the patient had an admission diagnosis with the keywords 'varices' 'hepatitis' 'cirrhosis' or 'alcohol' or a past medical history of cirrhosis, portal hypertension, or encephalopathy. From review of the primary and secondary reasons for admission, plus admission diagnoses, then review of individual patient notes, liver admissions were further sorted as acute alcohol related, chronic ARLD and non-alcoholic liver disease

The number of bed days and the levels of care were compared and statistical significance determined with Chi-square test

Results and Discussion: Over the period July 2012-June 2022, there were 13,405 admissions across the two units. 730 (5.45%) were identified as having a significant liver-disease, of which 345 (47% of liver cases, 2.6% of all admissions) were predominantly alcohol-related. The median age was 54 yrs (IQR 45-63), 63.7% were male.

Encephalopathy was present in 127 patients, with a 58% 30-day mortality. 146 patients required Renal support, with a 68% mortality. The combination of advanced respiratory, advanced cardiovascular and renal support was present in 55 patients, of which 12 (22%) survived to leave the ICU.

These patients utilized a total of 4184 ICU bed days (5.5% of all bed days), 1972 ventilator days and 601 renal replacement days

Conclusions: There has been a steady increase in Liver-disease related admissions to our ICUs over the past ten years, with a rate these past two years twice that of 2010-12. This appears greater than the reported increase in hospital admission rates. A large proportion of this is Alcohol-related. Resource utilization is markedly increased, outcomes are variable but overall survival rates remain modest

Reference:

1. https://www.gov.uk/government/statistics/liver-disease-profiles-january-2022-update/liver-disease-profiles-january-2022-update

09AP08-01
Spread of multiresistant Enterobacteriaceae strains in the hospital environment through intensive care passage of patients

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Background and Goal of Study: Antimicrobial resistance represents an enormous global health crisis and one of the most serious threats mankind face today. *Enterobacteriaceae* that produce extended-spectrum beta-lactamases (ESBLs) are often involved healthcare infections, increasing hospitalization time, morbidity and mortality rates, especially in Intensive Care Unit (ICU), where a great part of patients have debilitating diseases which make the susceptible to infections. Among several ESBLs that emerge from these pathogens, CTX-M type enzymes is most frequent. We aimed to identify the beta-lactamases circulating in a tertiary care hospital, encoded by the genes blaCTX-M-15, bla SHV-1 and bla-TEM-1 in *Escherichia coli* (*E. coli*) and *Klebsiella pneumoniae* (*K. pneumoniae*) strains.

Materials and Methods: We established the associated resistance phenotypes among patients hospitalized in the Intensive Care Unit of County Clinical Emergency Hospital of Craiova, Romania. The patients were either admitted to ICU from Emergency Room or clinics of Surgery, Orthopaedics or Urology. A total of 92 non-duplicated bacterial strains (28 strains of *E. coli* and 64 strains of *K. pneumoniae*) were resistant to ceftazidime (CAZ) and cefotaxime (CTX) by Kirby–Bauer disk diffusion method, were identified using the automated VITEK2 system. Detection of ESB-encoding genes and other resistance genes was carried out by PCR using specific primers.

Results and Discussion: *E. coli* strains were resistant to 3rd generation cephalosporins and moderately resistant to quinolones, whereas *K. pneumoniae* strains were resistant to penicillins, cephalosporins, sulfamides, resistant to quinolones and carbapenems. Most *E. coli* strains had blaCTX-M-15 gene (20/28 strains), two strains had the blaSHV-1 gene, but 11 strains had blaTEM-1 gene. We detected tet (A) gene in 10 strains and tet(B) in two strains. K. pneumoniae strains we detected blaCTX-M-15 in 50 strains, blaSHV-1in all strains and blaTEM-1 in 24 strains. The tetracycline gene tet(A) was detected in 20 strains, but the gene tet(B) was not detected in any strains. Colistin resistance gene mcr-1 was not detected in either *E. coli* or *K. pneumoniae* isolates.

Conclusion(s): The high frequency of the CTX-M-1 group and a high rate of ESBL co-production are changing the epidemiology of the healthcare associated infections. This epidemiology is a constant and increasing challenge, not only in Romania, but worldwide.

09AP08-02
Nosocomial infections in ICU with multidrugresistant *Escherichia coli* in a tertiary care hospital

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Background and Goal of Study: Nosocomial infections continue to challenge hospital or ambulatory medicine, even in this century. Nosocomial infections occur in patients who have a prolonged hospitalization time so the main departments where these infections can occur are Intensive Care Unit (ICU). In plus to the exposure to the hospital environment, there is also the fact that they have depressed immunity, due to the surgical intervention plus the barrier of the skin and visceral layers is compromised.
Materials and Methods: The study was conducted on biological samples collected from 8,700 patients from the ICU, from Emergency Room, Urology, Surgery, Orthopedics and Gastroenterology clinics of the Craiova Emergency Clinical Hospital, through the years 2020-2022.
Results and Discussion: In the hospital environment was found an increased morbidity due to *Escherichia coli* infections in a percentage of 7.54%. The results of sensitivity testing to anti- infective chemotherapeutics allowed the establishment of some resistance phenotypes, which showed the phenomenon of multi-resistance. The isolated strains showed increased resistance to: chloramphenicol (100%), amoxicillin (75%), amoxicillin/clavulanate (54.62%), teicoplanin (53.09%), ceftriaxone (44.44%), cotrimoxazole (40,26%). Increased sensitivity was found to netilmicin and fosfomycin (100%), meropenem (99.1%), amikacin (96.77%), cefoxitin (94.44%), cephalothin (93.52%), tobramycin (93,18%) and tigecycline (92.31%).
To highlight the behavior towards β-lactams, 4 main markers were observed: aminopenicillin (amoxipenicillin); carboxypenicillin (ticarcillin) or a ureidopenicillin (piperacillin); a first generation cephalosporin (cefalotin or cefoxitin); a third-generation cephalosporin (cefotaxime or ceftazidime).
The most frequent was the plasmid penicillinase (PAZA) secretory phenotype in a percentage of 52.24%, followed by the inducible chromosomal cephalosporins (PAZA) secretory phenotype in a percentage of 20.76% and the wild-type phenotype in a percentage of 18.72%.
Conclusion(s): Establishing resistance phenotypes to anti-infective chemotherapy is necessary for a medical unit, to choose effective therapy and prevent the selection of multiresistant strains. There is a need for teamwork made up of clinicians, microbiologists, epidemiologists, hygienists, hospital pharmacists, and hospital economists to bring benefits to everyone individually, but especially to patients.

09AP08-03
Influence of intra-abdominal pressure on renal function in patients with acute pancreatitis

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Background and Goal of Study: The harmful effect of increased intra-abdominal pressure (IAP) on renal function is multifactorial and refers to pre-renal and renal damage. Prerenal disorders can be corrected while the direct compressive effect on the renal parenchyma leads to increased renal vascular resistance and decreased renal blood flow and often permanent renal damage. Therefore, the goal is early examination of the impact of IAP on kidney function and perfusion in patients with acute pancreatitis and developed intra-abdominal hypertension (IAH) with the aim of rapid therapeutic response and prevention of permanent consequences.
Materials and Methods: IAP was measured every 12 hours through a urinary catheter placed in the bladder, in 65 patients with acute pancreatitis and IAP values above 12 mmHg. IAP values were compared with hourly diuresis, creatinine, urea, lactate, abdominal perfusion pressure (APP) and glomerular filtration (GF) values.
Results and Discussion: Analyzing the obtained correlation coefficients, it was proven that the linear relationship between IAP and the hourly diuresis variable ($r = 0.583$) is positive and significant, between IAP and the tested lactate variable is positive and significant ($r = 0.795$), between IAP and APP variable positive and strong ($r=0.836$), between IAP and GF variable positive and strong ($r=0.903$), between IAP and creatinine variable positive and strong ($r= 0.791$), between IAP and urea variable positive and strong ($r=0.830$). A simple multiple linear regression showed the influence of lactate and GF on the outcome of treatment in patients with acute pancreatitis and IAH.
Conclusion(s): An increase in IAP leads to a decrease in diuresis, the creation of tissue edema and the accumulation of toxic and decaying metabolites and an increase in lactate, creatinine and urea levels, and a decrease in APP and GF.
References:
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2. Nunnall ME, Ferrer R, Martin GS, Martin-Loeches I, Machado FR, De Backer D, Coopersmith CM, Deutschman CS and For the Surviving Sepsis Campaign Reasearch Committee. The Surviving Sepsis Campaign: research priorities for the administration, epidemiology, scoring and identification of sepsis. Intensive Care Medicine 2021; 9:34.

09AP08-05
Comparation of RIFLE and AKIN criteria in assessment of acute kidney injury in critically ill Covid-19 patients

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Background and Goal of Study: Acute kidney injury (AKI) is a sudden disruption of previously normal (stable) kidney function, which occurs within a few hours or days, resulting in the accumulation of harmful metabolic products, impaired water and electrolyte homeostasis, and acid-base disturbances. It includes a wide range of disorders - from a moderate, transient decrease in kidney function to serious, permanent damage, which requires treatment with dialysis. Pulmonary manifestations of Covid-19 are the most significant prominent, but AKI is observed as a frequent complication of the disease, and can be noticed already at the time of admission of patients for hospital treatment (1). The mortality rate of hospital Covid-19 patients with the development of AKI is higher, compared to patients without kidney damage. The objective of the work is to evaluate the frequency of AKI in the Intensive Care Unit, according to the RIFLE and AKIN scales, as well as the sensitivity of scales for the incidence and mortality of critically ill Covid-19 patients.
Materials and Methods: After the approval of the Ethics Committee of the University Clinical Center (UCC) of the Republic of Srpska, a retrospective, descriptive study included 204 patients and it was conducted using the data of critically ill Covid-19 patients treated in Clinic for Anesthesiology and Intensive therapy at the UCC of the Republic of Srpska, in the period from October 2020-January 2021 and from March 2021-May 2021.
Results and Discussion: There are statistically significant differences ($p < .001$) in the distribution of patients depending on the AKI classification scale, a higher probability that the patient will be diagnosed with AKI and a higher degree of AKI, if the AKIN scale is used. Mortality is a statistically significantly more likely outcome in patients with AKI ($pRIFLE < 0.001$; $pAKIN < 0.001$), regardless of the applied scale, but there are no significant differences in predicting mortality.
Conclusion(s): AKIN scale is more sensitive in assessing AKI, compared to the RIFLE scale, while in terms of mortality, there are no statistically significant differences between the mentioned scales, but mortality is statistically significantly higher in patients who developed AKI.
Reference:
Legrand M, Bell S, Forni L, Joannidis M, Koyner JL, Liu K, et al. Pathophysiology of Covid-19-associated acute kidney injury. Nat Rev Nephrol 2021; 17(11): 751–764.

09AP08-06
Differences in the pharmacokinetics and pharmacodynamics of linezolid between critically and non-critically ill patients with confirmed infections caused by gram-positive bacteria: do the more severe patients need an initial higher dose of linezolid?

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Background and Goal of Study: Linezolid (LNZ) is an antibiotic used for the treatment of difficult-to-treat infections caused by Gram-positive bacteria, such as methicillin-resistant *Staphylococcus aureus* (MRSA) and *Enterococcus faecium*. No studies have compared the PK/pharmacodynamics (PKPD) achievement and outcomes between critically ill (ICU) and non-critically ill patients. The objectives were to describe the PKPD and efficacy of LNZ in patients with *E. faecium* and MRSA infections comparing ICU versus non-ICU patients.
Materials and Methods: Single-center, retrospective PK study conducted at the Parc de Salut Mar, Barcelona, between January 2010-October 2022. All patients treated with LZD for a confirmed infection caused by *E. faecium* or MRSA and undergoing therapeutic drug monitoring (TDM) were included. Demographic, clinical, microbiological and PK variables were collected. Blood samples at day 3 of treatment were obtained within a TDM program. LNZ plasma concentrations were analyzed by a high-performance liquid chromatography (HPLC) method. Data were compared between ICU and non-ICU patients.
Results and Discussion: 220 patients were included: 119 ICU patients (54%) and 101 non-ICU (46%) patients. Comparative data are shown in Table 1. Clinical cure was 69 % in ICU-patients vs 82.8% in non-ICU patients ($p = 0.019$) and microbiological eradication was 71.6% in both groups ($p = 0.99$). PK LNZ data comparing both groups is shown in Table 2.
Conclusion: ICU patients showed a lower LNZ plasma exposure at the first TDM sample compared to non-ICU patients despite not having important differences in baseline characteristics. They also presented a lower clinical cure rate and a higher mortality. These results suggest that critically ill patients may need an initial higher LZD dose to improve PK/PD. The impact of a low LZD exposure on clinical outcomes should be evaluated.

Variable	ICU patients n=119	Non-ICU patients n=101	p value
Male, mean (%)	81 (68.1)	65 (64.4)	0.56
Age, mean (SD[a])	68 (11.3)	68 (14.7)	0.15
Charlson score, mean (SD)	2.7 (2.3)	3.1 (2.4)	0.51
BMI[b], mean (SD)	28.4 (7.1)	26.6 (7.6)	0.85
Baseline GFR[c], mean (SD)	59 (37.7)	61.9 (43.1)	**0.05**
Focus of infection, n (%)			**<0.001**
Abdominal	56 (47.5)	19 (19)	
Respiratory	44 (37.3)	14 (14)	
Urinary	28 (28)	8 (6.8)	
Skin and soft tissue infections	37 (37)	6 (3.4)	
Others	2 (2)	4 (3.4)	
LOS[d]	64.8 (75.8)	48.4 (47.0)	0.39
All-cause mortality			
7-day	1 (0.8)	1 (1)	1
30-day	17 (14.3)	5 (5)	**0.02**
In-hospital	42 (35.3)	18 (17.8)	**0.004**

[a]SD, standard deviation; [b]BMI, Body Mass Index; [c]Baseline Glomerular Filtration Rate (estimated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formula); [d]LOS, Length of hospital stay.

Table 1.

Variable (mean,SD)	ICU patients	Non-ICU patients	p value
Cmin, mg/L	5.8 (7.6)	10.4 (10.3)	**0.015**
Cmax mg/L	19.6 (11.0)	20.8 (10.9)	0.64
Cmin< 2 mg/L	56 (48.7)	18 (18.6)	**<0.001**
Cmin : 2-8 mg/L	30 (25.2)	33 (32.7)	0.222
$AUC_{0\text{-}12h}$ mg*h/L	130.15 (121.8)	200.5 (165.9)	**0.001**

Cmin, minimium concentration; Cmax, peak concentration; $AUC_{0\text{-}12h}$, area under the concentration-time curve.

Table 2.

09AP08-07
Pharmacokinetics and pharmacodynamics of linezolid in critically ill patients with confirmed infections caused by drug-resistant gram-positive bacteria: is it adequate to use a standard dose?

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Background and Goal of Study: Pathophysiological changes in critically ill patients with severe infections may alter the pharmacokinetics (PK) of antimicrobials, leading to treatment failure or toxicity. The objectives were to assess the interindividual PK variability of linezolid (LNZ) PK and the attainment of an optimal PK/pharmacodynamic (PD) target.
Materials and Methods: Single-center, retrospective, observational PK study (January 2010-October 2022) in patients admitted to the intensive care unit treated with LNZ at a standard dosage (600 mg/12h) and undergoing therapeutic drug monitoring (TDM). Demographic, clinical, microbiological and PKPD variables were collected. Blood samples were obtained within a TDM program and LNZ plasma concentrations were analyzed by a high-performance liquid chromatography (HPLC) method. An optimal PKPD target attainment was defined as Cmin 2-8 mg/L and/or an AUC_{24}/MIC > 100 mg*h/L and potential overexposure was defined as Cmin ≥8 mg/L and/or AUC_{24} of ≥300 mg*h/L.
Results and Discussion: A total of 119 patients were included being 81 (68.1%) males. Mean (SD) clinical data: age 68 (11.3) years; Charlson Index and APACHE-II score 2.7 (2.3) and 21.4 (8.1), respectively; Body Mass Index 28.4 (7.1), baseline estimated glomerular filtration rate (by CKD-EPI) and creatinine serum concentrations 59 (37.7) ml/min/1.73m^2 and 1.74 (1.36) mg/dL, respectively. Most frequent focus of infection: abdominal 47.5%, respiratory 37.3%, urinary 28% and skin and soft tissue infections 37%. Clinical outcomes: clinical cure 69 %, microbiological eradication 71.6% and length of ICU stay 26.7 (26.5) days. Seven-day, 30-day and in-hospital all-cause mortality were 0.8%, 14.3% and 35.3%, respectively.
Pharmacokinetics and pharmacodynamic data are shown in Table 1.

Variable	Value
Cmin, mg/L, mean (SD)	5.8 (7.6)
Cmin<2 mg/L, n (%)	56 (47.1)
Cmin 2-8 mg/L, n (%)	30 (25.2)
Cmin>8 mg/L, n (%)	29 (24.4)
Cmax mg/L, mean (SD)	19.6 (11.0)
AUC_{12h}, mg*h/L, mean SD)	130.2 (121.8)
AUC_{24h}/MIC > 100 mg*h/L	45 (37.8)
AUC_{24h}≥300 mg*h/L, n (%)	14 (11.8)

Cmin, minimium concentration; Cmax, peak concentration; $AUC_{0\text{-}12h}$, area under the concentration-time curve.

Table 1.

Conclusions: A high interindividual PK variability of LNZ was present in the ICU patients. Less than one third of patients were able to achieve an optimal PKPD target, in almost 50% the plasma exposure was suboptimal and in about 30% overexposure. These results suggest that a TDM program may be necessary to individualize LNZ dosage in this population.

09AP08-08
Multidrug resistant bacteria in surgical intensive care units

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Background and Goal of Study: Multidrug-resistant bacteria (MDR) are often associated with severe infections. We evaluated the MDR bacteria in surgical intensive care unit (ICU) in patients with hospital infection.
Materials and Methods: Prospective cohort study was conducted in surgical ICU. Samples were routinely collected from the patient with suspected hospital infection. The antibiotic susceptibility testing was performed by disk-diffusion and broth dilution method. Double disk synergy test and inhibitor based test with clavulanic acid were applied to screen for ESBLs. The transferability of resistance determinants was determined by conjugation. The nature of ESBL, carbapenemases, and fluoroquinolone resistance determinants was investigated by PCR. The genes conferring resistance to β-lactams including broad-spectrum and extended-spectrum, class A, class B or metallo-β-lactamases-MBLs, and class D carbapenemases or carbapenem-hydrolysing oxacillinases-CHDL, and to fluoroquinolones were sought in Enterobacterales. In the *Acinobacter (A.) baumannii* isolates, genes encoding KPC, MBLs and CHDL were determined by PCR using protocols and conditions as described previously.
Results and Discussion: 30 MDR isolates, were collected in two months period. 17 were male. The mean age of patient was 69,6. Isolated MDR pathogens were: 20 *Klebsiela (K.) pneumoniae*, one *Enterobacter cloacae*, four *A. baumanii*, three *Pseudomonas aeruginosum,* and one *Proteus mirabilis* and VRE, respectively.Double disk synergy and combined disk test were positive in all *K. pneumoniae* isolates except two, indicating production of an ESBL. Hodge test and CIM were positive in all but one strain, consistent with the production of carbapenemase. Ertapenem resistance was transferable from 12 isolates positive for OXA-48 carbapenemase.
The resistance determinants to non-beta-lactam antibiotics were not cotransfered alongside with ertapenem resistance. Cefotaxime resistance was not transferred from any of the tested strains. OKNV testing and PCR detected OXA-48 carbapenemase in all except two *K. pneumoniae* isolates and NDM in one. OXA-48 positive *K. pneumoniae* isolates coharboured ESBLs belonging to CTX-M family. L/M plasmid was found in all OXA-48 producing *K. pneumoniae* isolates. All *A. baumanii* isolates were CRAB and positive for OXA-23 carbapenemase.

Conclusion(s): OXA-48 seem to be the dominant resistance trait among our isolates spreading horizontally by L/M plasmid.

09AP08-09
Project 0-100; improving antimicrobial stewardship on ICU

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Background and Goal of Study: Antibiotic resistance is a global health threat. The O'Neill report estimated that without action by 2050, 10 million people every year will die from antimicrobial resistance.[1] Keys to using antibiotics appropriately start with antimicrobial stewardship, which has been shown to reduce inappropriate antibiotic administration; particularly in ICU.[2]
On ICU, decisions regarding antimicrobial treatment plans are often made or reviewed with microbiology input and documentation of these decisions are a key step in antimicrobial stewardship.
In our centre, these decisions are rarely documented. This leads to inappropriate antibiotic course lengths and delays in prescribing.
This quality improvement project aims to promote antimicrobial stewardship by increasing the documentation of microbiology MDT meeting decisions; with the aim of 100% compliance. This project comprised two PDSA (plan, do, study, act) cycles.
Firstly, moving to online documentation and secondly, by nominating a staff member who would be directly responsible for documenting these decisions. Both these interventions were underpinned by an education sessional promoting antimicrobial stewardship.
Materials and Methods: Data was retrospectively collected via patient notes where there is a dedicated section to record whether microbiology reviews have taken place. Data was collected initially to determine a baseline and then 1 week after each intervention.
Results and Discussion: Compliance with documentation improved from 3.0% to 96% over a 3-week period. The most successful intervention was nominating a staff member who would be directly responsible for documenting these decisions.
Conclusion: In conclusion, this project demonstrates that in making change the current culture needs challenging. To make this into a more lasting change simple practical interventions are key. Therefore, in reflecting on the ways to make lasting change via small steps makes this project very transferable to other hospitals.
References:
1. O'Neill J. 2016. Tackling drug-resistant infections globally: final report and recommendations the review on antimicrobial resistance. Available at: https://amr-review.org/Publications
2. Rimawi RH, Mazer MA, Siraj DS, Gooch M, Cook PP. Impact of regular collaboration between infectious diseases and critical care practitioners on antimicrobial utilization and patient outcome. *Crit Care Med* 2013; 41: 2099– 107.

09AP08-10
A protective effect of IgA against SARS-CoV2 in bronchoalveolar lavages in COVID-19 patients, admitted in ICU

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Background and Goal of Study: IgA antibodies against SARS-CoV2 have been shown to an earlier and higher neutralizing effect comparing to IgG, probably for their increased flexibility and a longer hinge that could facilitate the interaction with spike trimmer. A prompt and strong response to SARS CoV-2 may also be associated. However pre- existing immunity to the four endemic cold-causing coronavirus in humans (HCoV229E, -NL63, -OC43 and -HKU1) may play a role in infection control and then a milder disease in patients with endemic coronavirus infection.These observations could suggest a possible protective effect of IgA in this contest, although a harmful effect of high titre of IgA on disease progression has been observed.
Material and Methods: We focused on the presence of antibodies of the IgG and IgA isotype in the blood and bronchoalveolar lavage (BAL) of a group of patients with severe COVID-19 respiratory failure, requiring invasive mechanical ventilation. We have enrolled in the study critically ill patients, admitted in Intensive Care Unit at the "University Hospital OORR" Foggia (Italy), from January to May 2021. At admission these patients were intubated for critical conditions and underwent to BAL and peripheral blood sampling. For all these, clinical history and course and laboratory data were recorded. Then we measured the presence of IgG and IgA antibodies to SARS-CoV-2 in plasma and BAL samples by using commercially available ELISA assays following manufactures's instructions.
Results and Discussion: We have enrolled 31 patients (25 were male and 6 female; the mean age was 70 ± 9.88). During ICU stay seven patients (22%) died and 24 (78%) had good prognosis. IgG and IgA antibodies against SARS-CoV2 were detectable in all plasma samples. In BAL samples IgG were regularly detectable, in contrast IgA were observed only in 19 (61%) cases. Interestingly, a statistically significant inverse correlation was found between the mortality rate and the presence of IgA to SARS-CoV 2 in BAL. In fact, none of the 19 patients with a positive IgA died, compared to 7 out of 12 patients with a negative IgA-BAL (p: 0,0008)
Conclusion: Although limited in size, this study strongly suggests a significant protective effect of the mucosal immunity in COVID 19 patients, even in advanced stages of the disease.
Reference:
Delphine Sterlin et al. "IgA dominates the early neutralizing antibody response to SARS-CoV-2" - Sci. Transl. Med. 13, eabd2223 (2021) 20 Jan 2021

09AP08-11
Secondary infections in critically ill patients with COVID-19 ARDS admitted to single center Intensive Care Unit in Croatia: a preliminary report of a retrospective study

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Background and Goal of Study: Infections acquired during the course of intensive care unit (ICU) stay, i.e. secondary infections, are common in critically ill COVID-19 patients. The aim of this study was to describe the incidence and outcomes of secondary bacterial and fungal infections in critically ill COVID-19 patients treated with invasive mechanical ventilation.

Materials and Methods: This retrospective study was conducted from March 2021 to March 2022 in a single tertiary hospital in Split, Croatia.

Adult patients with COVID-19, admitted to the ICU and mechanically ventilated for at least 48 hours, were included. Secondary infections included ventilator-associated pneumonia (VAP), bloodstream infections, and urinary tract infections. Primary outcome was the occurrence of secondary infections. The study protocol was approved by hospital Ethics committee.

Results and Discussion: Of 674 included COVID-19 patients, 468 (69.4 %) acquired at least one secondary bacterial or fungal infection. Our results are comparable to reported rate from a single Belgian ICU (1).

A high incidence of antibiotic usage prior to ICU admission was observed (83%).

Patients with secondary infections tended to spend more days on invasive mechanical ventilation, have longer ICU stay, and worse 60-day survival compared to patients without secondary infections (Table 1).

	All patients	Without secondary infection	With secondary infection
N (%)	674	206 (30.6)	468 (69.4)
Age, years	64.96 ± 11.33	60.93 ± 12.67	66.72 ± 10.22
Male, n (%)	462 (68.5)	133 (64.6)	329 (70.3)
Any comorbidity, n (%)	538 (79.9)	152 (73.8)	386 (82.5)
Chronic Immunosuppression, n (%)	78 (11.8)	31 (15)	47 (10.2)
Antibiotics before ICU admission, n (%)	559 (82.9)	172 (83.5)	387 (82.7)
Corticosteroids before ICU admission, n (%)	573 (85)	172 (83.5)	401 (85.7)
COVID-19 specific agents before ICU admission, n (%)	98 (14.5)	34 (16.5)	64 (13.7)
WHO clinical score on admission	8.04 ± 0.49	8.02 ± 0.49	8.05 ± 0.5
PaO2/FiO2 on admission, mmHg	84.1 ± 35.5	86.13 ± 38.03	83.25 ± 34.31
Outcomes			
Duration of invasive mechanical ventilation, days	11.18 ± 8.71	6.08 ± 3.58	13.42 ± 9.35
Duration of ICU stay, days	14.6 ± 9.97	8.42 ± 3	17.34 ± 10.74
Survival at ICU discharge, n (%)	450 (66.8)	162 (78.6)	288 (61.5)
Survival at 60 days from ICU admission, n (%)	377 (55.9)	156 (75.7)	221 (47.2)

Data are presented as mean ± SD or frequencies (%).

Table 1. Characteristics and outcomes of COVID-19 critically ill patients treated with invasive mechanical ventilation.

Conclusion: These preliminary results confirm a high rate of secondary infections in patients with COVID-19 admitted to the ICU and requiring invasive mechanical ventilation. Further research is needed into identifying patients at highest risk for the acquisition of secondary infections.

References:

1. De Bruyn, A., Verellen, S., Bruckers, L. et al. Secondary infection in COVID-19 critically ill patients: a retrospective single-center evaluation. BMC Infect Dis 22, 207 (2022).

09AP08-12
Assessment of left ventricular function in critically Ill patients with COVID-19: feasibility and findings

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Background and Goal of Study: The cardiac sequelae of Coronavirus Disease 2019 (COVID-19) may result in morbidity and mortality. Echocardiography is routinely used to assess cardiac pathology. However, infection control measures made the imaging of patients with COVID-19 challenging and limited the use of echocardiography.

Aim: To assess the quality of the echocardiographic images acquired in critically ill patients with COVID-19 and describe the left ventricular (LV) function in patients with severe COVID-19.

Materials and Methods: The electronic medical records of all patients diagnosed with COVID-19 between 01/05/20 and 31/12/20 who had echocardiography whilst admitted to an intensive care unit at King Abdulaziz Medical City, Riyadh were reviewed.

Results and Discussion: The study included 85 patients (female 24, 28.2%; mean age 64 ± SD 15.7 years; mean body mass index; BMI 30.8 ± SD 7.45). Of the 67 patients (78.8%) who were overweight (BMI > 25 kg/m^2); 38 were obese (BMI > 25 kg/m^2). Echocardiography was technically difficult in 57 patients (67%). Complete studies were performed in 43 patients (50.6%). Limited echocardiography was performed in 41 patients (48.2%). Images could be obtained in all but one.

The indications for echocardiography included the assessment of patients with stroke (4; 4.7%), acute coronary syndromes (6; 7.1%), raised troponin (3; 3.5%) and suspected endocarditis (9; 10.6%). Two patients did not have the indication for echocardiography recorded. Measurement of LV function (34; 40%) was most commonly requested. However, adequate images to measure LV function could not be obtained in 12 patients. The other 73 patients (85.9%) generally had preserved LV function (Teich ejection fraction (EF) 59.7% ± SD 12.0). Ejection fraction (EF) was over 50% in 59 patients (68.9%). Seven (8.2%) had mildly reduced ejection fraction (EF 40-49%) and another 7 patients had EF < 40%. Diastolic dysfunction was identified in 47 patients (55.3%). Steroids were administered to 80 patients (94.1%) before echocardiography.

Conclusion(s): Requests for echocardiography were reduced during the COVID-19 pandemic to minimize sonographers' exposure. Imaging critically ill patients is always challenging. Yet, interpretable images were obtained in most cases. Less than 10% of the cohort

had systolic dysfunction. However, diastolic dysfunction was present in more than half of the critically ill patients with COVID-19 in the present cohort.

09AP09-01
Drug screening to improve propofol infusion syndrome (PRIS) using zebrafish model

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Background and Goal of Study: PRIS is a rare and fatal multisystem disorder including rhabdomyolysis caused by long-term high-dose administration of propofol. Detailed pathomechanism of PRIS has not yet been elucidated.
Zebrafish is useful animal to study human diseases. Zebrafish larvae is translucent and it is easy to evaluate skeletal muscle structural abnormalities. They have high reproductive capacity and 50~300 eggs are available at a time. That is a great advantage for *in vivo* drug screening.
The purpose of this study is to create animal model of PRIS using zebrafish and elucidate the pathomechanism of propofol induced skeletal muscle abnormalities. Also, we search for therapeutic agents for propofol induced muscle damage using zebrafish model.
Materials and Methods: Wild-type zebrafish larvae of 4 days post fertilization (4 dpf) were cultured in fish water containing 0, 62, 125, 250 and 500 μM of propofol for 1, 3, 6 and 24 hours. The structure of skeletal muscle was analyzed by birefringence assay and determined the suitable experimental condition as a PRIS model. Drug screening was performed using a chemical library containing 1,280 drugs. Wild-type zebrafish larvae at 4 dpf were treated with 125 μM of propofol together with 10 μM of each drug for 3 hours. After drug treatment, structural change of skeletal muscle was analyzed by birefringence assay.
Results: Treatment with 125 μM of propofol for 3 hours induced structural abnormality of skeletal muscle of zebrafish larvae at 4 dpf by birefringence assay and considered as a good animal model for PRIS (Figure). After screening the drug library, we found 27 candidate drugs to improve muscle structural abnormalities of propofol-treated fish.

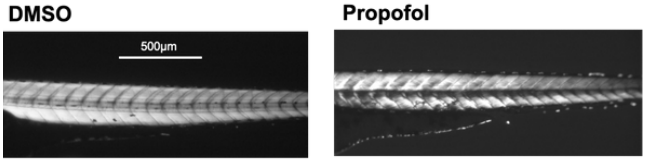

Figure. Birefringence assay.

Discussion: These results suggested that our zebrafish model of PRIS and the candidate drugs we found will lead to elucidate the pathomechanism of PRIS in skeletal muscle.

09AP09-03
Immuno-modulatory effects of dexamethasone in severe COVID-19 - a Swedish cohort study

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Introduction: Dexamethasone has received an emerging focus due to its protective effects on mortality in severe COVID-19.
Aims: In the present study we aimed to investigate the physiological as well as immunological effects associated with dexamethasone administration in patients admitted to the intensive care unit (ICU) with severe COVID-19.
Methods: A total of 216 adult COVID-19 patients were included, 102 (47%) received dexamethasone 6 mg/day for 10 days and 114 (53%) did not. Standard laboratory parameters, plasma levels of cytokines, endothelial markers, immunoglobulin (Ig) IgA, IgM and IgG against COVID-19 virus were analyzed post ICU admission.
Results: Patients with dexamethasone treatment vs. those without, had higher blood glucose but lower blood lactate, plasma cortisol, IgA, IgM, IgG, D-dimer, cytokines, Syndecan-1 and E-selectin (Figure 1), and received less organ support.
There was an association between dexamethasone treatment and IL-17A, MIP-1α, Syndecan-1 as well as E-selectin in predicting 30-day mortality. In patients who received dexamethasone within 14 days of COVID-19 infection, the crude mortality risk at 30 days was 0.4 (0.2 – 0.9), compared to those who received the treatment later in their disease course (Table 1).
Conclusion: In a cohort of critically ill COVID-19 patients, early administration of dexamethasone was associated with widespread effects on immune and physiologic responses, some of which could mediate effects on mortality.

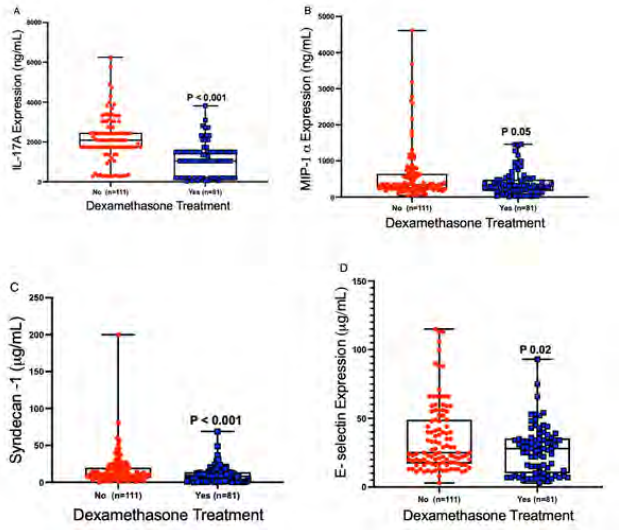

Figure 1. Plasma levels of inflammatory mediators and endothelial injury markers in critically ill COVID-19 patients who received dexamethasone treatment (n=81) versus those who did not (n=110), missing: (n=25). Differences analyzed by Mann-Whitney test.

30 days mortality risk	All patients	COVID-19 day <14 on admission	COVID-19 day ≥14 on admission
Dexamethasone treatment	0.7 (0.4 – 1.4)	**0.4 (0.2 – 0.9)**	3.1 (0.7– 14)

Table 1. Logistic regression derived odds ratios (OR) and 95% confidence intervals (CI) for the association between dexamethasone treatment and mortality at 30 days in COVID-19 patients admitted to the ICU. Sub-analysis among COVID-19 patients who received corticosteroid treatment earlier < 14 days of versus those who received later ≥ 14 days.

09AP09-04
An audit of the use of methylene blue for vasoplegic syndrome in cardiac surgery and refractory shock

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Background and Goal of Study: Vasoplegic syndrome (VS) is a form of vasodilatatory shock that can occur in many clinical scenarios, including cardiac surgery. Methylene blue (MB) inhibits nitric oxide synthase and subsequent activation of soluble guanylyl cyclase, and may antagonize the underlying pathophysiology of VS. It may play a role in the management of postoperative VS and vasodilatatory shock syndromes. We aimed to review the use of MB in the treatment of perioperative VS and refractory shock at our institution.
Materials and Methods: Data of adult patients who received MB for VS at Harefield Hospital (2016-2021) were extracted from the electronic system and analysed retrospectively.
Results and Discussion: 125 patients (M 75%, mean age 55±18y) received MB, which was administered in the intensive care unit (ICU) and in the operating theatre in 97 and 28 patients, respectively. The doses used ranged between 50 and 200 mg. MB was given preferentially as a bolus, and 25% of patients received repeated doses. 64 (51.2%) patients received MB to treat cardiac surgery-related VS, while septic shock was the second most common indication (Table 1). As serotonergic antidepressants with MB can precipitate serotonin syndrome, 16 patients (12.8%) were at risk of developing it. Of these, 37.5% underwent transplantation or mechanical circulatory assist device implantation. 48 (38.4%) patients survived the VS episode and were discharged from ICU. No MB-related side effects were recorded.

Clinical scenario	N (%)
Valve surgery ± coronary artery bypass grafting	42 (33.6)
Left ventricular assist device implantation	11 (8.8)
Heart transplantation	5 (4)
Coronary artery bypass grafting	4 (3.2)
Aortic surgery	2 (1.6)
Septic shock	26 (20.8)
Lung transplantation	14 (11.2)
Post-resuscitation syndrome	7 (5.6)
Other	14 (11.2)

Table 1-MB indications

Conclusion: There is no consensus on technical aspects and benefits of MB for VS. According to our institutional guidelines, MB is the third line off-label therapy after norepinephrine and vasopressin for refractory shock, especially in cardiac surgery. Dosage was within safe limits and most of the patients had no contraindications for its use.
Further studies on timing, dosage regimen and administration practices are needed in order to maximize the role of MB in VS.

09AP09-06
What's the role of Endotoxemia in patients with depressed cardiac function who develop septic shock after cardiac surgery? An observational study

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Background and Goal of Study: In cardiac surgery, the prevalence of sepsis is between 0.39% and 2.5%, with a mortality ranging from 65% up to 79% 1. Endotoxin or LPS is recognized as the most potent and common microbial mediator implicated in the pathogenesis of septic shock. It is the most prominent "alarm molecule" able to trigger inflammation process 2.
Materials and Methods: We conducted a retrospective observational study on 41 patients with depressed cardiac function who developed septic shock after cardiac surgery between 2020 and 2022. Patients received a cycle of Levosimendan and of extracorporeal blood purification therapy (EBPT). Patients were compared with data already recorded of a population of 38 patients. Primary endpoint of the study was to value Blood Endotoxin Activity at different time points.
Furthermore were registered: assessment of multiorgan dysfunction and the dynamics of biochemical and biohumoral variables; the performance indicators of the cardiovascular system and of hemodynamic dysfunction and Vasoactive Inotropic Score (VIS); hospital mortality, length of stay in the ICU and 30-day, 60-day, 90-day survival.
Results and Discussion: The two groups did not significantly differ in age and gender as well as in the prevalence of clinical history. A significant greater reduction of EAA value was observed in the active group compared to the control group at all time points. Median VIS significantly decreased and Median EF, SV, CO significantly increased at 48h and 72h in active group. A lower percentage of patients died in the active group at 30, 60 and 90 days and a greater survival of the active group compared to the control group is described.
Conclusion(s): The difficulty in managing patients with septic shock has been to guarantee a correct timing of the start of treatment, which unfortunately cannot be the same for all patients, as it depends on a correct and fast diagnosis2. The search for new and rapid biomarkers, such as Endotoxemia, could be useful in improving the problem of the time, to confirm the diagnosis and speed up the initiation of multimodal treatments.

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2. Evans L et al. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021. Intensive Care Med. 2021 Nov;47(11):1181-1247

09AP09-08
Short-term esmolol confers persistent cardiac protection after treatment withdrawal

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Background and Goal of Study: Left ventricular hypertrophy (LVH) is a strong and independent predictor of cardiovascular morbidity and mortality in patients with hypertension. Regression of LVH is associated with a reduction in the incidence of cardiovascular events. Regression of LVH with antihypertensive therapy has been reported, although only after long-term treatment. We have previously proved that short-term treatment with esmolol (48 hours) produces regression of cardiac remodeling (1). However, we do not know yet if this effect is maintained over time once the drug infusion is stopped.
Materials and Methods: Once the study was approved by the Ethic Committee on Animal Investigation (CEEA), we selected spontaneously hypertensive (SHR) male adult rats (14 months old) and randomly divided them into two groups: those who received 300mcg/kg/min iv esmolol infusion for 48h (SHR-E) and those who received iv saline as placebo (SHR). After treatment, each group was randomly divided into three subgroups: those studied just after 48h of treatment withadrawal (SHR-48h y SHR-E-48h), after 7 days (SHR-7d y SHR-E-7d) and after a month (SHR-1m y SHR-E-1m) from stopping the treatment. We studied echocardiographic parameters with M-mode measurements (interventricular septal end diastolic thickness, left ventricular end diastolic diameter and left ventricular posterior wall diastolic thickness) to calculate left ventricular mass index (LVMI). Cross-sectional area (CSA) of cardiomyocytes and collagen volume fraction (CVF) of the left ventricle were determined by optical microscopy and image analysis (H/E 40x and Masson 20x stains, respectively). The groups were compared using an independent *t* test, considering $p < 0.05$ as statistically significant.
Results and Discussion: LVMI and CSA values of cardiomyocytes from SHR-E-48h were decreased compared to SHR-48h ($p< 0.05$), and these changes persisted in SHR-E-7d and SHR-E-1m. CVF from SHR-E-7d was decreased compared to SHR-7d ($p< 0.05$), and these changes persisted in SHR-E-1m.
Conclusion: Esmolol produces early regression of left ventricular hypertrophy, and this effect is maintained over time once drug infusion is stopped.
References:
Quintana-Villamandos et al. Early regression of left ventricular hypertrophy after treatment with esmolol in an experimental rat model of primary hypertension. Hypertens Res 2013; 36:408-413.
Acknowledgements: This study was financed by a grant from FIS 16/02069 and FEDER Funding.

09AP09-10
Risk factors for mortality in critically ill patients with septic shock treated with AN69ST (oXiris®) hemofilter: a retrospective observational study in Pauls Stradins Clinical University Hospital

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Background and Goal of Study: Although several studies have reported a hemodynamic improvement and lactate clearance benefit for a new adsorptive oXiris® hemofilter, it's effect on mortality remain controversial. Possible risk factors for poor outcomes need to be analyzed to identify strategies for individual case management and reduce mortality.
Materials and Methods: To identify the risk factors related to the patient's 28-day mortality, 35 consecutive septic shock cases treated with the oXiris® for at least 24 hours during 2022 were retrospectively analyzed. The demographic, laboratory, continuous renal replacement therapy (CRRT) parameters data, Sequential Organ Failure Assessment (SOFA) and Dynamic Score System (DSS) were collected from patient's files prior and 24 hours after treatment with oXiris® hemofilter.
Results and Discussion: A mean age was 65 [IQR 47-73] years. Besides standard septic shock therapy, all enrolled patients received CRRT with oXiris® mostly due to the hemodynamic instability (the median dose of norepinephrine (NE) was 0,27μg/kg/min (IQR: 0,13 - 0,39)) or high inflammatory markers (Procalcitonin (PCT; median 26; IQR: 11-71); C-reactive protein (CRP; median 268; IQR: 153 - 299). The median pre-treatment SOFA score was 12 (IQR: 10–33) and DSS score was 8 (IQR: 6-10). The median treatment initiation time was 19 h (IQR: 14-48) and hemofilter duration time was 69,5 h (IQR: 44,5–72).
After 24 h of CRRT with oXiris®, median NE dose, blood lactate and PCT levels decreased by 0,06 μg/kg/min (25%), 0,5 mmol/l (21%) and 9,7ng/ml (37,3%) respectively. The SOFA score was decreased by 1 point (8,3%) after 24 h of treatment. Among the total patients, 28-day mortality was 45,7% [n=16]. In logistic regression analysis only SOFA scale, DSS score and time before treatment (patients were clustered in two group - who received oXiris® ≤ 24 h or >24 h upon ICU admission) were considered as independent risk factors for 28-day mortality ($p<0,001$).
Conclusion(s): SOFA scale, DSS and time before treatment were indicated to be the risk factors of high mortality rate in septic patients treated with oXiris® hemofilter. Identification of these risk factors can be helpful in the timely intervention of patients at high risk of death for health care providers. Moreover, in this study a comparison of two score systems (DSS and SOFA) was reported to for the first time, that can subsequently simplify the validation of this new DSS score in future.

Critical Emergency Medicine - Trauma and Resuscitation

10AP01-01
Accidental perforation of the right subclavian artery in a 22-year-old female drug abuser. A case report

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Background: The use of heroin is associated with the more harmful forms of drug abuse because 38% of the cases receive it through direct endovascular injection[1], predisposing to vascular injury[2]. We describe the case of a 22 year old female drug abuser presenting with perforation of her right subclavian artery and the diagnostic and therapeutic approaches that led to a successful outcome. Traumatic injuries of the subclavian artery are related with high morbidity and mortality rates.Thus, timely and effective management is required in order to optimize outcome.
Case report: The patient presented to the emergency department with active hemorrhage in the right subclavicular area, reporting an injection of heroin into a subclavian vessel 10 days ago.She was hemodynamically unstable and was transferred for CT angiography that revealed active extravasation from the right subclavian artery. We made the decision to proceed to endovascular treatment.The patient was intubated and continuous arterial access was gained through her left radial artery.The first arterial blood gas analysis revealed a Hb of 2,4 g/dL and immediately the massive transfusion protocol of our hospital was employed. In the catheterization lab, a stent was introduced via the guide-wire and after an angiography, it was expanded. Angiography after the stent placement revealed good blood flow within the right subclavian artery without any leakage, artery stenosis or dissection.The patient was transferred to the ICU.After a follow up CT and anterior cervical hematomas drainage by maxillofacial surgeons, she was extubated on the third postoperative day. She was discharged from the hospital on the eighth postoperative day and on her follow up visit, 30 days after the intervention, she was doing well.
Discussion: Subclavian artery injuries, though rare, bear high morbidity. Treatment with minimally invasive techniques and team work ameliorate the prognosis of these patients.
References:
1. European drug report 2022
2. Eur J Vasc Endovasc Surg 2006, 32: 389-396
Learning Points: Importance of rapid recognition and management in such a life-threatening injury as subclavian artery perforation. Teamwork between many different medical specialties.Implementation of minimally invasive techniques.

10AP01-02
A fatal case of “Cosmonaut drug” ingestion in Sars-CoV-2 positive patient

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Background: Phenibut (β-phenyl-γ-aminobutyric acid) is a gamma-aminobutyric acid (GABA) analog and agonist. Created in 1960. in Soviet Union and intended for use by cosmonauts for anxiolysis and cognitive enhancement. Use of phenibut typically exerts anxiolysis and sedation but it can also cause altered mentation, respiratory depression, tonic-clonic seizures, temperature dysregulation and symptoms may mimic serotonin syndrome or neuroleptic malignant syndrome (NMS).
Case report: 17-year old male was brought around 2 p.m. to Emergency Pediatric Department (EPD) after celebration of his 18.-th birthday with consummation of large amounts of energy drinks and ″enhancing dietary supplement″ bought online later identified as phenibut. Initially he presented with a decreased level of consciousness and was extremely agitated.Vital signs were unremarkable. Laboratory workup showed elevated liver enzymes as well as creatinine phosphokinase and myoglobin highly increased and Sars-Cov-2 positive.He was admitted to pediatric ward. During the night his body temperature was rising over 40°C. In the morning level of consciousness decreased and lab tests showed increasing levels of creatinine phosphokinase and myoglobin as well as failure of liver and kidney function. NMS was suspected, supportive therapy was initiated and he was transferred to Intensive care unit (ICU). Despite intensive treatment (mechanical ventilation, sedation, CRRT, off label use of Dantrolen) he deteriorated and went into cardiac arrest with fatal outcome.
Discussion: The number of reported cases of phenibut dependence and intoxication is relatively small. Systematic review by Kupats et al presented sixteen patients with acute phenibut intoxication but none of them were fatal.That is in concordance with other case reports that we are aware of, with just one of them presenting possibly fatal outcome. There were no case reports that we found to this date that show possible link between phenibut intoxication and activation of NMS.
References:
1. Lapin I. Phenibut (beta-phenyl-GABA): a tranquilizer and nootropic drug.CNS Drug Rev. 2001;7(4):471-81.
2. Kupats E,Vrublevska J, Zvejniece B,Vavers E, Stelfa G,Zvejniece L, et al. Safety and Tolerability of the Anxiolytic and Nootropic Drug Phenibut: A Systematic Review of Clinical Trials and Case Reports. Pharmacopsychiatry.2020;53(5):201-8.
Learning Points: Physicians should be aware of phenibut, its misuse and the potential for severe toxicity in adolescents.

10AP01-03
Intraoperative cardiac arrest caused by unexpected vasospastic angina requiring prolonged resuscitation using extracorporeal membrane oxygenation

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Background: Vasospastic angina (VSA), also known as variant angina, usually occurs at rest. Vasospasm during surgery is very rare and necessitates prompt management to prevent its development into ventricular arrhythmia, which may result in cardiac arrest.
Although it is difficult to preoperatively assess intraoperative vasospasm, the availability of medical resources may allow better outcomes in the operating room[1].
Case report: We present the case of a 77-year-old hypertensive male, with no history of coronary artery disease, who underwent laparoscopic inguinal hernia surgery under general anesthesia, using sevoflurane-fentanyl-remifentanil. Sudden VSA occurred during surgery, just before closing. ST elevation was observed for 103 seconds, resulting in Ventricular fibrillation. Cardiopulmonary resuscitation (CPR) was immediately attempted, but pulseless electrical activity was observed after defibrillation. Stone heart condition was observed via transesophageal echocardiography, and extracorporeal CPR (ECPR) was performed. Return of spontaneous circulation was obtained 77 minutes after cardiac arrest.
VSA was diagnosed by the patient's clinical course and the results of his coronary angiography. Extracorporeal membrane oxygenation was removed on the first postoperative day, and the patient was discharged without any further sequelae. During the CPR, the patient state index (PSi) by SedLine®, which reflects brain function, was preserved.
Discussion: ECPR should be considered based on guidelines.But even if the ECPR is performed, longer low-flow times are associated with poorer neurologic prognosis[2]. In such cases, PSi has been reported to be a possible predictor of neurological prognosis.
References:
1. Jochen HinKelBein et al
Perioperative cardiac arrest in the operating room environment: a review of the literature
Minerva anestesiologica 2017 Nov;83(11):1190-1198
2. Takayuki Ohtani et al
Low-flow time is associated with a favorable neurological outcome in out-of-hospital cardiac arrest patients resuscitated with extracorporeal cardiopulmonary resuscitation
Journal of Critical Care Volume 2018 Dec;48:15-20
Learning Points: Ventricular arrhythmia caused by VSA could develop too rapidly to manage. ECPR for intraoperative refractory cardiac arrest should be considered to avoid adverse events, such as hemorrhage. Psi may be useful to assess the quality of CPR and to predict the neurological outcome.

10AP01-04
Tranexamic acid and viscoelastic hemostatic assay in severe traumatic brain injury, from evidence to clinical practice

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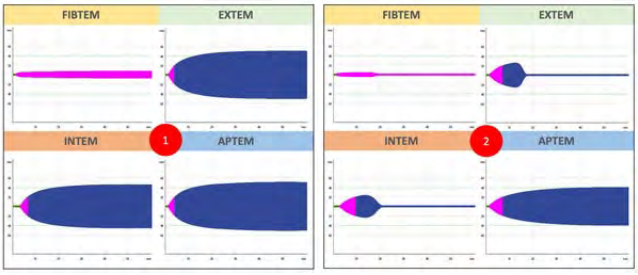
Background: Traumatic brain injury (TBI) remains one of the most challenging health and socioeconomic problems of our times. It is a fact that TBI is associated with coagulopathy which results in the need for blood products, organ dysfunction, longer stay in ICU and higher mortality. We aim to underline the importance of early and targeted hemostatic resuscitation by presenting a case report with fatal outcomes.
Case report: 55 year-old man with severe TBI due to a bike accident who was transferred to our center intubated, hemodynamically stable and with reactive and symmetrical pupils. The initial viscoelastic hemostatic assay (VHA) was normal and the cranial CT scan showed a subdural hematoma with midline shift so a decompressive craniectomy was performed urgently. During the surgery, the patient suffered a cardiac arrest, recovered after 15 minutes of advanced cardiac life support and fluid administration, secondary to significant intracranial bleeding.
Another VHA was performed showing data compatible with hypofibrinogenemia and hyperfibrinolysis. Therefore, tranexamic acid (TXA) and fibrinogen concentrate were administered. A new CT scan after surgery showed major brain damage and, on the following day, encephalic death was confirmed.



Discussion: Recent studies have shown that administration of TXA within 3 hour of injury reduces death in mild-to-moderate TBI with no evidence of any increased risk of adverse events[1]. Moreover, VHA - guided management algorithms have proved to reduce mortality in patients with severe TBI[2].
Given the lack of specific TBI management guidelines considering targeted hemostatic resuscitation as a fundamental pillar despite recently published evidence on this subject, we consider it necessary to develop specific and center-individualized management algorithms to guide hemostatic resuscitation in this subgroup of patients.
Reference:
CRASH-3 trial (1); ITACTIC trial (2)
Learning Points: Increased fibrinolysis in often observed in patients with TBI as shown in this case report. While it is true that VHA-guided treatment was done, TXA should probably have been administered empirically in the first 3 hours after the accident.

10AP01-05
Remote real-time supervision of prehospital emergency ultrasound: a case report

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Background: Due to the technical progress of portable devices, prehospital emergency ultrasound (PEU) is increasingly used. However, prehospital circumstances can complicate adequate execution and rapid translation of findings. Technical advances offer the opportunity for remote real-time supervision of prehospital ultrasound. Certainly, there is a lack of evidence on the impact of tele-ultrasound on patient outcome.
Within the course of the ongoing study "Live-Stream of prehospital emergency ultrasound in patients with acute dyspnoea" (ClinTrials.gov NCT04817488) remote real-time supervision led to a major change of decision-making for the prehospital emergency physician in a challenging case.
Case report: A prehospital emergency physician was called to a 60-year-old patient due to a sudden onset of acute dyspnoea and chest pain. On arrival, the awake patient showed the following vital signs: open airway, respiratory rate > 20/min, peripheral oxygen saturation of 88%, heart rate 120/min, blood pressure 200/100 mmHg.
The 12-lead ECG showed a new-onset left bundle branch block. For differentiation between an acute coronary syndrome and an acute aortic syndrome the physician decided to perform PEU.
As depicted in Figure 1, the parasternal long axis view unveiled an approximately 20 x 50 mm mobile, homogenous mass, attached to the basal interatrial septum at a small pedicle, with diastolic prolaps into the left ventricle.
Due to this finding the prehospital emergency physician decided to use the opportunity of tele-supervision. With remote real-time support the diagnosis of a cardiac myxoma was established, which resulted in an alteration of prehospital treatment and choice of admission hospital.

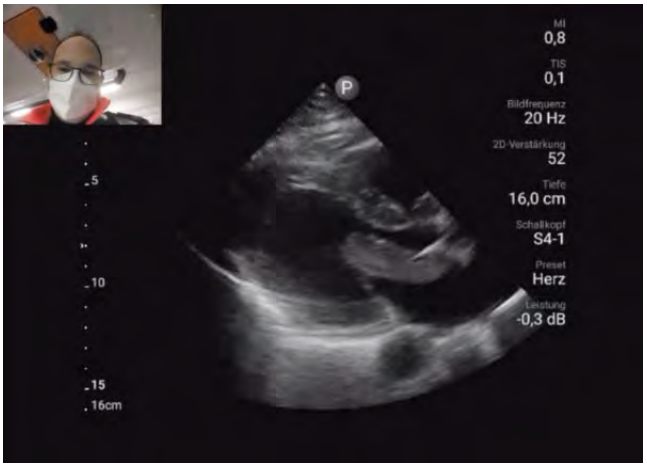

Figure 1.

Discussion: Although previous studies demonstrated technical feasibility of prehospital tele-ultrasound, a beneficial impact on patient outcome is rarely reported In this case remote real-time supervision supported the prehospital emergency physician in decision making during a challenging case.
Learning points: In prehospital circumstances the opportunity of tele-ultrasound can provide expert-opinion at the scene and possibly improve patient outcome.

10AP01-07
Left ventricle rupture. How often in the emergency room?

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Background: Ischemic heart disease accounts for 1.8 million deaths annually, accounting for 20% of all deaths in Europe and is the single most common cause of death globally. Mechanical complications of acute coronary syndromes, although rare, are surgical emergencies. Left ventricular free wall rupture (LVFWR) can be caused by trauma or, more commonly, by ischemia. The incidence is estimated at 1%, with extremely high mortality. Early diagnosis is the cornerstone of the patient's prognosis.
Case report: We present a case report of a 68-year-old female patient with history of hypertension and dyslipidemia. 4 hours after diagnosis of ST-elevation myocardial infarction (STEMI) at another clinical institution, she was transported without medical assistance to the emergency room (ER) of a tertiary hospital.
On admission to the ER, she was in cardiac arrest (CA) in pulseless electrical activity with 2 minutes of evolution, in basic life support maneuvers. She returned to spontaneous circulation after 2 cycles of chest compressions. She recovered from CA with a neurological status compatible with no need for airway protection, hemodynamically unstable and with an electrocardiogram showing complete left bundle branch block and ST elevation in the anterolateral leads and reciprocal ST segment depression in the inferior leads.
After immediate post-cardiac arrest care, she underwent chest CT which revealed cardiac tamponade due to LVFWR. Coronary angiography confirmed LV free wall rupture and complete occlusion of the left anterior descending artery. She was transferred to the operating room for emergent coronary revascularization surgery and ventriculoplasty. The postoperative period was uneventful, and the patient was discharged without neurocognitive deficits after 10 days of hospitalization, 7 of which in the intensive care unit.
Discussion: Undiagnosed LV wall rupture rapidly evolves to cardiocirculatory dysfunction, with cardiac tamponade and hemothorax being the immediate complications. The high clinical suspicion in the post-STEMI patient who evolves into obstructive shock and echocardiography make the diagnosis quicker, allowing progress in the chain of care. Rapid recognition, adequate medical follow-up and medical/surgical treatment allow for a 75% increase in survival.
Learning Points: This case report demonstrates a favorable evolution of a post-infarction tamponade, highlighting the need for a quick diagnosis and its emergent treatment.

10AP01-08
Acute pancreatitis developed Takotsubo cardiomyopathy followed by diabetic ketoacidosis: a case report

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Background: Takotsubo cardiomyopathy (TCM) is characterized by temporary ventricular wall abnormality and followed by cardiac dysfunction resulting in heart failure. TCM is induced by physiological and psychiatric stress including pain. There are few case reports describing TCM and pancreatitis. The therapeutic strategies are quite opposite.
Case report: A 55-year-old female patient (50.4 kg & 160 cm) complained epigastralgia and dyspnea. She has a history of mammectomy 2 years ago and chemotherapy. Mild diabetes was pointed out and oral medication therapy was continued. Electrocardiography showed abnormality in the ST-segment (Figure), and blood concentration of creatinine kinase (MB fraction) and troponin I were 4.9 ng/ml and 0.58 ng/ml, respectively. Echocardiography revealed hypokinesis of the left ventricular apex (Figure).

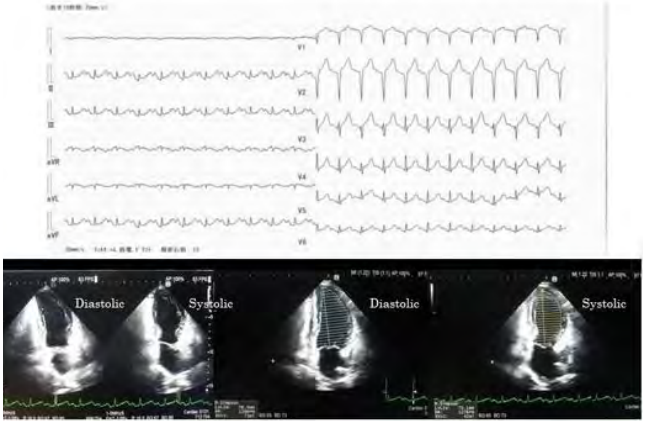

Figure. Electrocardiography and echocardiography of the patient on the admission. Abnormal ST elevation and hypokinesis mainly of the left ventricular apex were observed.

Ejection fraction was 29%. Thus, the final diagnosis of TCM followed by heart failure was made at emergency room. She was admitted to an intensive care unit. Diuretics was intravenously given, and the fluid loading was restricted. On the next morning, tachypnea was observed. The blood gas analysis showed the development of diabetic ketoacidosis (pH: 6.9, $PaCO_2$: 10.7 mmHg, blood glucose: 393 mg/dl and total ketone body: 17423 μmol/L). Serum concentrations of amylase and lipase were 113 IU/L and 438 IU/L, respectively. Acute pancreatitis-induced TCM was strongly suspected, and hydration and continuous insulin infusion were initiated under repeated evaluations of cardiac function. Recovery from severe ketoacidosis was followed by normalization of cardiac function. She discharged the hospital on the 20 hospital days without any complications.
Discussion: Dehydration is one of important strategies for treatment of heart failure. On the other hand, hydration is absolutely recommended against acute pancreatitis. The cause of epigastralgia was overlooked in the case, and initial therapy worsened the diabetes resulting in severe ketoacidosis.

Reference:
Yeh J et al. BMC Gastroenterology 2021; 21: 134. Koop AH et al. BMJ Case Rep 2018; bcr2018225877.
Learning Points: We should take more attention to the original stress that induced TCM.

10AP01-09
Cerebral fat embolism in proximal femur fracture: how long to wait? – Case report

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Background: Fat Embolism Syndrome (FES) is a rare clinical entity that usually manifests within 12 to 72 hours after long bone fracture, which is the main etiology.[1,2] The classic manifestations include hypoxemia, neurologic changes, and petechial rash, but none of them is specific of FES.[1,3]
Case report: An 18-year-old female patient, ASA I, was admitted to the Orthopedics unit due to diaphyseal fractures of the left femur and right tibia after a car accident with projection. A surgical correction was scheduled for the 3rd day of hospitalization.
On D2, she complained about visual changes, followed by agitation and worsening of the clinical status with prostration, disorientation, and desaturation. Nevertheless, she remained hemodynamically stable. Pulmonary embolism and acute cerebral events were excluded by tomography.
Upon the suspicion for Cerebral Fat Embolism (CFE), the patient submitted to emergent surgical correction of the femoral fracture under general anesthesia. She was extubated after the procedure and admitted to the Intermediate Care Unit (ICU). The first 3 days, she maintained fluctuations in the state of consciousness and periods of hypoxemia. She underwent a cerebral magnetic resonance imaging, that confirmed the diagnosis of CFE.
The patient remained in the ICU for 6 days, with progressive improvement of neurological and pulmonary status, and complete resolution of the symptoms.
Discussion: This case highlights the importance of a quick approach to patients with long bone fractures, due to the risk of FES. The most effective prevention is early correction of these fractures.[4] Postponing orthopedic surgery has advantages in preoperative optimization and stabilization of patients, as well as management of operating room dynamics. However, this case reinforces the demand to prioritize patients with long bone fractures and the importance of clinical surveillance of these patients.
In most cases there is a complete recovery, symptoms are transient and reversible. However, there are documented cases of persistence of symptoms, and a non-negligible rate of FES-related death.[5]
References:
1. Case Rep Orthop **2021**, 5585085
2. Chest **159**, 1064-1071 (2021)
3. Radiol Case Rep. vol. 17, pp. 283-285
4. J Trauma 1982; 22:891
5. Indian J Crit Care Med 2015; 19:687
Learning Points: Avoiding delay in surgical correction and maintaining adequate perioperative surveillance of these patients prevents significant complications and reduces morbimortality

10AP01-10
Bone cement implantation syndrome in hip cement hemiatroplast: right ventricule failure and intraoperative transthoracic echocardiogram

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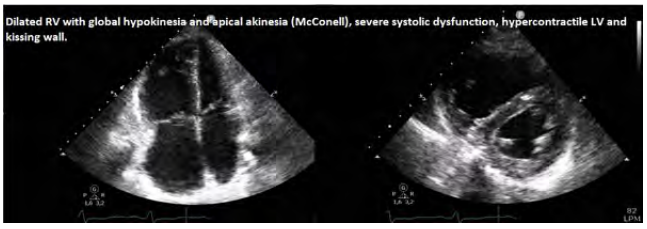
Background: Bone cement implantation syndrome (BCIS) is a cause of morbidity and mortality intra- and postoperative in hip cement hemiatroplast. It produces hypoxia, loss of consciousness and arrhythmias, which can lead to right ventricule (RV) failure and cardiac arrest.
It is a frequent surgery without definition criteria and not fully understood pathophysiology that can be extremely serious, which is why more studies should be carried out.
Case report: We present a case of an 85-year-old woman undergoing hip cement hemiatroplast. The patient had multiple comorbidities (hypertension, heart failure, pulmonary hypertension and atrial fibrillation (AF)).
During cementation, the patient presented cardiac arrest. We started advance life support until she returned to spontaneous rhythm. Intraoperative transthoracic echocardiogram (TTE) showed data of severe RV dysfunction due to pulmonary embolism (fulminant SCIB):Patient was transferred to critical care unit intubated, soported with epinephrine, dobutamine and pulmonary vasodilators. During immediate postoperative period, RV function was monitored with TTE. On 3rd postoperative day, she is discharged from the unit stable.



Discussion: The patient had high risk of SCIB (advanced age, ASA III, cardiac pathology, and cemented prosthesis). It would be indicated surgical selection for uncemented prosthesis and invasive monitoring should be considered to minimize morbidity and mortality. Special attention should be paid during cementation and prosthesis inserction.
Intraoperative echocardiography is useful to identify SCIB, assess cardiac function, and guide resuscitation.
Its pathophysiology is not well known and its treatment is based on hemodynamic and respiratory support, so more studies must be carried out in order to carry out a specific treatment and prevention.
Reference:
Donaldson AJ, Thomson HE, Harper NJ, et al. Bone cement implantation syndrome. Br J Anaesth 2009;102:12–22.
Learning points:
1. More studies are necessary to understand the mechanism of SCIB and to establish a targeted treatment.
2. Patients at high risk of developing SCIB should be identified.
3. TTE is useful in SCIB.

10AP01-11
Is the chest compression system that harmless?

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Background: Chest Compression System (LucasÒ device) is frequently used in cardio respiratory arrest to improve the compressions and minimize human factors such as fatigue. This device was first applied in 2003 and there is no research about any recorded injuries. It's proven that there's no benefit from the use of LucasÒ when comparing with manual compressions within the 30-day survival.
Case report: We describe a case of a 67 y/o male patient, with known history of myocardial infarction, who came to the hospital with chest pain, nausea and sweating. He had a cardiac arrest in the waiting room and was quickly assisted by the emergency team. 4 advanced life support cycles were completed with LUCASÒ until he recovered spontaneous circulation and after that he was assessed by a cardiologist. In the hemodynamic room no coronary occlusion was found, but the patient started to show hemodynamic instability and distended abdomen. Due to that, the patient underwent an abdominal tomography that revealed massive retroperitoneal hemorrhage from a ruptured aneurysm in the lower pole of the left kidney.
In the operating room (OR), an emergent total nephrectomy and segmental enterectomy were done with class IV hemorrhage and blood product replacement, which included tranexamic acid, erythrocyte concentrate, platelets, fibrinogen concentrate and fresh frozen plasma. The bleeding was stopped but despite all efforts, the patient suffered severe brain injury.
Discussion: In the described case, the patient came to the urgency with chest pain, suggestive of acute myocardial infarction and ended up in the OR with a massive haemorrhage after LUCASÒ application for about 10 minutes. Was the haemorrhage already there? Was the compression device properly applied? He had previous cardiac history. Also, he never had presented trauma history and had no bruises in him.
References:
1. Olsen A *et* al. Severe intra-abdominal injuries following the LUCAS chest compression system being applied for cardiopulmonary resuscitation. April, 2019.
2. Parkins D *et* al. Mechanical versus manual chest compression for out-of-hospital cardiac arrest (PARAMEDIC): a pragmatic, cluster randomised controlled trial. Mar, 2015.
Learning points: Chest compression system does not seem to be so harmless as that. All health care providers must know how to correctly apply the device. More research is needed in order to assess the effects of mechanical compressions.

10AP01-12
How thromboelastometry can change our practice: a case report

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Background: Hemorrhagic shock is a medical emergency that often requires a multidisciplinary response in which anesthesiologist is the team leader. Thromboelastometry has been considered an effective tool for bleeding management in critically ill patients. Thromboelastometry can guide transfusion therapy quickly, reducing the need for blood products. We report our experience with a case of hemorrhagic shock, in which bleeding management was guided by thromboelastometry.
Case report: A 61year-old woman with cardiovascular risk factors under dual antiplatelet therapy was present with 3rd class hemorrhagic shock, 12 hours after percutaneous coronary intervention (PCI) by stenosis stent, for exploratory laparotomy. Hemodinamic resuscitation was based on the point of care data of the thromboelastrogram with the administration of erythrocyte concentrate and fluids associated with vasopressor support for adequate perfusion. The test showed normal platelet function despite complete adherence to dual antiplatelet therapy. Hemorrhagic focus was controlled, after nephrectomy. She was discharged from the intensive unit after 4 days, with no chest pain.
Discussion: With thromboelastometry, we avoided the administration of platelets, which we thinked to have their function inhibited due to dual antiplatelet therapy but the test showed normal platelet function. Thus, the administration of a blood product not necessary was avoided.
References:
Abdelfattah and Cripps. Thromboelastography and Rotational Thromboelastometry use in trauma. Int J Surg 2016 Sep;33(Pt B):196-201; Volod et al. Viscoelastic Hemostatic Assays: A Primer on Legacy and New Generation Devices. J Clin Med 2022 Feb 7;11(3):860.
Learning points: Thromboelastometry may be considered a useful, feasible and safe tool to monitor and manage patients with hemorrhagic shock. Moreover, it has the potential benefit of allowing rapid diagnosis, goal-directed therapy and thus, avoiding unnecessary blood component transfusion and their risks.

10AP02-01
Impact of CoVid19 pandemic on in-hospital cardiac arrest and CPR outcomes on a tertiary university hospital. A retrospective cohorts analysis

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Background and Goal of Study: During the COVID19 pandemic worse cardiopulmonary resuscitation (CPR) outcomes were reported[1]. These have been attributed to delays in detection and treatment of CA[1]. Preventive measures were introduced in our protocol of in-hospital cardiac arrest (IHCA)[2]. Thus, we aimed to determine whether our CPR outcomes had changed since the pandemic and whether they were different in COVID19-infected vs uninfected patients.
Materials and Methods: A retrospective study was carried out using a database of all the CPR team activations. It was approved by the ERB of the Hospital Clínic de Barcelona (HCB/2021/1075). "Prepandemic" (2019) vs "pandemic" (2020-21) groups were defined. COVID-infected vs uninfected patients were also compared. Demographics, CPR data, ICU length of stay, mortality, and neurological outcome (good if Glasgow Outcome Scale [GOS] >3 at discharge) were collected. Statistical analysis was performed with IBM SPSS Statistics v27.
Results and Discussion: 308 patients were included in the study. Demographic data did not differ significantly between groups. Main results are shown in tables 1 and 2.

	Prepandemic (102)	Pandemic (206)	p-value
Cardiac arrest [n(%)]	24 (23.5)	81 (39.3)	0.005*
Respiratory arrest [n(%)]	13 (12.9)	25 (12.1)	0.88
Critically ill non-arrest [n(%)]	59 (57.8)	89 (43.2)	0.016*
In-hospital mortality [n(%)]	27 (28)	84 (43)	0.012*
ICU LOS [$\bar{x}$(sd)]	3.48 (5.1)	7.58 (11.1)	0.0046*
GOS>3 [n(%)]	64 (96)	89 (82)	0.0049*

	COVID+ (26)	COVID- (180)	p-value
Cardiac arrest [n(%)]	8 (31)	73 (40.6)	0.33
Respiratory arrest [n(%)]	7 (27)	18 (10)	0.0376*
Critically ill non-arrest [n(%)]	10 (38)	79 (43.9)	0.6
In-hospital mortality [n(%)]	11 (42.3)	73 (42.7)	0.97
ICU LOS [$\bar{x}$(sd)] [n(%)]	19.14 (21.6)	5.91 (7.5)	0.0001*
GOS>3 [n(%)]	10 (71.4)	79 (81.4)	0.41

No differences were seen in resuscitation times for CPR nor in the likeliness of ROSC.
Conclusions: Changes in the IHCA protocol during the pandemic, did not alter resuscitation times.
A worse prognosis was observed in patients with CA during the pandemic. This could be explained by the relative change in cardiac arrest characteristics.
Although COVID+ patients had longer ICU stays, this did not alter their prognosis.

References:
1. K. Gupta et al. Resuscitation. 2022 Jan;170:134-140.
2. M. Magaldi et al. Protocolo RCP COVID-19 Hospital Clínic de Barcelona. https://intranet.clinic.cat/?q=ca/system/files/pnt_pcr_coronavirus_v4_1.pdf

10AP02-03
Permissive hypoventilation equally effective to maintain oxygenation as positive pressure ventilation after porcine class III hemorrhage and whole blood resuscitation

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Background and Goal of Study: Securing airway and ventilation are fundamental in prehospital care to ensure adequate oxygenation. Pre-hospital emergency anesthesia and tracheal intubation may lead to circulatory collapse in severe hemorrhage.
It is possible that permissive hypoventilation: refraining from tracheal intubation, positive pressure ventilation and accepting spontaneous ventilation, may lower this risk, and instead allow for immediate whole blood resuscitation. It is not known if oxygen delivery can be maintained with this strategy.
We investigated the feasibility of permissive hypoventilation after class III hemorrhage and subsequent whole blood resuscitation.
Materials and Methods: 19 crossbred swine, mean weight 58.5 kg, were anesthetized with ketamine/midazolam and hemorrhaged to a mean (SD) 1298 (220) mL and randomized to permissive hypoventilation (n=9) or positive pressure ventilation with a Ppeak mean (SD) 14.9 (0.3) cm H_2O, PEEP 0 cm H_2O (ZEEP) and FiO_2 21% (n=10). Three prehospital phases were investigated: during 15 min on scene without intervention, 30 min whole blood resuscitation and 45 min after completion of resuscitation.
Results and Discussion: In permissive hypoventilation vs positive pressure ventilation, indexed oxygen delivery (DO_2I) decreased to mean (SD) 4.73 (1.06) vs 3.70 (1.13) mL min^{-1} kg^{-1} after hemorrhage and increased to 8.62 (2.09) vs 6.70 (1.56) mL min^{-1} kg^{-1} at completion of resuscitation. DO_2I, indexed oxygen consumption (VO_2I), and arterial saturation (SaO_2) did not differ between groups.
Permissive hypoventilation increased the respiratory rate to mean (SD) 45 (1.8) vs 19 (1.3) ($p<0.001$) and increased pCO_2 mean (SD) 6.37 (0.74) vs 4.99 (0.50) ($p=0.004$) kPa. In positive pressure ventilation, Ppeak /ZEEP mean (SD) 14.9 (0.3) cm H_2O and mean pressure/ZEEP 5.7 (1.4) cm H_2O were tolerable and did not deteriorate circulation. Cardiac index (CI), systolic arterial pressure (SAP), hemoglobin (Hb), heart rate did not differ between groups.
Conclusion(s): Permissive hypoventilation and positive pressure ventilation were equally effective to maintain oxygen delivery in all three prehospital phases. A respiratory rate of 40 was feasible, showing no signs of respiratory fatigue for 90 minutes, indicating that whole blood resuscitation may be prioritized in select patients with severe hemorrhage and spontaneous breathing.

10AP02-04
The role of early fracture fixation in reducing the incidence of fat embolism syndrome

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Background and Goal of Study: Although fat embolism is common among trauma patients (1), it only occurs between 2-5% of the time in those with long-bone fractures (1). Fixation of these fractures was reported to significantly decrease the incidence of fat embolism syndrome(2,3).
Materials and Methods: This unicentric retrospective study took place between September 2021 and September 2022 at the University Trauma Hospital in Tirana, Albania. The study included 216 randomly selected patients with “isolated” femur fractures. The aim was to evaluate the role of early fixation of fractures in the incidence of fat embolism syndrome (FES).In 86 patients aged 21-40 years, fracture fixation was performed within the first 24 hours (Gr 1);
In 130 patients aged 19-41 years, fracture fixation was performed after the first 24 hours (Gr 2).
Results and Discussion: In the first group, the incidence of FES was 2.3% (2pt’) and without severe respiratory signs. In the second group, the incidence of FES was 6.9% (9pt’) and 4 of them needed respiratory assistance in the ICU. The incidence of FES was significantly lower in Gr 1, fixed within the first 24 hours from the fracture, compared to Gr 2, fixed after the first 24 hours from the fracture. ($p<0.005$). Pulmonary complications in Gr2 patients were also more pronounced.
Conclusion(s): Early fracture fixation reduces the incidence of FES and benefits the reduction of pulmonary complications.

References:
1. Constantine S Bulautian VLR (2017): Fat Embolism: Background, Pathophysiology, Etiology. Available from: http://emedicine.medscape.com/article/460524- overview#a8
2. Svenningsen S, Nesse O, Finsen V, Hole A, Benum P (1987): Prevention of fat embolism syndrome in patients with femoral fractures--immediate or delayed operative fixation? Ann Chir Gynaecol.,76(3):163–6.
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10AP02-05
Prognostic models for outcome prediction following in-hospital cardiac arrest using pre-arrest factors: a systematic review, meta-analysis and critical appraisal

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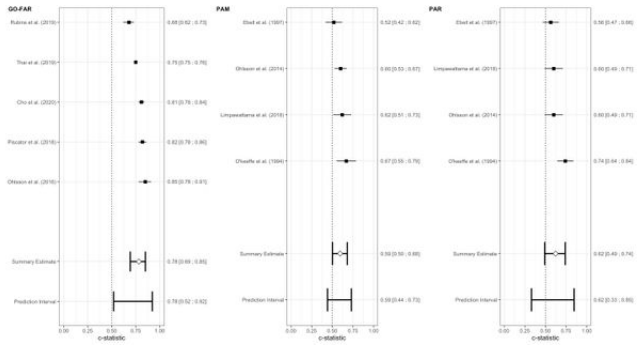
Background and Goal of Study: Several prediction models of survival after in-hospital cardiac arrest (IHCA) have been published, but no overview of model performance and external validation exists. We performed a systematic review of the available prognostic models for outcome prediction of attempted resuscitation for IHCA using pre-arrest factors to enhance clinical decision-making through improved outcome prediction.

Materials and Methods: This systematic review followed the CHARMS and PRISMA guidelines (Registration: PROSPERO CRD42021269235). Medline, Embase, Web of Science were searched up to October 2021. Studies developing, updating or validating a prediction model with pre-arrest factors for any potential clinical outcome of attempted resuscitation for IHCA were included. Studies were appraised critically according to the PROBAST checklist. A random-effects meta-analysis was performed to pool AUROC values of externally validated models.

Results and Discussion: Out of 2678 initial articles screened, 33 studies were included in this systematic review: 16 model development studies, 5 model updating studies and 12 model validation studies. The most frequently included pre-arrest factors included age, functional status, (metastatic) malignancy, heart disease, cerebrovascular events, respiratory, renal or hepatic insufficiency, hypotension and sepsis.

Only 6 of the developed models have been independently validated in external populations. The GO-FAR score showed the best performance with a pooled AUROC of 0.78 (95% CI 0.69-0.85), versus 0.59 (95%CI 0.50-0.68) for the PAM and 0.62 (95%CI 0.49-0.74) for the PAR.



Conclusion(s): Several prognostic models for clinical outcome after attempted resuscitation for IHCA have been published. Most have a moderate risk of bias and have not been validated externally. The GO-FAR score showed the most acceptable performance. Future research should focus on updating existing models for use in clinical settings, specifically pre-arrest counselling.

Acknowledgements: The authors acknowledge W. Bramer for helping with the systematic literature search.

10AP02-06
Early measurement of cardiac pre- and afterload parameters of severely burned patients on admission to hospital

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Background/Goal of Study: An early and adequate fluid therapy is crucial to maintain organ function after burn trauma. Major burns lead to a systemic response with fluid loss to surrounding tissues and to cardiac dysfunction. Advanced haemodynamic monitoring (AHM) is often used to guide fluid therapy. Decreased cardiac output (CO) and decreased stroke volume (SV) have been shown to be associated with mortality.

Whereas parameters of AHM are usually measured after patients have been admitted to the intensive care unit, in this study AHM was implemented already after arrival at hospital, before initial surgical treatment.

Methods: We conducted a monocentre, prospective cohort study with inclusion of 19 severely burned patients ≥ 20% total body surface area (TBSA). AHM with arterial waveform analysis (PulsioFlex-ProAqt®, Getinge) was implemented immediately after admission with measurement of SVV as dynamic preload parameter, CO and systemic vascular resistance to guide resuscitation therapy.

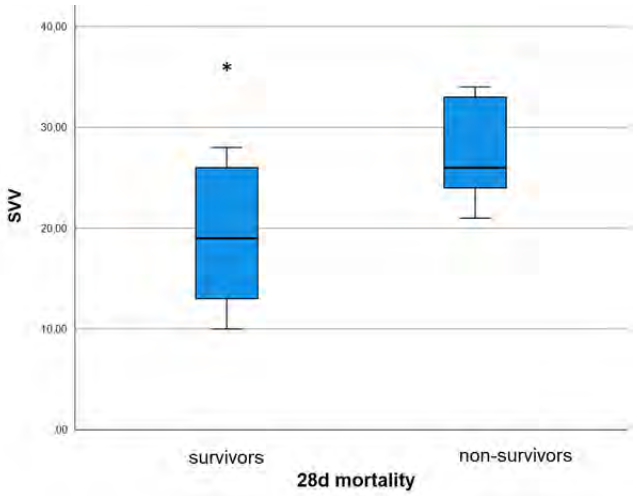

Figure 1. SVV at admission, x-axis: 28d mortality, y-axis: SVV (%), *p=0.017

Median (range)		
	1st measurement at admission	24h after burn trauma
CI (l/min/m²)	3,16 (2,43-5,60)	2,85 (1,99-4,66)
SVV (%)	21 (10-34)	16 (8-31)
SVRI (dyn x s x cm⁻⁵)	1828 (1097-2687)	1842 (1156-4557)
MAP (mmHg)	102 (60-135)	76 (56-105)
HF (bpm)	95 (83-125)	81 (45-151)
Applied volume (ml)	1000 (500-4000)	16000 (9758-43049)

Table 1. Parameters at admission to hospital.

Results and Discussion: Initially increased SVV was associated with mortality after 28d [mean SVV survivors vs. non-survivors 18,92 (±6,37) % vs 27,6 (±5,68) %, p=0,017]. CO, systemic vascular resistance index and prehospitally applied fluids were no predictors of survival in our cohort.

Small sample size and heterogeneity of burn severity within the study group are limitations to our findings. Reliability of uncalibrated AHM has generally been questioned.

Our study suggests usefulness of such devices in the setting of acute burn resuscitation. Whether early measurement and correction of SVV leads to improvement of patient centered outcomes needs further research.

Conclusion: We could confirm SVV as a predictor for survival of major burn trauma. The use of uncalibrated arterial waveform analysis enables a very early monitoring of parameters relevant to burn shock survival.

10AP02-07
Current practice of sepsis protocols and bundles and further measures for hemodynamic stabilization in European and non-European emergency departments

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Background and Goal of Study: Sepsis bundles represents the most important key elements for initial sepsis treatment. Since more than one decade they are strongly recommended by international sepsis guideline.

Moreover, numerous studies have demonstrated the beneficial impact of using sepsis bundles on mortality.

Materials and Methods: A network of leading European societies (ESAIC, ESICM, EUSEM, ESCMID, ESS, ESPNIC, IFA) conducted the European Sepsis Care Survey between 08/2021 and 06/2022.

This substudy analysed the reported current practice in emergency department in the European Union (including UK) and in non-European countries. Presence of sepsis bundles and targeted timeframe and practice of further actions for hemodynamic stabilisation was collected.

Results and Discussion: The European Sepsis Care Survey collected information of more than 1000 hospitals of all sizes. Participating hospitals were mainly general and community hospitals (51%) and university or teaching hospitals (36%). Information from 928 emergency departments was included in this analysis.

Conclusion(s): In this sample, sepsis bundles are only present in the half of the emergency departments. Nevertheless perception is that the single elements of the bundles are on a high level established in emergency departments using bundles. Point of care lactate in an significant proportion of emergency departments is not available.

	Total		Europe (incl. United Kingdom)		Non-EU countries	
Protocol, care pathway or bundle for management of sepsis	n=939	%	n=706	%	n=233	%
yes	472	50,9	374	53,7	98	42,2
no	346	37,3	243	34,9	103	44,4
not known	81	8,7	56	8,0	25	10,8
not answered	29	3,1	23	3,3	6	2,6
Bundle elements in EDs using bundles	(N=472)		(N=374)		(N=98)	
Measure lactate level	441	93,4	351	93,9	90	93,4
Obtain blood cultures before administration of antibiotics	460	97,5	366	97,9	94	97,5
Administer broad-spectrum antibiotics	430	91,1	338	90,4	92	91,1
Begin rapid administration of 30ml/kg of crystalloid for hypotension or lactate ≥4mmol/L	430	91,1	341	91,2	89	91,1
Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥65mmHg	372	78,8	279	74,6	93	78,8
Availability lactate point-of-care						
yes	739	79,6	573	82,3	166	71,6
no	149	16,1	92	13,2	57	24,6
not anwered	40	4,3	31	4,5	9	3,9

Table 1. Availability of sepsis protocols, pathways or bundles and bundle elements in emergency departments.

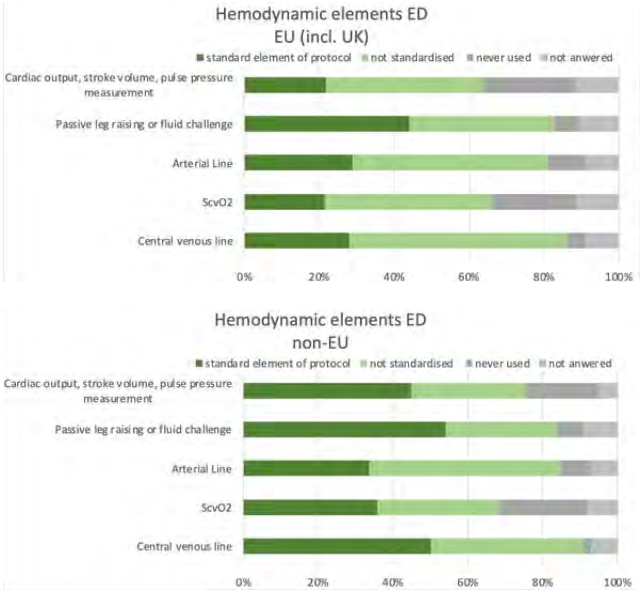

Figure 1. Hemodynamic elements performed in the emergency departments.

10AP02-08
Feasibility of quality indicators on prehospital advanced airway management in a physician staffed emergency medical service: a provider point of view

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Background and Goal of Study: Prehospital Advanced Airway Management (PAAM) requires specific and complex skills to be delivered at a high standard. In 2018 a group of international experts developed 17 quality indicators (QI) covering all steps of PAAM. The main objective of our study was to determine the feasibility of these QI from the provider point of view by means of a survey.
Materials and Methods: In 2019, we introduced the systematic collection of the data required to calculate these 17 QI in two physician staffed emergency medical services (EMS). The QI were collected in a dedicated electronic case report form (CRF).
For the survey, an online questionnaire was developed and sent to all emergency physicians who documented at least one CRF between January 1, 2019 and December 31, 2021. The feasibility assessment was based on three criteria: reliability of data collection, relevance and acceptance.
Results and Discussion: Among the 44 physicians who received the questionnaire, 41(93%) responded. The median number of CRF completed per physician during the study period was 11 (interquartile range 4-17; range 1-48). The median time to complete the CRF was seven minutes (interquartile range 3-16;range 1-25) and was considered reasonable by 95% of physicians. The reliability of data collection was rated as good or excellent for each of the 17 QIs, with the lowest rated for the following three QIs: duration of preoxygenation, duration of laryngoscopy, and occurrence of desaturation during laryngoscopy.
Overall, 75% of physicians assessed the set of QI to be relevant and thus meaningfully measure the quality of PAAM and 74% accepted the set of QI to assess the quality of PAAM. The collection of QI data was considered feasible, relevant and acceptable by the physicians. Technological solutions facilitating automatic collection of vital parameters and timings during the procedure itself could improve the reliability of data collection necessary for certain QI.
Conclusion(s): The collection of QI on PAAM appears feasible. Studies in other EMS are needed to determine the external validity of our results.
References:
Kottmann A, Kruger AJ, Sunde GA, Roislien J, Heltne JK, Carron PN, et al. Establishing quality indicators for pre-hospital advanced airway management: a modified nominal group technique consensus process. Br J Anaesth. 2022;128(2):e143-e50.

10AP03-01
Acetate attenuates brain injury by stimulating astrocyte-neuron lactate shuttle in a mouse model of ischaemic stroke

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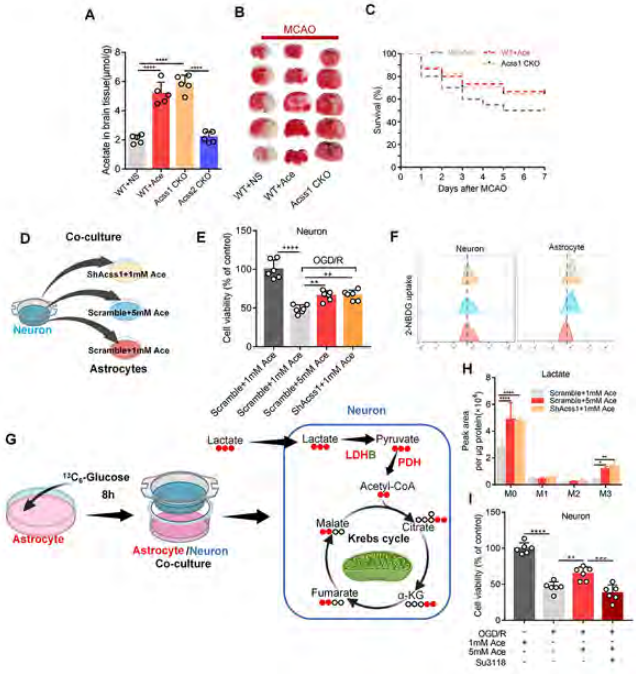
Background and Goal of Study: Ischaemic stroke remains to be a leading cause of death around the world. Acetate exerts extensive pathophysiological effects on the brain; however, whether acetate would attenuate brain injury after ischaemic stroke as well as the underlying mechanisms remain unkown.
Here, using a mouse model of middle cerebral artery occlusion (MCAO), we aimed to demonstrate that acetate stimulates astrocyte-neuron lactate shuttle (ANLS) and attenuates brain injury after MCAO.
Materials and Methods: To expose the brain to accumulated acetate, mice were undergoing a serial gavage with 2mg/g acetate for 28 days. Acss1 astrocyte conditional knockout (Acss1 CKO) mice and Acss2 CKO mice were used. An astrocyte-neuron co-culture system and oxygen glucose deprivation/reperfusion were established in vitro. Carbon 13 (^{13}C) tracing was performed to prove the acetate-dependent increase of ANLS.
Results and Discussion: An elevation of acetate was also observed in Acss1 CKO brain but not in Acss2 CKO brain(**A**). We demonstrated that acetate accumulation in brain attenuates MCAO-induced brain injury and improves survival(**B,C**). We showed an acetate accumulation-dependent increase of astrocytic glucose uptake(**D,F**), secondarily upregulating ANLS(**G,H**), which then protects neurons from OGD/R injury(**E,I**).
Our results reveal an unexpected facet to the biology of acetate, which indicate an emerging function of acetate to impact the metabolic crosstalk between astrocytes and neurons.



Conclusion(s): We concluded that acetate attenuates MCAO-induced brain injury by stimulating ANLS.

10AP03-02
The mutual influence of critical hyperglycemia and sepsis in burned patients

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Background and Goal of Study: Control of glucose values with exogenous insulin has been beneficial in the treatment of critically ill as well as in burn patients Hyperglycemia is frequent in sepsis, even in patients without diabetes or impaired as a consequence of inflammatory response and stress, so its occurrence is related to the severity of the illness. The aim of this study is to evaluate the relationship between sepsis and critical hyperglycemia in adult patients with severe burns.
Materials and Methods: This study is an observational retrospective study in the Service of Burns, University Hospital Center "Mother Teresa", Tirana, Albania (UHCT). This study observed adult burn patients (≥ 20 years old) hospitalized in the ICU of the Burn Service in UHCT for 5 consecutive years. In order to estimate any possible dependability of the critical hyperglycemia during the disease on any of the variables (Age, BMI, Glucose values on admission, BSA%, depth of burn), we performed a multivariate analysis.
Results and Discussion: Adult patients constituted 346 or 44 % of the total number. The mortality was 14.5 %. Generally, there were 90 patients diagnosed with sepsis and the prevalence of sepsis in adult burn patients for our service is 26%.From the multivariate analysis, we noticed that for every increase of age by one year is increased with 1 % the possibility for critical hyperglycemia. For every increase of BMI by 1 unit are increased with 3 % the possibility of critical hyperglycemia. For every increase of Glucose values on admission with 1mg/dL above the normal range are increased with 1 % the possibility for critical hyperglycemia is. Persons with sepsis have 3,3 times more likely possibilities for critical hyperglycemia than persons without sepsis.
Conclusion(s): The prevalence of critical hyperglycemia in the burned adult population in our center is estimated to be 15.6% on admission and 7% during the disease. 58.3% of patients in the critical hyperglycemia group were diagnosed with sepsis and on the other side patients with sepsis have three times the possibility of hyperglycemia. Our modest opinion is to support the conventional glucose control protocol but with attention to detecting those patients who can profit from tight glycemic control.

10AP03-05
Prediction of fatal outcomes in German general aviation accidents - a new scoring system to facilitate emergency control centres

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Background and Goal of Study: Numerous accidents occur with General Aviation aircrafts every year. To date, pre-emptive prediction of survival or death is impossible. The current study aims to identify significant factors elementary to predict survival after General Aviation aircraft accidents. The Implementation of a scoring system, including these factors, may facilitate emergency control centres.
Materials and Methods: Data of flight accidents over a 20-year period (extracted from the German Federal Bureau of Aircraft Accident Investigation [BFU]) was analysed for fixed-wing motorized small aircrafts below 5,700 kg MTOW. Factors of interest were analysed using Chi^2- and Mann-Whitney-U-Tests. Logistic regression was used to establish a score to calculate the probability of a fatal outcome after an aircraft accident.
Results and Discussion: The BFU lists 1,595 aircraft accidents between 2000 and 2019. The factors "third quarter of the year" ($p=0.04$), "last quarter of the year" ($p=0.002$), "fire" ($p<0.0001$), "distance from airport >10 km" ($p<0.0001$), "landing" ($p<0.0001$) and "cruise" ($p<0.0001$), significantly correlated positively or negatively with a fatal outcome.
"Take-off", "approach", "month", "day of the week", "persons on board above three", "night-time" and "icing conditions" showed no significant correlation. Using logistic regression "third quarter of the year" and "cruise" were excluded when using the B-STEP method. Including the four significant parameters, the score showed a strong effect with $f^2=0.709$.
Conclusions: The analysis of General Aviation aircraft accidents in Germany enabled the identification of relevant factors and establishment of a new scoring system for survival prediction after small aircrafts accidents below 5700 kg MTOW. The implementation of the scoring system in emergency control centres in the context of digital development and artificial intelligence can improve emergency response planning and distribution.

10AP03-06
Acute kidney injury after spinal surgery

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Perioperative acute kidney injury (AKI) is common and increases the risk of morbidity and mortality. The incidence the perioperative AKI in spine surgery (SS) in the latest studies is around 3.9%.
Identify the incidence of AKI perioperative in SS and identify which are the perioperative risk factors for AKI and if the appearance of other postoperative complications was associated with development of AKI.
Methods: Retrospective Observational Study in a tertiary referral centre from to 2019 to 2020 .A total of 501 patients underwent SS were included. We performed the measurement of common variables like mayor spinal surgery (MSS) defined as surgical procedures on three or more intervertebral levels, procedures in which osteotomy is performed, resection of metastasis or primary tumor; level of American Society of Anesthesiologists (ASA), the preoperative hemoglobin level, pre-existing chronic renal failure, dyselectrolytemia and critical bleeding.
We analysed plasma creatinine (Screa) and glomerular filtration (GF) baseline and AKI defined like absolute increase in levels (Screa) greater than 0.3mg/dl or increase greater than 50% of the baseline or decrease in urinary output (<0.5ml/kg/h) for more than 6h. We performed for continuous variable the Student's test and for categorical variables, the chi-squate.
Results: Of the series of total cases (n 501), (AKI) appeared in 3.39%, 64.7% were men and 35% were women, 76% were scheduled surgery and 23% were emergency surgery, 35% were MSS and 47% had a hospital stay longer.
A statistically significant association between AKI and the SS of more than three levels P(0.048), ASA III P(0.009), preoperative hemoglobin level P(0.003), dyselectrolytemia P(<0.001), critical bleeding P(0.044), and also developed AKI patients with prolonged hospital admission P(<0.001), postoperative anemia P(0.001), and readmission to critical care unit P (0.002).
Although mortality appeared in 5,8%, was not statistically significant association.AKI was not associated with a higher preoperative creatinine, diabetes, hypertension or cardiovascular disease.
Conclusion(s): In our study the incidence of perioperative AKI in patients underwent SS was 3.39%, ASA III patients, SS of more than 3 Levels, dyselectrolaemia and critical bleeding may be at increased risk, the appearance of other postoperative complications with increased morbidity has been associated with development of AKI.

10AP03-08
Leadership in operating room emergencies – searching for the captain?!

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Background and Goals: The operating room (OR) is a dynamic environment requiring a heterogeneous group of professionals to work together in high-stress situations. Teamwork is fundamental, with all members required to understand the other discipline's importance and contribution. Effective leadership is vital when dealing with OR emergencies, and lack thereof is associated with poor patient outcomes.
We wished to examine interprofessional leadership In the OR by describing how medical disciplines perceive team leader roles during different intraoperative crisis events.
Methods: Cross-sectional survey of health-care workers in the OR of a single large tertiary medical center. An online questionnaire was used to assess perceived leadership roles and responsibilities during crisis management. The survey was sent to all general surgeons (GS), anesthesiologists (AS), and OR nursing staff (ORN) at a single tertiary medical center. The questionnaire covered multiple key OR emergency events.
Results and Discussion: Between 10.2020-12.2021 a total of 143 responses were collected, 6 were excluded as they were incomplete. There was no difference in age or experience between groups. There was a similar number of female professionals in the GS, AS groups but a higher percentage of female professionals in the ORN group.
More than 95% of the participants answered that they had previously participated in the treatment of a medical emergency in the OR. When assessing specific scenarios, there was a wide consensus that malignant hyperthermia, transfusion reactions, and fire in the airway should all be managed by the anesthesiologist.
However, significant inconsistencies were seen between the disciplines for multiple key scenarios. In case of active intraoperative bleeding, the GS and ORN groups reported that the surgeon should function as team leader (93.8%, 61.2%) compared to only 12.3% of the AS group.
For Resuscitation events, 95.9% of AS believed they should lead compared to only 75% of GS (p=0.009). Additionally, there was profound disagreement between all disciplines regarding the identity of the leader in cases of a fire not involving the airway (p<0.001).
Conclusions: We found a lack of consensus within multidisciplinary OR teams concerning the identity of the team leader in many life-threatening emergencies. Bridging these gaps is crucial for effective teamwork and should affect the way we simulate and train medical personnel.

10AP03-09
Toxicology on intensive care: presentation, epidemiology and outcomes

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Background and Goal of Study: Toxicology forms a significant part of the workload of the intensive care units in the UK. However, there is a lack of an up-to-date understanding of self-poisonings requiring critical care. We reviewed the epidemiology and outcome of patients with self-poisoning admitted to the intensive care unit (ICU) at a tertiary teaching hospital in Scotland.
Materials and Methods: All patients admitted to ICU in the period 2015-2021 were reviewed to identify those with a diagnosis of drug overdose or self-poisoning. The records of these patients (n=398) were analysed to obtain details about their presentation, epidemiology and outcome.
Results and Discussion: Median age was 41 years. The male:female ratio was 1.55:1. The substances most commonly involved were: alcohol, opioids, tricyclic antidepressants, benzodiazepines, recreational drugs and paracetamol. The majority of patients (86%) required ventilatory support and 8% received renal replacement therapy. Median length of stay in intensive care was 1.5 days. Thirty patients (7.5%) died in hospital. High mortality was particularly associated with opioid and benzodiazepine toxicity.
Conclusion(s): The patterns of toxicological presentation change over time. Therefore, periodic analysis is required to ensure there is a contemporaneous understanding of the nature of toxicological presentations to intensive care. Our retrospective review demonstrates that toxicology constitutes a significant part of the workload of a general intensive care. Sedative toxidromes are not only common, but have an association with high mortality.

Respiration and Airway Management

11AP01-01
A new score using clinical and ultrasound parameters could predict difficult laryngoscopy

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Background and Goal of Study: The objective of this study was to identify if difficult laryngoscopy (DL) can be predicted by exploring the upper airway using ultrasonography.
Materials and Methods: This prospective, single-center observational study included 102 adult patients requiring general anesthesia for elective surgery at University Hospital of Basurto. Preoperatively, we performed body mass index, cervical circumference, upper lip bite test, sternomental distance, Mallampati-Samsoon grade and the Arné risk index clinical airway assessment and distance betweem hyoid bone, thyrohioid membrane, thyroid cartilage and epiglotis-skin ultrasound measurements.
All patients underwent general anaesthesia with tracheal intubation and direct laryngoscopy. The Cormack-Lehane classification was established to define the difficulty of direct laryngoscopy. We dichotomized laryngoscopy into easy (C-L grade I and II) and difficult (C-L grade III and IV).
Results and Discussion: We found correlation for cervical circumference and gender (p=0.0024) with DL (p=0.0013); also for ultrasonography distances and DL: thyrohyoid membrane-skin ≥1.60cm (p=0.0018); thyroid cartilage-skin ≥0.78cm (p=0.0272); epiglottis-skin ≥2.10cm (p=0.0012).We created a risk score for DL: distance thyrohyoid membrane-skin ≥1.60cm (2 point), thyroid cartilage-skin ≥0.78cm (3 points) and gender (2 points for male). The score could vary from 0 to 7 points;≥5 the risk of DL is 34 times higher (p=0.0010)(1).
Conclusion(s): Ultrasound distance between different laryngeal structures and the skin, are useful tools to predict DL.
Reference:
1. Sotoodehnia M, et al. Ultrasonography indicators for predicting difficult intubation: a systematic review and meta-analysis. BMC Emerg Med. 2021 Dec 1;21(1).

VARIABLES	OR (IC 95%)	p	Beta	WEIGHT
DISTANCE THYROHIOID MEMBRANE TO SKIN				
< 1.60 cm	Ref.			0
≥ 1.60 cm	5.35 (1.29 – 22.16)	0.0208	1.6769	2
DISTANCE THYROID CARTILAGE TO SKIN				
< 0.78 cm	Ref.			0
≥ 0.78 cm	8.94 (1.02 – 78.23)	0.0477	2.1910	3
GENDER				
Female	Ref.			0
Male	4.84 (1.08 – 21.65)	0.0390	1.5775	2
AUC	0.855			
Hosmer y Lemeshow, P	0.575			
Score range				0 – 7

11AP01-02
A randomized controlled study on the success rate of laryngeal mask airway insertion using tongue depressor and stylet

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Background and Goal of Study: LMAs are increasing in use because of their convenience. The conventional technique using the index finger is known to have a success rate of about 80%. Disadvantages of this method are, it may not enter in the desired direction, the cuff may overlap, or the epiglottis may be bent. To compensate for this drawback, it was assumed that if a curved stainless tongue depressor similar to a laryngoscope blade that can lift the chin and tongue, and a stylet to pass easily through the palatine curve of the oral cavity are used together, the success rate of insertion would be increased and the LMAs would be in more optimal position. Therefore, this study was designed.
Materials and Methods: In this prospective, randomized controlled study, 168 patients undergoing general anesthesia who are eligible for the laryngeal mask insertions were enrolled. The patients were allocated to two groups with 1:1 ratio: when the laryngeal mask was inserted, the control group was inserted by conventional method and the treatment group was inserted using a tongue depressor and a stylet.
The primary outcome was the first-attempt success rate of insertion. The secondary outcomes were the overall success rate, insertion time, hemodynamic changes before and after insertion, oropharyngeal leak pressure, fiberoptic grade, and postoperative airway complications.
Results and Discussion: There was no significant difference in patient characteristics between the two groups. There was no significant difference in patient characteristics between the two groups. The first-attempt success rate (control group 85.2% vs. treatment group 95.1%; p=0.035) and overall success rate (control group 90.1% vs. treatment group 100%; p=0.004) were significantly higher in the treatment group. LMA was located in more optimal position in the treatment group. The oropharyngeal leakage pressure, vital signs, and insertion time did not show a significant difference between the two groups. There were no differences between the two groups in postoperative complications such as sore throat, blood stains, dysphagia, and dysphonia.
Conclusion(s): LMA insertion using a tongue depressor and a stylet increased the first-attempt success rate and overall success rate. It also enabled more optimal LMA position without increase complications. It is thought that it would be more effective for successful LMA insertion and could help patient safety during LMA insertion.

11AP01-03
Nasendoscopy to predict difficult videolaryngoscopic intubation: a multivariable model development study

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Background and Goal of Study: Transnasal videoendoscopy (TVE) is standard of care for staging of pharyngolaryngeal lesions. However, it is unknown if difficult videolaryngoscopic intubation can be predicted by TVE.[1]
This study aims to determine if TVE can be used supplementary to the Simplified Airway Risk Index (SARI) in patients with anticipated difficult airway management scheduled for videolaryngoscopy.
Materials and Methods: 374 anaesthetics in 320 adults with expected difficult airway management were included in this prospective observational study. Preoperative TVE was performed in 252 cases. The primary outcome was whether the anaesthetist issued a difficult airway alert after Macintosh videolaryngoscopy. SARI, clinical factors and TVE findings were used to fit three multivariable mixed logistic regression models.
Eligible covariables were selected by least absolute shrinkage and selection operator (LASSO) regression. Model performance was assessed by likelihood ratio tests (LRT) and Akaike information criterion (AICc).
Results and Discussion: SARI was a predictor for the primary outcome (odds ratio [OR] 1.33, 95% confidence interval [CI] 1.13 to 1.58). AICc for SARI (327.1) improved when TVE parameters were added (311.0) and LRT for SARI plus TVE parameters was better than for SARI plus clinical factors ($P < 0.001$). Vestibular fold lesions (OR 1.82; 95% CI 0.40 to 8.29), epiglottic lesions (OR 3.37; 95% CI 0.73 to 15.54), pharyngeal secretion retention (OR 3.01; 95% CI 1.05 to 8.63), view restrictions on the rima glottidis < 50% (OR 2.13; 95% CI 0.51 to 8.89) and ≥ 50% (OR 2.52; 95% CI 0.44 to 14.56) were concerning.

Characteristics	SARI	SARI with clinical factors	SARI with TVE
	OR (95% CI)	OR (95% CI)	OR (95% CI)
SARI			
SARI [0-12]	1.33 (1.13-1.58)	1.38 (1.15-1.65)	1.37 (1.08-1.76)
Clinical factors			
Age [years]	-	1.02 (0.99-1.04)	-
Height [cm]	-	1.01 (0.97-1.05)	-
Dysphagia	-	2.42 (1.08-5.41)	-
Whispering or aphonia	-	5.60 (1.22-25.74)	-
Dry cough	-	0.54 (0.20-1.47)	-
TVE findings			
Pharyngeal secretion retention	-	-	3.01 (1.05-8.63)
Lesions			
Vocal cords	-	-	0.11 (0.01-1.82)
Vestibular folds	-	-	1.82 (0.40-8.29)
Epiglottis	-	-	3.37 (0.73-15.54)
View restriction on rima glottidis			
Relevant, < 50% of glottis area	-	-	2.13 (0.51-8.89)
Covers ≥ 50% of glottis area	-	-	2.52 (0.44-14.56)
Multiple unilateral lesions	-	-	0.92 (0.19-4.38)
AICc	327.1	323.2	311.0
Likelihood ratio test (compared with SARI)	-	$P = 0.013$	$P < 0.001$
Likelihood ratio test (compared with SARI with TVE model)	$P < 0.001$	$P < 0.001$	-

Table. Multivariable mixed effects logistic regression models

Conclusions: SARI predicted difficult videolaryngoscopic intubation. TVE improved the prediction of difficult videolaryngoscopy in addition to the SARI and was superior to a simple symptom screening for pharyngolaryngeal lesions.
Reference:
1. Barclay-Steuart A, Großhennig HL, Sasu PB et al. Transnasal videoendoscopy for preoperative airway risk stratification - development and validation of a multivariable risk prediction model. Anesth Analg 2023.

11AP01-04
A prospective cohort study of awake videolaryngoscopy intubation in patients with anticipated difficult airway at a tertiary center

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Background and Goal of Study: Awake fiberoptic intubation is the gold standard for management of anticipated difficult tracheal intubation. However, videolaryngoscopes are being used more commonly. We performed a prospective cohort study of awake videolaryngoscopy intubations in patients with anticipated difficult airway at a tertiary university hospital to assess current practice and complications.
Materials and Methods: In this prospective, observational, study, data from all awake videolaryngoscopy intubations performed during a period of 10 months in the operating room were collected. Data included: patient demographics, technical performance, videolaryngoscopy used (C-MAC® with D-Blade versus Airtraq®), success rate, number of intubation attempts, tracheal intubation conditions (Cormack-Lehane laryngoscope glottic view, operator-reported difficulty, patients' discomfort), and the incidence of complications.

	Total 104 patients	Videolaryngoscope C-MAC 85 patients (81,7%)	Videolaryngoscope Airtraq 19 patients (18,3%)	*P*
How many operators				
1	31(29,8)	23(27,1)	8(42,1)	0,123
2	43(41,3)	34(40,0)	9(47,4)	
≥ 3	30(28,8)	28(32,9)	2(10,5)	
Modified Cormack-Lehane scale	45(43,3)	40(47,1)	5(26,3)	0,087
Grade 1	37(35,6)	25(29,4)	12(63,2)	
Grade 2a	15(14,4)	14(16,5)	1(5,3)	
Grade 2b	5(4,8)	4(4,7)	1(5,3)	
Grade 3	2(1,9)	2(2,4)	0(0)	
Grade 4				
Grade of difficulty				
No difficulty	46(44,2)	(45,9)	7(36,8)	0,489
Mild difficulty	37(35,6)	27(31,8)	10(52,6)	
Moderate difficulty	11(10,6)	10(11,8)	1(5,3)	
Severe difficulty	10(9,6)	9(10,6)	1(5,3)	
Easy of procedure (VAS, 0-10) 10 = severe difficulty	2,00(4)	2,00(5)	2,00(3)	0,258
Patient discomfort (VAS, 0-10) 10 = bad tolerance	1,5(3)	2,00(3)	1,00(3)	0,299
Success rate	97(93,3)	80(94,1)	17(89,5)	0,609

Table.

Results and Discussion: A total of 104 patients were included. The videolaryngoscopes used were the C-MAC® (82%) and the Airtraq® (18%). Only five awake videolaryngoscopy intubations were performed with no sedation. The most common sedative technique was combined midazolam and fentanyl (95%). Most operators (92%) had performed videolaryngoscopy intubation more than 20 times previously. First-attempt intubation rate was 69% and overall success rate was 93.3%.
Most frequent complications were secretions (22%), impossibility (6.7%), desaturation (5.7%), over-sedation (3.4%) and need more of 3 attempts (3.4%). Characteristics of the intubations performed with the Airtraq and C-MAC videolaryngoscopes are described and compared in table 1. No significant differences were found between the two videolaryngoscopes.
Conclusion(s): Awake videolaryngoscopy intubations are safe procedures with high success rate in patients with anticipated difficult airway. No differences were found in success rate, grade of difficulty, patient disconfort or complications between the Airtraq and C-MAC videolaryngoscopes.

11AP01-05
Reusable versus disposable laryngeal masks: a life cycle environmental impact analysis

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Background and Goal of Study: The latest decades we have seen an increased use in disposable laryngeal masks, but little is known about the environmental impact of this change. The main objective of the present study was to analyze the environmental impacts of reusable and single use laryngeal masks (LM), using a life cycle analysis.
Materials and Methods: We compared the reusable Ambu®Aura40 (Aura40) with the disposable Ambu®AuraStraight (AuraStraight) and Intersurgical®Igel (Igel) using a Life Cycle Assessment. Input data was collected at Helsingborg Hospital, Sweden, from the producers of LMs and in the Ecoinvent® database v3.6.
We assessed the environmental impacts with ReCiPe 2016 in Simapro® assuming that the Aura40 was reused 40 times. Uncertainty analyses were performed with Monte Carlo simulations. Results are expressed as median and 2.5th to 97.5th percentiles for one use of respective LM.
Results and Discussion: Compared to the Aura40**,** the disposable AuraStraight had a 256% larger impact on climate (Δ277 gCO2eq [276-278]) and a 547% larger impact on resources (Δ44.3 mUSD2013 [44.2-44.4]). Compared to Aura40, the Igel had a 647% larger impact on climate (Δ699 gCO2eq [695-707]) and a 1091% larger impact on resources (Δ88.4 mUSD2013 [87.3-89.3]). The damages to human health and ecosystems of the Aura40 were uncertain and did not differ compared to any of the disposable LMs.
Compared to AuraStraight, the Igel had a 110% larger climate impact (Δ426 gCO2eq [421-433]), a 49% larger impact on human health (Δ0.43 μDALY [0.42-0.45]), a 84% larger impact on resources (Δ43.9 mUSD2013 [43.0-45.1]) and a 71% larger impact on ecosystem (Δ1.24x10^{-9} species.year [1.19x10^{-9}-1.31x10^{-9}]).
Sensitivity analyses revealed that if a fossil-heavy electricity mix is used, such as the mixes in US or Germany, the climate impact of Aura40 is similar to that of the disposable LMs.

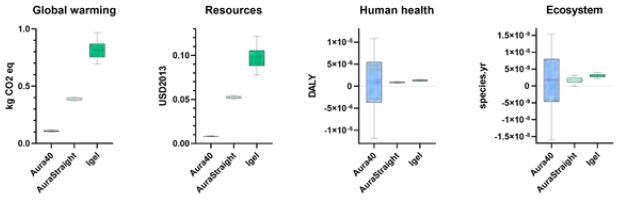

Figure 1. The environmental impacts of the Aura40, the AuraStraight and the Igel.

Conclusion(s): In a Swedish setting, the reusable Aura40 had the smallest impact on climate and resources and offer an opportunity to reduce the environmental impact of anaesthesia. Of the disposable LMs, the AuraStraight had the lowest environmental impact.

11AP01-06
Old but (not always) gold. Can videolaryngoscopy overcome copur score?

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Background and Goal of Study: 30% of anaesthesia-related accidents are caused by difficult airway management and 70% of these accidents result in permanent brain damage or even death. Nowadays, videolaryngoscopy is considered the main technique to facilitate tracheal intubation and reduce its complications as pulmonary inhalation of gastric material.
In the operating block of E. Profili Hospital in Fabriano videolaryingoscopy has been the routine practice for pediatric patients since November 2021.
Therefore, goals of the study were:
1. Evaluating the routine use of videolaryngoscopy in reducing clinical risk as pulmonary inhalation of gastric material and consequent inhalation pneumonia.
2. Predicting unexpected difficulties during tracheal intubation in the pediatric surgical setting.
3. Comparing Fremantle Videolaryngoscope Scoring System and Colorado Pediatric Airway Score, a predictive score of difficult intubation in children.
Materials and Methods: Preliminary prospective observational study of 120 pediatric patients (aged from 3 to 16 years of age; 53 female and 67 male) undergoing surgery, assessed through the previously mentioned scores and classifications.
Results and Discussion: First attempt tracheal intubation achieved in 95% of children, without using any additional device.
No intubation was impossible, regardless of the difficulties predicted by the Colorado Pediatric Airway Score and the videolaryngoscopic view obtained.
All difficult tracheal intubations not predicted by parameters and scores (3,33% in our case series) were successfully performed.
Conclusion(s): Based on our data we can conclude that routinary use of videolaryngoscopy:
• has reduced the time spent in the operating room and the use of additional devices for managing difficult airways;

• has completely decreased clinical risk of difficult intubations in pediatric patients, eliminating the impossible ones;
• has eliminated the risk of pulmonary inhalation regardless of the videolaryngoscopic vision;
• has made possible overcoming the limits of the Colorado Pediatric Airway Score, a score predicting difficult intubation in children, allowing us to manage easily any unexpected difficult airway.
Further studies are needed to endorse the hypothesis of abandoning scores and parameters predicting difficult intubation with huge benefits in terms of time spent on surgical patient preoperative evaluation.

11AP01-07
How to rescue failed Macintosh videolaryngoscopy - conversion to hyperangulated videolaryngoscopy or direct epiglottis lifting? A prospective observational non-inferiority study

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Background and Goal of Study: Hyperangulated videolaryngoscopy (HA-VL) and direct epiglottis lifting (DEL) with the Macintosh blade are considered rescue techniques for failed Macintosh videolaryngoscopy (MAC-VL). The primary hypothesis of the study was that the improvement of the percentage of glottis opening (POGO) achieved by DEL is non-inferior to conversion to HA-VL in cases of failed MAC-VL.
Materials and Methods: Within 374 anesthetics in 320 adults with expected difficult airway management we identified 129 cases with failed MAC-VL in this prospective observational study[1] in whom rescue maneuvers such as DEL, HA-VL and direct lifting with HA-VL (DEL-HA) were applied. Stored videos were reviewed by at least 3 independent observers who agreed on a consensus vote.
The POGO and glottic view with videolaryngoscopy (6 grades defined by Petzoldt[1]) were assessed for all applied rescue maneuvers. A linear mixed and a linear model were fitted. Estimated marginal means were used to analyze differences between rescue techniques for POGO and glottic view.
Results and Discussion: 163 rescue techniques (77 DEL, 57 HA-VL, 29 DEL-HA) were applied exclusively or sequentially. HA-VL improved POGO (mean; 95%-CI) by +43.7% (34.1-53.3; $p<0.0001$) and glottic view by +1.9 grades (1.6-2.2; $p<0.0001$), while DEL improved POGO by +49.7% (41.4-58.0; $p<0.0001$) and glottic view by +2.2 grades (1.9-2.5; $p<0.0001$).
With a difference of 6.0% (95%-CI -6.5-18.5%) and a lower bound of the CI above the non-inferiority margin (-10% for POGO) non-inferiority of DEL was confirmed. DEL-HA improved POGO by +75.1% (61.6-88.6; $p<0.0001$) and glottic view by +3 grades (2.6-3.5; $p<0.0001$).
Conclusion: Conversion to HA-VL or DEL substantially improved glottic view if MAC-VL failed. Our data show that if MAC-VL fails, lifting the epiglottis directly with the Macintosh blade within the same attempt is non-inferior to HA-VL. Our data show a synergistic effect between HA-VL and DEL.

Reference:
1. E. K. Kohse, H. K. Siebert, P.B. Sasu et al. A model to predict difficult airway alerts after videolaryngoscopy in adults with anticipated difficult airways - the VIDIAC score. *Anaesthesia.* 2022;77(10):1089-1096.

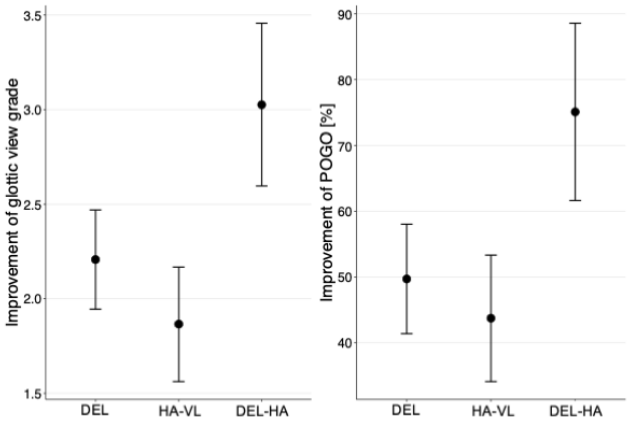

Figure. Estimated marginal means (95%-CI) for improvement in POGO and glottic view grade (1: vocal cords completely visible, 2a: part of the cords visible, 2b: posterior cords only just visible, 2c: arytenoids but not cords visible, 3: epiglottis but no glottis visible, 4: laryngeal structures not visible) for applied rescue maneuvers.

11AP01-08
Training requirements in point of care ultrasonography of the upper airway: a feasibility study

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Background and Goal of Study: Point-of-care ultrasonography of the upper airway can be a useful supplement to conventional pre-anesthetic clinical evaluations. However, the reliability of such examinations is highly operator-dependent and proper training in sono-anatomy and ultrasound operational skills is required. The objective of this study aims to assess the minimum training requirements for applying a predefined upper airway scanning protocol in healthy volunteers by anesthesia trainees.
Materials and Methods: Twenty-two healthy volunteer members of the Operating Room staff participated in the study. A predefined scanning protocol that included the identification of specific structures (hyoid bone, vocal cords, thyrohyoid membrane/epiglottis/pre-epiglottic space, cricothyroid membrane, and thyroid gland), as well as the performance of specific measurements (distance from the hyoid bone to skin, anterior commissure to skin, epiglottis to skin, and thyroid isthmus to skin) was taught in a single-day training course. The trainees' competence was assessed after multiple scanning repetitions. Mixed effects regression models were applied for the trainee-instructor differences in all ultrasound measurements.
Results and Discussion: Cricothyroid membrane visualization had the lowest success rate (88%), followed by thyrohyoid membrane/epiglottis/pre-epiglottic space (91%) and hyoid bone visualization

(96%). Visualization of both superficial structures (vocal cords and thyroid gland) had 100% success rate. Trainee-instructor differences were statistically significant for hyoid bone to skin ($p<0.001$) and for epiglottis to skin distances ($p=0.016$). Measurement of the distance from the epiglottis to the skin required more scanning repetitions to achieve minimum deviance from the instructor compared to other measurements. However, trainees were able to achieve minimum deviance for all four measurements in ten or less scanning repetitions.

Conclusion(s): At least 10 scanning repetitions of a pre-defined upper airway scanning protocol can be used as a minimum standard for training. Identification and interpretation of deeper structures was more challenging. However, further research regarding education in upper airway ultrasound is warranted.

11AP01-09
Use of SuperNO2VA™ for gastrointestinal endoscopy under sedation in patients at risk of hypoxaemia

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Background: Most of gastrointestinal endoscopic (GE) procedures are performed under sedation being hypoventilation and hypoxaemia very common (20-50%). Risk factors for hypoxaemia include high ASA physical status, obstructive sleep apnoea (OSA), obesity and prolonged procedural duration. SuperNO2VA™ device (Vyaire Medical, Mettawa,USA) is a nasal mask that delivers a high fraction of inhaled oxygen and allows continuous positive pressure.
We aim to assess the incidence of respiratory events on patients at risk of hypoxaemia undergoing GI endoscopy under sedation with SuperNO2VA™ respiratory support.
Methods: Retrospective cohort study of patients having GE procedures under deep sedation with propofol and remifentanil target-controlled infusion during 2022. We included patients at risk of hypoxemia defined as ASA 3 or 4 with at least one of the following criteria: difficult ventilation criteria, longer and more invasive procedures, and respiratory insufficiency in whom a SuperNO_2VA™ nasal mask was used during the procedure.
The aims of the study were the incidence of hypoxaemia (SpO_2 <92%) and the need for rescue manoeuvres to improve ventilation (opening airway and manual ventilation). We also performed a subanalysis of high-risk patients with body mass index >45kg/m² and severe OSA or those under domiciliary oxygen therapy.

	Age, y.o	Male/ female	BMI, kg/m2	OSA	Difficult mask ventilation	SpO2 basal, %	Procedure duration, min	Lowest SpO2 during procedure,%	SpO_2 ≤92% n	Need of opening airway	Need of manual ventilation
Risk patients (n=32)	63 ±14	21(66%)/ 11(34%)	34 ±10	13 (41%)	28 (88%)	96±4	35±25	98±3	1 (3%)	3 (9%)	1 (3%)
High-risk patients (n=13)	63 ±14	6(46%)/ 7(54%)	44 ±14	11 (85%)	11 (85%)	93±4	34±30	97±3	0	0	1 (8%)

Table 1. Clinical characteristics of patients. Data expressed as mean±SD and n(%).

Results: 45 patients were included. Basal Oxygen saturation was 95±4%. Only 1 patient, suffered hypoxaemia (SpO2<92%); and 4 patients needed airway rescue manouvres. The mean lowest saturation during the procedure was 98±3%. In any case the procedure was interrupted. 13 patients were at high risk *(Table 1)*. 1 risk patient suffered hypoxaemia and needed both rescue manouvres. 3 patients at risk and 1 high risk patient needed rescue manouvres. No high-risk patients had hypoxemia events.
Conclusions: In patients at risk of hypoxemia, the use of SuperNO_2VA during GE procedures under deep sedation, is associated with a very low incidence of respiratory events. SuperNO_2VA is an easy-to-use and portable device that might be considered to improve safety in patients at risk of hypoxaemia undergoing gastrointestinal endoscopy under sedation.

11AP01-10
An analysis of the impact of the COVID-19 pandemic on advanced airway device usage and cost

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Background and Goal of Study: Over 62 days at our institution in 2019, 1100 adults had general anaesthesia (GA; 17.7 cases/day) and 38 advanced airway devices were used (extrapolated to 224 devices/year; cost £7712).1 Guidance on airway management for patients with Coronavirus Disease 2019 (COVID-19) suggested that a videolaryngoscope (VL) should be used as the primary device for the tracheal intubation of patients with COVID-19. This may have had an impact on airway management.
Aim: To identify changes in the usage of devices designed for the management of difficult airways.
Materials and Methods: A prospective evaluation of the usage of all devices available for the management of difficult airways in adults was performed in all the theatre suites of Stoke Mandeville Hospital (SMH), Aylesbury, England over two months (18/11/18 to 17/01/19).1 The service was re-evaluated at SMH from 17/08/21-27/11/21. The methodology has been described previously.[1]
The numbers of each device available were counted at the start of the audit and monthly thereafter. Device usage was calculated by subtracting the number of each device available at the end of each evaluation period from the number of devices available at the start of the audit (taking into account any additional devices delivered during the audit).
The cost of each airway device was obtained from the most recent invoices from the supplier of each device at the end of each service evaluation. The unit cost of each device was calculated by dividing the total cost of the invoice by the number of devices supplied (i.e. replacement cost).
For contextualization, the number of adult patients (aged above 16 years) receiving GA during the study period were obtained.
Results and Discussion: A total of 1309 adults patients had GA over 102 days in 2021 (12.8 cases/day) and 343 advanced airway devices were used (extrapolated to 1228 devices/year; cost £10,410). This was driven by a large increase in the use of videolaryngoscopy.

Conclusion(s): Our institution's change in practice may reflect a fundamental shift in airway management paradigms driven by guidelines for airway management in patients with COVID-19. This has implications for anaesthetists' training and the cost of airway management.

Reference:

1. Rahman M, Koli P, Cottrell A, Reeves J, Ali T, Rajendram R. Devices designed for the management of difficult airways: a prospective evaluation of device usage and cost. Anaesthesia 2020;75(Supplement 2):52

11AP01-11
Effect of pneumoperitoneum and laparoscopy on lung EIT-derived overinflation and collapse in morbidly obese patients

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Background and Goal of Study: Obesity can increase the risk of atelectasis during general anesthesia, especially in laparoscopic surgery [1].
PEEP can counteract the tendency of dorsal lung to collapse, but it needs to be personalized to minimize both the risks of overinflation (OI) and collapse (CO). Electrical Impedance Tomography (EIT) can be used to personalize PEEP, but the effect of the surgical phase on the best PEEP provided by EIT has not been explored yet.
Materials and Methods: We enrolled obese (BMI ≥ 30) patients undergoing planned laparoscopic surgery. A 16-electrodes EIT monitoring (Dräger PulmoVista 500, Dräger AG) was used to evaluate the amount of CO and OI during a PEEP titration trial (PEEP 16 cmH_2O - PEEP 6 cmH_2O; steps of 2 cmH_2O). The best PEEP was defined as the crossing point between CO/OI [2].
The assessment was done after anesthesia induction (BP_{ind}), during pneumoperitoneum (BP_{pn}) and before extubation (BP_{ext}).
Results and Discussion: We enrolled 15 patients, aged 58±16 years with a BMI of 36±5 kg/cm^2. The overall duration of anesthesia was 216±91 minutes and the duration of the laparoscopic time 116±45 minutes. The median [IQR] values of CO and OI after induction (A), pneumoperitoneum (B) and before extubation (C) are reported in Figure1.

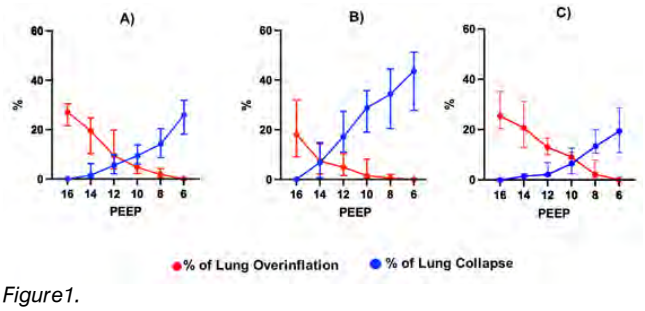

Figure1.

We found a significant difference between BP_{ind} (10 [9-15] cmH_2O) and BP_{pn} (14 [11-16] cmH_2O, p=0.004) while no difference was found between BP_{ind} and BP_{ext} (10 [8-14] cmH_2O, p=0.17).
Pneumoperitoneum reduced the OI at the highest levels of PEEP (p=0.31) and increased significantly CO at the lowest PEEP (p=0.016).
Conclusion(s): In obese patients undergoing laparoscopy, the PEEP able to minimize CO and OI changes dynamically during surgery, with higher levels during the laparoscopic phase. A continuous monitoring is needed to provide the best PEEP levels according to the surgical step.

References:

1. Eichenberger A-S et al. Morbid Obesity and Postoperative Pulmonary Atelectasis: An Underestimated Problem. Anest & Analg 2002;95:1788–92.
2. Costa ELV et al. Bedside estimation of recruitable alveolar collapse and hyperdistension by electrical impedance tomography. Intens Car Med 2009;35:1132–7.

11AP02-01
Successful epiglottic cystectomy with anesthesiologists supports using video laryngoscopy

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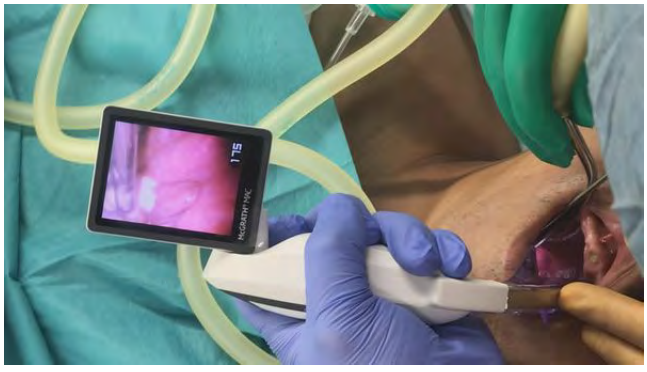
Background: Epiglottic cysts (EC) are dangerous because they can cause airway obstruction, unexpected difficulties with mask ventilation and intubation, and asphyxia. We present a case of EC-resection under video laryngoscopic assistance after safe awake intubation.
Case report: The case patient was a 44-year-old man with lung cancer. We planned the lobectomy; however, we reviewed the upper gastrointestinal endoscopy results, which revealed the EC in the preoperative evaluation and noted the possibility of difficult intubation. After examination and discussion with the surgical team, we decided to remove the EC before the lobectomy.
The EC descended from the left vestibular fold and blocked the glottis, which inferred the oral intubation. Additionally, the patient had a small jaw and a positive Upper Lip Bite Test, which implied the more difficult intubation. Therefore, we performed fiberscope-guided nasal intubation under light sedation and local anesthesia and then induced general anesthesia.



Before starting the cystectomy, we inserted the video laryngoscope (McGRATH(r)) to check the intubation tube, which allowed us to observe the EC and to have a larger working space to perform cystectomy compared with the original plan of microscopic surgery. Therefore, the otolaryngologist completed the cystectomy under

McGRATH's view with the anesthesiologist's support. There was no postoperative cyst recurrence, and the patient underwent scheduled lung cancer surgery with easy intubation of a double-lumen tube two months later.

Discussion: Some reports showed the efficiency of the video laryngoscope for difficult intubation under the existence of EC (1,2); however, there are few reports that video laryngoscopy had been helpful in EC cystectomy.

We confirmed the usefulness of video laryngoscopy and the perioperative contribution to operative safety by the anesthesiologist's decisions.

References:

1. Min Lee S, et al. J Int Med Res. 2019;47:3416-3420.
2. Sugita T, et al. Anesth Prog. 2018;65:204-205.

Learning Point: Anesthesiologists have the potential to contribute to far more effective works by utilizing tools and tactfully participating in surgery.

11AP02-02
Dental alterations: a challenge for the anesthesiologist?

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Background: Tooth eruption disorders are more frequent in the upper arch (69.9%) and the area of the incisors (51.2%).(2) These disorders lead to changes in oral cavity morphology which in turn can be associated with difficult airway.

Case report: We report a case of a 40-year-old man with a total body surface area (TBSA) burned of 20% admitted to a burn intensive care unit (ICU) in Portugal. The burn consisting of deep second and third degree covered the right hemithorax and right upper limb. Despite not having relevant medical history, the patient presented changes in tooth eruption. As a child, due to the presence of his primary teeth, the permanent lateral incisors erupted behind the central incisors. These teeth have no structural function, hamper oral hygiene and should have been extracted in adulthood, but the patient refused.

Furthermore, he presented other signs of difficult airway, namely, presence of beard, narrow palate and short thyromental distance. When the patient was proposed for scarectomy in the operatory room, an intubation strategy was defined with A to C plans.

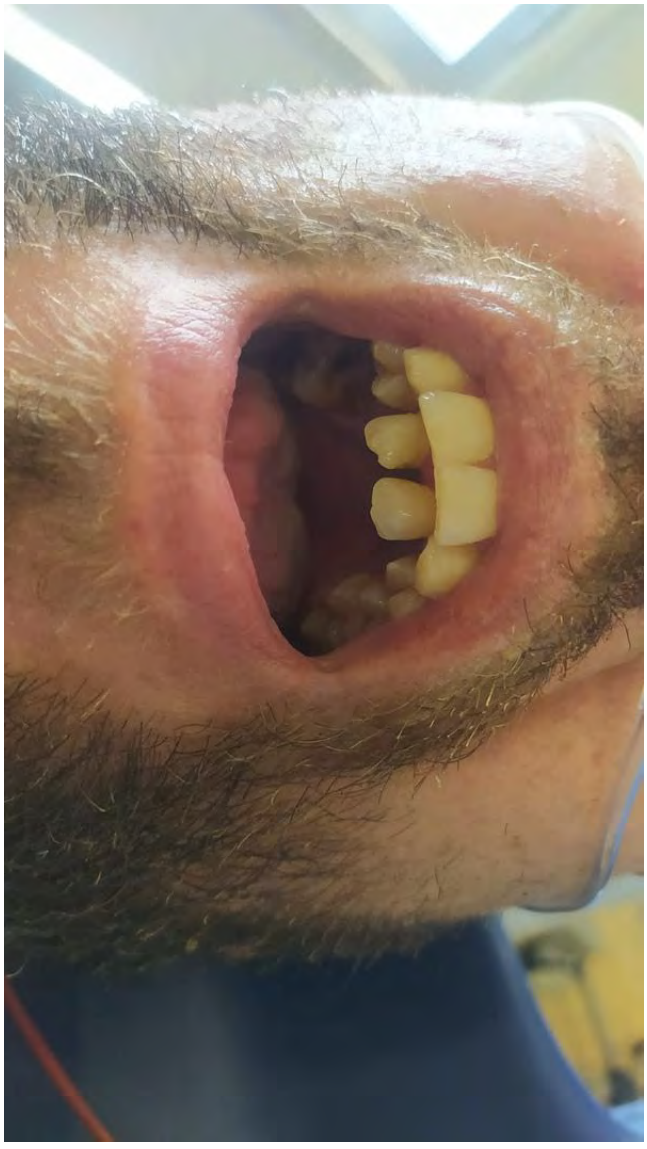
Considering the good mouth opening and anterior larynx, a videolaryngoscope was used, as well as an armored tube with smaller internal diameter (7.0 mm). A fibroscope, bougie, frova and difficult airway trolley were available. Both intubation and surgery were uneventful.

Discussion: Tooth eruption disorders can lead to difficult airways and intubation strategies need to be defined. Considering the predictability of the difficult airway, several strategies of approach the airway were traced. The option for the videolaryngoscope was the most appropriate because it doesn't interfere with the teeth and palate and it facilitates the visualization of the glottic space and the successful performance of orotracheal intubation.

Reference:

Malcangi G et al. Impacted Central Incisors in the Upper Jaw in an Adolescent Patient: Orthodontic-Surgical Treatment—A Case Report. Applied Sciences. 2022; 12(5):2657.

Learning Points: Tooth eruption disorders can be associated with difficult airway and strategies need to be defined before intubation.



11AP02-03
Videolaryngoscope plus flexible fiberoptic bronchoscope as combined access in multinodular goiter with tracheal deviation difficult airway management. A case report

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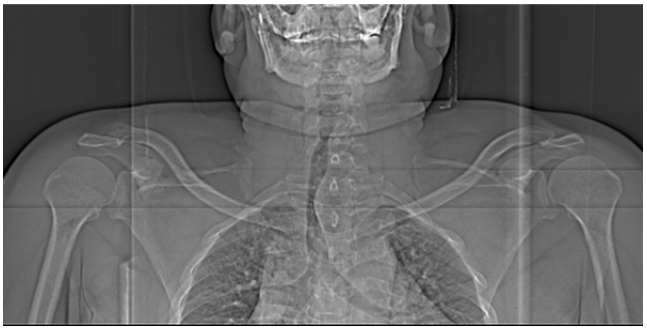
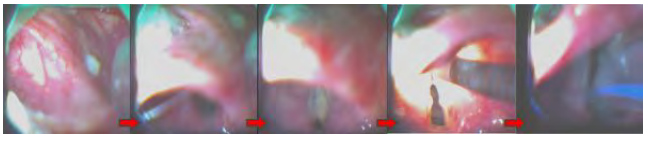
Background: Videoptical and fibreoptic systems have resulted in significant advances in difficult airway management. Videolaryngoscopes provide a higher intubation success rate, but intubation may occasionally fail. In these cases, the simultaneous use with a fiberoptic bronchoscope (FOB) (*combined access*) can be a very interesting option.
Case report: We present a 51-year-old obese male (BMI 31 kg m-2) with OSAS, smoker, and chronic alcoholic. He comes to the hospital because of difficulty in passing air, especially when he is in the supine decubitus position. He does not have dysphagia, nor has he noticed voice alterations. Cervicothoracic CT scan shows a multinodular goiter with tracheal deviation to the right and decreased caliber (10 mm. transverse axis in the narrowest area). He was scheduled for a total thyroidectomy. Preoperative airway assessment included a Mallampati grade 3, khan test class II, macroglossia, and a large uvula contacting the base of tongue.





Following the application of standard monitors, pre-oxygenation with a facemask, Airtraq was inserted, allowing partial visualization of the glottis. Additional maneuvers were ineffective in optimizing visualization and centering the glottis. Without removing the Airtraq, a fiberoptic bronchoscope was inserted through an endotracheal tube (*ETT*) mounted in the guiding channel. FOB was used as a guide for intubation, and Airtraq allowed visualization of ETT advancement through the cords.
Discussion: No device is perfect in all scenarios, so appropriate measures must be taken to ensure patient oxygenation and have alternative plans to secure the airway. A FOB and rigid video laryngoscope in the same clinical setting may prove to be complementary devices, optimizing those situations where each device would fail separately and facilitating successful tracheal intubation in difficult airway situations.

11AP02-04
Use of cook staged extubation set in a critically ill patient with a difficult airway: a case report

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Background: Extubation is unsuccessful in around 0.4-25% of critically ill patients. The use of exchange catheters in patients with suspected difficult airways is part of the protocol to allow for emergent reintubation if necessary[1].
Case report: A 62-year-old woman with a history of hypertension and hypothyroidism, was scheduled for vocal cord polyp excision. Intraoperative bleeding persisted after surgery. Tranexamic acid tamponade was performed, and she was admitted to resuscitation, keeping her intubated. Airway assessments were made with a videolaryngoscope and fiberoptic bronchoscope every 24h until there was no active bleeding and a decrease in glottic edema. A leak test was performed, being positive for bubbling and with a 50% decrease in tidal volume.
Among the possible weaning strategies, staged extubation was chosen, inserting the guide 4 cm beyond the tip of the endotracheal tube to prevent accidental extraction. The guide was maintained for the first hours to facilitate reintubation and oxygen insufflation if necessary. The patient tolerated it, except an isolated coughing episode. Before removing it, we verified that she vocalized the letter “e”.
Discussion: Critically ill patients have an extubation failure rate about 20%. This complication increases hospital days, as well as morbidity and mortality[2].
Literature suggests exchange catheters use for patients with difficult airways extubation, as it increases the success of reintubation on the first attempt[3].
The Cook extubation set offers greater patient tolerance as a 0.889mm diameter guide is used with a soft end to minimize tracheobronchial injury. In addition, if necessary, a ventilation catheter can be placed for oxygen insufflation by jet ventilation.
References:
1. Mort TC. Continuous airway access for the difficult extubation: the efficacy of the airway exchange catheter. Anesthesia and Analgesia 2007; 105: 1357-1362
2. Menon N, Joffe Am, Deem S, et al. Occurrence and complications of tracheal reintubation in critically ill adults. Respiratory Care 2012; 57: 1555-1563
3. Kulkarni AP, Agarwal V. Extubation failure in intensive care unit: Predictors and management.Indian Journal of Critical Care Medicine 2008; 12: 1-9
Learning Points: Exchange catheters for critically ill patients with a known difficult airway extubation , reduce morbidity and mortality. The Cook set has a guide with a very soft end that provides greater tolerance by the patient.

11AP02-05
Oropharyngeal injuries related to videolaryngoscopy intubation. A graphic report of a case

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Background: Videolaryngoscopy (VL) is an important tool for airway management but it has an increased rate of oropharyngeal injuries. We present a report of a pharynx wall lesion during VL and provide practical recommendations to reduce their incidence.
Case report: A 81-year-old woman with a Mallampati class 2 airway was scheduled for shoulder surgery. After standard general anesthesia induction, the first VL showed full glottis and allowed insertion of a 7.5 endotracheal tube (ETT) mounted on a Rigid Stylet™. While removing the VL blade, we detected a perforation of the right tonsillar pillar *(Figure 1)*.

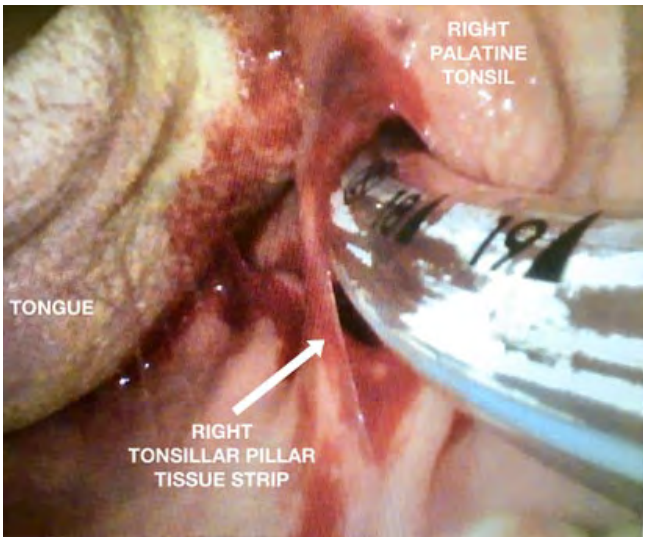

Figure 1. Videolaryngoscopy image showing perforation of approximately 1.5cm of the right tonsillar pillar by the ETT. The arrow points to the soft strip of pillar tissue and mucosa that was injured and caused bleeding on the retropharynx. Other relevant anatomical structures are marked.

After Otorhinolaryngology (ORL) evaluation, surgery proceeded as the bleeding was minimal and the airway secured. After careful extubation under VL vision, minor bleeding from the pillar required a hemostatic stitch. Postoperative care was standard and the patient was discharged home 2 days after surgery.
Discussion: The inherent design of videolaryngoscopes (VLs) and the indirect vision of the oropharynx increase the risk of injuries up to 15 times compared to direct laryngoscopy. Severe injuries like the one reported are rare (incidence of 0.3%) yet relevant given the increasing popularity of VL.
Traumatic laryngoscopy is prevented using a four-step technique that combines direct visualization of the oral cavity and video imaging after the ETT passes the tonsillar pillar. Relying mostly on video can lead to pillar perforation.
Some VLs require a stylet (e.g. Rigid Stylet™) to shape the ETT to match the acutely angled blade. We suggest that a malleable stylet may reduce oropharyngeal trauma without hindering intubation.
In the literature, most patients with this complication were extubated after the lesion was revised by the ORL team. Our experience shows it may be safe to proceed with surgery under favorable conditions (no active bleeding, superficial trauma).
Learning Points: Serious oropharynx injuries related to VL are relatively rare. To reduce their risk, operators should follow the four-step technique and consider using a malleable stylet. ORL should revise these injuries upon detection, and in some cases, surgery can proceed without reintubation.

11AP02-06
Combined use of flexible bronchoscopy and videolaryngoscopy for awake tracheal intubation: a case report

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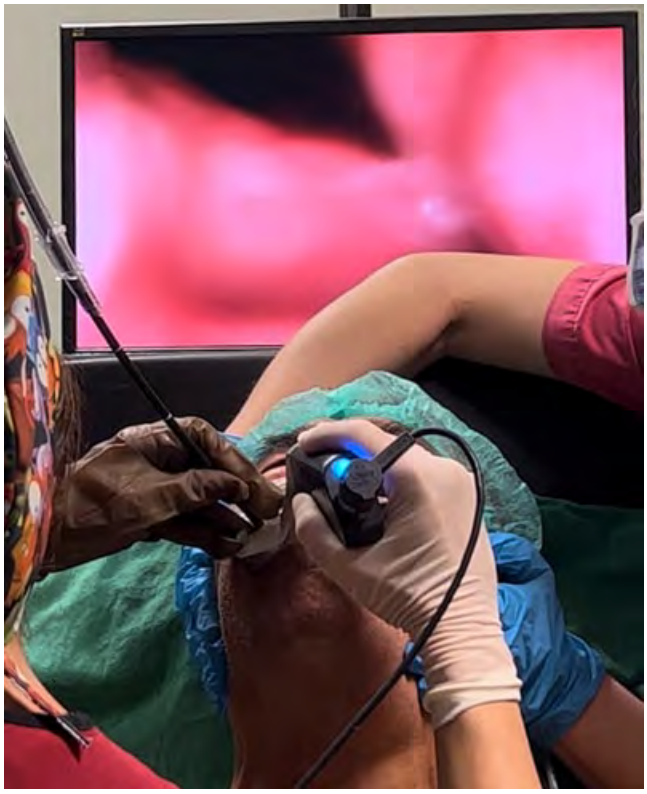
Intubating patients with laryngeal mass which narrows/obstructs the glottic opening might be challenging even for experienced anesthesiologists. Awake tracheal intubation (ATI) has a high success rate and a favourable safety profile for anticipated difficult airway. We aimed to discuss our case of successful tracheal intubation with combination of fiberoptic bronchoscopy (FB) and videolaryngoscopy (VL) when they both failed individually 69 year-old male patient was consulted to our clinic for total laryngectomy. In his preoperative evaluation he had shortness of breath,orthopnea and Mallampati Class was 3. Neck CT revealed tumoral mass that infiltrates epiglottis and narrows the glottis.



After routine ASA monitoring and supplemental oxygen delivery, sedation was performed with midazolam and dexmetedomidine.A total dose of 240 mg 10% lidocaine for topicalisation was used through direct spraying and mucosal atomisation device.

1st attempt with FB through nasal route and a
2nd attempt with FB through oral route were unsuccessful. Even though epiglottis could be visualised, glottic opening was not visible due to tumor and arytenoid oedema during both attempts. No desaturation was observed
3rd attempt was made with the combined use of FB and VL. As the patient was not able to lie down, face-to-face approach was used for C-MAC VL. We used VL to elevate epiglottis to reach glottic opening. The FB was inserted through oral airway at the same time. Following visualisation of carina, the tube was inserted. Anesthesia induction was performed after two-point check1. After the operation, the patient was extubated and transferred to the ICU.
ATI has been cited as the gold standard for a predicted difficult airway management but it can be unsuccessful in 1–2 % of cases.[1]Although multiple attempts increase the risk of airway trauma and obstruction,the use of alternative ATI techniques should be considered to avoid unnecessary FONA and/or high risk general anesthesia.When ATI techniques fail individually,considering combined techniques to overcome difficulties can be beneficial in selected patients
[1]Difficult Airway Society guidelines for awake tracheal intubation(ATI) in adults, Ahmad et all

11AP02-07
Vocal cord lesion: Is the Glidescope really at fault?

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Background: The introduction of video-laryngoscopes (VL) has revolutionized airway (AW) management.However, iatrogenic injuries associated with VL are increasing in the literature. Nasogastric tubes (NGT) have also been implicated in AW trauma.We report a case of a pseudo laceration of the vocal cord detected during rapid sequence intubation (RSI) with the GlideScope®.
Case report: 81-year-old female, admitted with mesenteric ischemia, undergoing urgent revascularization surgery. RSI was performed with the aid of the GlideScope®. After stylet removal, inability to advance the endotracheal tube (ETT) past the vocal cords lead to ETT removal. The stylet was reintroduced in the ETT outside of the patient's AW and a second attempt with VL was performed with improvement of the glottic view. An image of what seemed to be a laceration of the left vocal cord was observed. The AW was successfully secured and the on-call Otolaryngologist was consulted. Inspection of the larynx revealed a hematoma of the left vocal cord and multiple sub-acute hematomas of the pharyngeal walls. Intubation-induced trauma was suspected, however, due to the sub-acute and extensive appearance that hypothesis was discarded. The patient's file was re-assessed and records of a recent NGT insertion and removal were found. Further inspection of the vocal cord demonstrated dry blood mimicking a laceration. The patient was transferred to the ICU.
Discussion: Although the Rigid Stylet overcame difficulties encountered with ETT handling, AW lesions have been reported with the GlideScope®, including hematomas and vocal cord lacerations[1]. When handling the VL, the trajectory followed by the ETT from the oral cavity to the glottis is "blind", raising concern for potential AW trauma. NGT-induced AW lesions have been described in the literature[2]. In this particular case, the combination of a traumatic NGT insertion/removal, along with the administration of heparin for the ongoing ischemia and procedure, may have led to the formation of multiple hematomas, endangering the AW.
Learning points: Although VL are useful resources, AW injuries are possible. Inspection of the ETT trajectory should be performed following intubation to exclude iatrogenic injuries in blind spots. In acute abdominal disorders and presence of pharyngeal hematomas, the NGT should be considered as a differential diagnosis.
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11AP02-09
Dilemma in the PACU: airway obstruction in an undiagnosed COVID19-positive adult patient after elective surgery

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Background: Asymptomatic Covid19 infection is currently not known to predispose to laryngospasm.
Case report: This is the case of a 28-year old asymptomatic male Asian patient with BMI of 25 kg/m2, non-smoker with no comorbidities. Covid19 RT-PCR test 1 day prior was negative. Mallampati score was 3 with normal TMD. Routine induction for elective orthopedic surgery under GA with an LMA was planned.
On propofol, snoring was noted, managed by a head tilt chin lift maneuver. LMA was inserted easily. Procedure was uneventful, followed by voluntary smooth expulsion of the LMA by an awake swallowing patient, with adequate suctioning of secretions.
He was transferred to the PACU with stable VS and O2 mask support. Ten minutes in the PACU, he was referred for noisy breathing (inspiratory and expiratory) and decreased O2 saturation at 50%. He was unresponsive, and attempts to awaken were done. O2 support was increased to 10 LPM accompanied by head tilt chin lift, jaw thrust, and insertion of a Guedel airway, with slight improvement to 75%. PPV was administered, and saturation improved to 85%.
He was intubated using a videolaryngoscope, noting partially adducted vocal cords. Suctioning of the ETT revealed pink frothy fluid. O2 saturation quickly increased to 100%.
After 30 min of PPV with PEEP, the patient was coherent, swallowing and motioning to remove the ETT. He was extubated awake, with clear breath sounds, and monitored closely. The result of an RTPCR done earlier on the day of surgery was revealed to be positive. Non-development of symptoms and consistent normal O2 saturation prompted discharge and home quarantine.
Discussion: Negative-pressure pulmonary edema is a rare but life-threatening complication of airway obstruction. Early intervention with 100% oxygen and PPV with PEEP were vital to early resolution.[1] OSA (STOP-Bang score of 3) was initially considered as the sole cause; however, partial laryngospasm was evident.[2] A combination of obesity, OSA and Covid19 was the probable cause.
International standards require negative RTPCR within 24-72 hours prior to admission for elective surgery. However, early false-negative results are well-documented.[3]

This case posits that reactive airways even in asymptomatic Covid19 patients could still predispose to laryngospasm.
Learning points: Asymptomatic Covid-19 infection is still a present threat requiring anesthesiologists, other physicians and hospitals to consistently be prepared for its possible complications.

11AP03-01
Olfactory dysfunction as a measure of poor adaptation to cellular hypoxia: proof of concept

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Background and Goal of Study: Adaptation to cellular hypoxia is a key determinant of the critical illness outcome, but, at this time point, it can not be directly evaluated in everyday clinical practice. However, the effects of cellular hypoxia can be studied through exposure to high altitudes. Acute Mountain Sickness (AMS) occurs due to poor adaptation to hypobaric hypoxia found at high altitudes. Studies connecting olfactory dysfunction (OD) with altitude are emerging, but the relationship between AMS and OD is so far unknown. This study aims to explore the association between OD and AMS as a measure of poor adaptation to cellular hypoxia.
Materials and Methods: This prospective observational study included mountaineers on two high-altitude expeditions. Every morning after a new altitude gain, Lake Louise AMS score, AMS Clinical Function Score, heart rate, and SpO2 were recorded. At the same time, OD was assessed using a 3-item odor identification test.
Results and Discussion: A trend toward increasing Lake Louise AMS scores and AMS Clinical Function Scores and decreasing SpO2 with ascending altitude was observed. With increasing altitude, Lake Louise AMS Score increased, and the number of identified odors decreased.
Conclusion(s): Our results suggest an association between OD and AMS. This study provides proof of concept for using qualitative olfactory function tests based on readily available inexpensive items to detect OD related to poor adaptation to cellular hypoxia. The relevance of our findings extends to identifying patients with poor adaptation to cellular hypoxia in real clinical settings, which could provide more efficient phenotype-based risk stratification and hospital resource allocation.

11AP03-03
A new way of ventilation during Electromagnetic Navigation Bronchoscopy (ENB). EVONE® (Flow Control Ventilation)

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Background and Goal of Study: ENB is gaining popularity amongst bronchoscopists as one of the tools to diagnose pulmonary nodule. During ENB there is a narrowed airway exposure because of the size of the bronchoscope. Safe ventilation, good laryngotracheal exposure, and preservation of an adequate surgical working space are very important. This can be achieved by innovative ventilating system with flow-controlled ventilation (FCV), the Evone® (Ventinova, Eindhoven, The Netherlands).
The aim of our work was to evaluate feasibility and safety of the Evone® (FCV) system during the process of ENB under general anesthesia. Furthermore, It is important to reduce lung motion and prevent atelectasis during the procedure.
Materials and Methods: We perform general anesthesia with propofol and remifentanil TCI mode and rocuronium for neuromuscular blockade. Laryngeal mask was used to intubate the patient. We used VCV with a conventional ventilator for induction. Them we change to the FVC ventilation using the CTA (conventional tube adapter) adapter through the laryngeal mask.To prevent atelectasis and improve visualization we need: FiO2 (0.6-0.8), recruitment maneuvers, high level PEEP (8-10) and perform an inspiratory pause during the biopsy.
Results and Discussion: Since 2021 we have performed ENB in 18 patients. Out of 18 we have used Evone®(FVC) in 5 patients. Two men and three women medium age 65,2. Mean ventilation duration was 90 min (range 60-120 min) Mean biopsy + cryobiopsy time duration was (60 min) Mean minimal Sat O2 was 98 (range 96-100) mean peak pCO2 was 39 (range 38-40). Mean Compliance was 45 (range 57-40). No high pressures were detected.
No anesthesia- or biopsy-related complications, adverse events or intra-operative difficulties were reported. In all cases, compared to conventional ventilation (VCV), Evone (FVC) allowed better protective ventilation. All biopsies were positive “in situ” for lung cancer.
Conclusion(s): The Evone FCV ventilation system provides excellent conditions in patients undergoing ENB, as it combines excellent accessibility and visibility of the operation site with safe, stable and protective ventilation.
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11AP03-04
Effects of flow-controlled ventilation with negative versus positive end-expiratory pressure on haemodynamics, gas exchange, and lung mechanics in an experimental model of haemorrhagic shock in pigs

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Background and Goal of Study: Mechanical ventilation (MV) with negative compared to positive end-expiratory pressure (NEEP vs. PEEP) may improve cardiac output (CO) in haemorrhagic shock (HS).[1] We hypothesised that NEEP as compared to PEEP improves haemodynamics but temporarily impaires lung mechanics and gas exchange.

Materials and Methods: After approval (25-5131/522/53), 18 anaesthetised pigs (41±10 kg) with HS (blood volume -30%) underwent 4h of flow-controlled ventilation (FCV; Evone®, Ventinova) with tidal volume (VT) 7ml/kg, oxygen fraction 0.5, respiratory rate (RR) titrated to normocapnia, and randomly either PEEP (5 cmH_2O) or NEEP (-10 cmH_2O). Then, euvolaemia was restituted and PEEP 5 cmH_2O resumed in both groups for 30 min. Haemodynamic and respiratory data were reported as mean±standard deviation and analysed using paired t-test, 1-way ANOVA, and general linear model (significance level 5%).

Results and Discussion: HS significantly reduced mean arterial pressure (MAP), pulmonary capillary wedge pressure (PCWP), central venous pressure (CVP), global end-diastolic volume index (GEDVI), CO, stroke volume (SV), and haemoglobin concentration (no group difference at randomisation). While MAP was 50±8 mmHg directly after HS induction, 1h after randomisation MAP was 59±6 under PEEP and 70±5 mmHg under NEEP. Relative to the pre-randomisation time, NEEP (mean end-expiratory pressure -11±1 cmH_2O) as compared with PEEP (5±0 cmH_2O) significantly increased MAP (P=0.002), CO (P=0.030), cardiac index (P=0.008), SV (P=0.004), and SV index (P=0.018), but reduced PCWP (P=0.003) and CVP (P<0.001). Peak airway pressure, VT, RR, mean pulmonary-arterial pressure, GEDVI, arterial partial pressure of CO_2, and pH did not differ between groups. However, arterial partial pressure of O_2 (32±1 vs. 23±1 kPa, P<0.001) and compliance (27±1 vs. 11±1 ml/mbar, P<0.001) were lower and resistance (P<0.001) was higher during NEEP. Thirty minutes after intervention time, MAP, CO, CVP, SV, PCWP, and oxygenation no longer differed between groups, while compliance (28±6 vs. 21±6 ml/mbar, P=0.035) was still lower after NEEP ventilation.

Conclusion(s): In this model of haemorrhagic shock in pigs, FCV with NEEP, as compared to PEEP, improved haemodynamics and only temporarily impaired oxygenation, while compliance was still reduced after NEEP ventilation.

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11AP03-05
Pleural pressure during positive and negative pressure ventilation: a theoretical analysis

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Background and Goal of Study: Since the introduction of positive pressure ventilation (PPV) it has been assumed that there is no difference in lung ventilation between PPV and negative pressure ventilation (NPV), for the same driving pressure[1,2].

Materials and Methods: The compliance C in the linear part of the inspiratory Pressure Volume relation of the respiratory system allows calculation of the pleural pressure P_{pl}.

Results and Discussion: The respiratory system can be considered to consist of one balloon (the lungs) inside a second balloon (thoracic cavity), as depicted in figure 1. For both balloons the relation between volume V and transmural pressure P is described by $V(P) = V(0) + C.P$. If pleural pressure (the pressure between the balloons) is P_{pl}, airway pressure is P_{aw} and extra-thoracic pressure is P_{et}, the transmural pressure for thorax cavity is $P_{pl} - P_{et}$ and for the lung P_{aw}-P_{pl}.

Solving these two relations for the thorax cavity and the lungs, and denoting lung compliance by C_l and thorax wall compliance by C_t, results in $\Delta P_{pl} = \Delta P_{et} * C_t/(C_l+C_t)$ for NPV and $\Delta P_{pl} = \Delta P_{aw} * C_l/(C_l+C_t)$ for PPV. Hence any increase in airway pressure, which occurs in PPV, will increase pleural pressure proportionally. This is in much the same way as increased pressure from the outside, such as excessive abdominal weight against the diaphragm does.

Conversely, it stands to reason that decreased extra-thoracic pressure, as occurs during NPV, will always lower pleural pressure. Restriction must be made that the alveoli are openly connected with the airway (then P_{aw} is alveolar pressure).

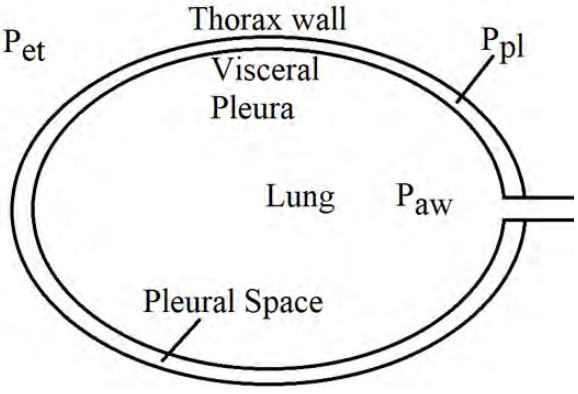

Figure 1. Lung enclosed by thorax cavity.

Conclusion(s): Application of negative extra-thoracic pressure will always result in the pleural pressure going down, whereas increased positive airway pressure will always result in an increase

in pleural pressure. This is a fundamental difference between PPV and NPV, and can be expected to have significant consequences for both ventilation and perfusion, as well the risk of pneumothorax.

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11AP03-06
Using Carestation™ Insights demonstrates in-house lung protective ventilation performance, stimulating behavioural change

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Background and Goal of Study: Anesthesiologists are obviously aware of the need and the advantages of keeping the lungs open, and will say that they already manage the lung protective ventilation (LPV) guidelines for each patient as necessary, yet they hardly act as such each time.

The LPV guidelines state that low tidal volume is needed in most patients getting positive pressure ventialtion (PPV) while a lung recruitment manoeuvre (LRM) and post end expiratory pressure (PEEP) are valuable when total respiratory compliance (C_{rs}) is low.

We all think that our own performance is good, and follow common recommendations until we are forced to see that, in reality, our own behaviour is far from ideal on every single occasion.

Materials and Methods: The Carestation Insights LPV application offers a way of automatically monitoring the C_{rs}, mode of ventilation, PEEP level, and when LRM is performed during PPV.

Carestation Insights LPV application shows these parameters for each connected operating room, both aggregated for the anaesthesia department and as a case-by-case view that can help to identify outliers. Mann-Whitney test analyses difference between using LRM or not.

Results and Discussion: When we started to use Carestation Insights LPV application, we discovered that our staff was not following all aspects of LPV to the same extent.

We analysed the anonymous data from April till July 2022 in 1441 patients (53 missing data). While PEEP settings of minimum 5 PEEP at the end of the procedure were quite well respected in 73 %, LRM was performed less often.

Adults getting PPV with a case duration >50 min and having a C_{rs}<40 at end of surgery got a LRM in only 15% of the cases. The patients with a Crs >40 at the end got a LRM in 20% of the cases. The patients with a Crs after induction <40 changed their Crs from a mean of 29+/-1.3 to 32+/-1.9 before extubation when no LRM was done (p=0.126) and from 29+/-2.9 to 42+/-5.3 when at least one LRM was done. (p=0.001)

When the Crs after induction was more > 40 their Crs dropped from 62+/- 0.8 to 55+/-0.9 when no LRM was done and from 59+/-1.9 to 57+/-2.7 when a LRM ws done. (Mann-Whitney p=0.182)

The patients with a starting Crs < 40 and getting a LRM had a lower TV (430+/-10 vs 395+/-10) (p=0.005), a higher et CO_2 (38+/-0.7 vs 35 +/-0.4) (p<0.001), a higher PEEP at the end (9.1+/-0.4 vs 5.3+/-0.1) (p<0.001) and a lower driving pressure (12.0+/-0.6 vs 12,8+/-0.3) (p=0.023) than those getting no LRM.

Conclusion(s): The LPV dashboard acts as a reminder of how we are performing in terms of LPV in our daily practice and might help to improve followinfg guidelines .

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Acknowledgements: Anesthesiologists Bruges

11AP03-07
Filling the gaping hole in the middle: a new definition of ideal alveolar gas

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Background and Goal of Study: Ventilation-perfusion heterogeneity ("VA/Q scatter") is substantial under general anaesthesia in most patients. In the 3-compartment model of VA/Q scatter (alveolar deadspace, shunt and central "ideal" compartments), Bohr deadspace and shunt calculations require the gas content of the "ideal" compartment.

However, no valid means exists for calculating this value. The alveolar gas equation for O_2, and the Bohr-Enghoff equation for CO_2, assume partial pressures which combine the ideal with the alveolar deadspace and shunt compartments respectively.

A novel "modal" definition is a proposed solution, at the VA/Q ratio in a lung where gas exchange (VO_2 and VCO_2) is maximal (modal). On either side of this point, increasing or decreasing VA/Q ratio reduces gas exchange efficiency for that gas (Figure). The location of this point depends on blood solubility of the gas.[1]

Materials and Methods: A computer model of gas exchange in physiological, unimodal log normal distributions of VA and Q was used to identify modal *ideal* alveolar O_2 and CO_2 partial pressures (modal ideal PAO_2 and $PACO_2$), and find equations to estimate these in a wide range of VA/Q scatter (log SD VA 0.25–1.75), overall VA/Q (0.4–1.6) and FIO_2 (0.18–1).

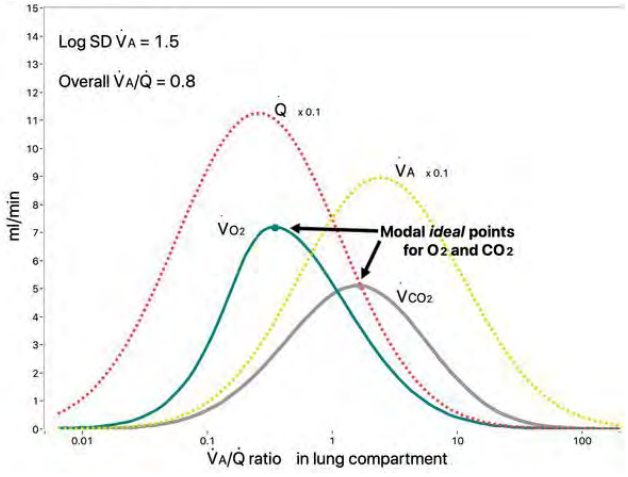

Figure. Typical distributions of VA,Q,VO_2 and VCO_2, in anaesthetised ventilated patients, and points of modal ideal PAO_2 and $PACO_2$.[2]

Results and Discussion: Modal *ideal* PAO_2 was accurately (r^2=0.999) described by substitution in the alveolar gas equation of the respiratory exchange ratio R with the term R–(1–$PEtCO_2$/$PaCO_2$), so that:

Modal ideal $PAO_2 = FIO_2 \cdot PB - PaCO_2/(R-(1-PEtCO_2/PaCO_2))$
Modal *ideal* $PACO_2$ was accurately ($r^2 > 0.99$) described by the equation:
Modal ideal $PACO_2 = (PEtCO_2 + PaCO_2)/2$
This also holds true for inert gases, to calculate the unique alveolar deadspace for any anaesthetic gas, as well as for CO_2.[1,2]
Conclusion: The modal *ideal* definition is a physiologically realistic and internally coherent concept of ideal alveolar gas, and can be calculated from readily measured clinical variables.
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11AP03-08
Should peripheral airway closure be named "dysfunction"?

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Background and Goal of Study: When the transpulmonary pressure (alveolar pressure minus pleural pressure) decreases, airways tend to close. This was first observed by Laennec[1] and demonstrated by Dollfuss[2] and Hedenstierna[3] in ventilated patients. The proportion of the lung that is closed is named closing capacity, and this is known to increase with age and due to obesity.
Airway closure due to rising pleural pressure is a natural behaviour and protects the alveolus against full collapse. Airway closure therefore is to be expected in all occasions that raise pleural pressure such as increased positive airway pressure during positive pressure ventilation.
Materials and Methods: Description of the respiratory system by standard physics modelling.
Results and Discussion: The respiratory system is commonly described as a balloon (the lungs) enclosed by a balloon (thorax cavity). For both balloons the relation between volume V and transmural pressure P is described by $V(P) = V(0) + C.P$, in which C denotes the compliance. If pleural pressure (the pressure between the balloons) is designed as P_{pl}, airway pressure by P_{aw} and extra-thoracic pressure by P_{et}, the transmural pressure for thorax cavity is $P_{pl} - P_{et}$ and for the lung P_{aw}-P_{pl}. Pleural pressures will change by increasing airway pressure as well as decreasing extra-thoracic pressure.
Solving these two situations for thorax cavity and lungs and denoting lung compliance by C_l and thorax wall compliance as C_t, results in $\Delta P_{pl} = \Delta P_{et} * C_t/(C_l+C_t)$ for negative extra-thoracic pressure and $\Delta P_{pl} = \Delta P_{aw} * C_l/(C_l+C_t)$ for positive airway pressure: any increase in airway pressure will increase pleural pressure proportionally, but decreased extra-thoracic pressure lowers pleural pressure.
Conclusion(s): Negative extra-thoracic pressure results in a reduction in pleural pressure which will help small peripheral airways to open up. Positive airway pressure increases pleural pressure and therefore induces airway closure. Many problems during positive airway pressure mechanical ventilation, atelectasis, pneumonitis, pulmonary emphysema, pneumothorax and other air leaks are related to raised pleural pressure[4]. Negative extra-thoracic pressure ventilation is expected to avoid many of these problems.
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11AP03-09
The technique of conduct of general anesthesia with preserved spontaneous breathing

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Background and Goal of Study: The immediacy of the problem of patient safety motivates anesthesiologists to focus on conduct of anesthesia with preserved spontaneous breathing. The objective of our study is to evaluate the efficacy of the technique of general anesthesia with preserved spontaneous breathing, which permits to increase safety and efficacy of anesthesia through elimination of myorelaxants, reduction in dose of general anesthetics and use of an endotracheal tube with irrigation port.
Materials and Methods: Prospective randomized controlled clinical trial of patients was approved by the clinic's Ethics Committee. All patients were divided into two groups. Patients from control group (n-64) were given general anesthesia with the use of myorelaxants, artificial lung ventilation in the Pressure Control Ventilation mode, sevoflurane and fentanyl. Patients from basic group (n-62) were given monoinduction with sevoflurane using an endotracheal tube with irrigation port for administration of medicines, trachea mucosal anesthesia with 40–60 mg of 2% lidocaine, ventilation in the Pressure Support mode, and performed sevoflurane inhalation and fentanyl infusion. The groups were homogeneous in terms of gender, comorbidity, type and duration of surgery. The estimated factors included systemic hemodynamic values, duration of early postoperative recovery and economic efficiency. The obtained data were processed using Microsoft Excel-2003 and Statistica for Windows - v. 6.0 software.
Results and Discussion: Hemodynamic profiles were of the same nature in both groups but a significant difference between the two groups was also registered in hemodynamic values, which in average were higher in the control group by 12.2–19.8% ($p<0.05$). Average HR values in the basic group were significantly lower ($p<0.05$) as compared to control group by 10.5–18.4%. Tracheal extubation of the patients from the basic group was performed earlier by 23.3–28.6%. This made it possible to reduce the duration of early postoperative recovery by a factor of 1.4 over the control group ($p<0.05$). The costs per anesthesia in the basic group were 15–18% less than in the control group ($p<0.05$).
Conclusion(s): The results of the trial showed the possibility of safe and efficient use of the unassisted breathing mode with pressure support and an endotracheal tube with irrigation port resulting in reduced duration of early postoperative recovery.

11AP03-10
Effects of driving pressure-guided positive end-expiratory pressure on postoperative pulmonary complications in patients undergoing laparoscopic or robotic surgery: a randomized controlled trial

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Background and Goal of Study: Individualized positive end-expiratory pressure (PEEP) improves respiratory mechanics. However, its impact on postoperative pulmonary complications remains inconclusive. Therefore, this study aimed to evaluate the effects of driving pressure-guided individualized PEEP on postoperative pulmonary complications in surgical patients. The authors hypothesized that driving pressure-guided individualized PEEP during surgery would decrease the incidence of postoperative pulmonary complications more than fixed PEEP.

Materials and Methods: This randomized controlled trial enrolled 364 patients with moderate-to-high risk for postoperative pulmonary complications scheduled to undergo laparoscopic or robotic lower abdominal surgery. The individualized group (n = 178) received driving pressure-guided PEEP, while the standard group (n = 186) received fixed PEEP of 5 cmH_2O during surgery. Both groups received a tidal volume of 8 mL/kg ideal body weight. The primary outcome was the incidence of postoperative pulmonary complications within seven postoperative days.

Results and Discussion: The mean PEEP in the individualized group was 13.9 (95% CI, 12.7 to 14.9) cmH_2O. The incidence of postoperative pulmonary complications was significantly lower in the individualized group than that in the standard group (78/178 [43.8%] vs. 110/186 [59.1%], risk ratio [95% CI], 0.741 [0.573 to 0.915]; p = 0.004). In the post hoc multivariable logistic regression analyses, driving pressure-guided PEEP was significantly associated with postoperative pulmonary complications (odds ratio [95% CI], 0.590 [0.379 to 0.918]; p = 0.020).

Conclusion(s): Driving pressure-guided individualized PEEP decreased the incidence of postoperative pulmonary complications within seven postoperative days in moderate-to-high-risk patients undergoing laparoscopic or robotic lower abdominal surgery. Titration of intraoperative PEEP based on driving pressure may benefit these patients.

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11AP03-11
Efficacy of face mask ventilation with 45-degree head rotation in anesthetized obese patients: a preliminary analysis

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Background and Goal of Study: Rotating the head to 45-degrees during mask ventilation (MV) is sometimes used by anesthesia providers to improve ventilation on induction. A study showed that head rotation improved ventilation in patients with BMI<35 kg/m^2.[1] But it is unknown if it helps when it really matters, in morbidly obese patients and those with obstructive sleep apnea (OSA). We assessed if 45-degree head rotation during MV would increase ventilation efficacy measured by expiratory tidal volumes (TV) in morbidly obese patients.

Methods: All patients with BMI≥35 kg/m^2 were included. Patients without OSA were screened using the STOP-BANG and then randomized by starting head-position to a crossover-controlled sequence: (1) neutral-rotated-neutral, or (2) rotated-neutral-rotated. Each head position was 1-minute. MV was with pressure control ventilation: pressure 20 cmH_2O, rate 16 breaths/min, no PEEP. TV for each breath was recorded.

Results and Discussion: The patients' demographic characteristics were not different between two groups (Table). Head rotation (rotated vs neutral position) did not improve ventilation: TV (369.1±163.5 vs 387.2±196.7mL; P=0.82), SPO_2 (98±2.5 vs. 97.7±3.2%; P=0.79), $EtCO_2$ (23.3±9.9 vs. 22±11.4mmHg; P=0.78). But low-risk patients for OSA by STOP-BANG had higher TV (545.9±6.6mL) than those with intermediate-risk (279±102.7mL), high-risk (400.9±173.9mL) or diagnosed OSA (374.4±195.9mL).

	Overall (n=20)	Neutral (n=9)	Rotated (n=11)
Age (years)	46.5 ± 12.8	43.9 ± 12.5	48.5 ± 13.2
Female sex	16 (80)	7 (77.8)	9 (81.8)
Height (cm)	165.6 ± 8.3	168.2 ± 9	163.4 ± 7.3
Body weight (kg)	118.6 ± 22.2	118 ± 21	119.1 ± 24.1
BMI ($kg\ m^{-2}$)	44.6 ± 7.4	43.6 ± 7	44.8 ± 7.9
ASA (II / III)	5 / 15	3 / 6	2 / 9
Mallampati III/IV	3 (15)	3 (33.3)	0 (0)
Edentulous	1 (5)	1 (11.1)	0 (0)
Thyromental distance (cm)	8.8 ± 7.6	7.0 ± 0.7	6.9 ± 1.1
Mouth opening (cm)	5.2 ± 0.9	5.3 ± 0.7	5.2 ± 1.1
Neck circumference (cm)	42.9 ± 2.8	43.4 ± 3.3	42.4 ± 2.2
Diagnosed obstructive sleep apnea	7 (35)	3 (33.3)	4 (36.4)
STOP-BANG (low/intermediate/high)	1 / 3 / 9	1 / 3 / 2	0 / 0 / 7

Table. Patient demographic characteristics. Data are presented as mean ± SD or n (%).

Conclusions: 45-degree head rotation did not clinically improve MV efficacy in anesthetized, apneic, morbidly obese adults. Preoperative STOP-BANG risk stratification could be a useful predictor for MV efficacy in morbidly obese surgical patients.

Reference:

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11AP03-12
Helmet for oxygen therapy – from concept to patient treatment in COVID-19 pandemic

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Background and Goal: The global coronavirus pandemic led to a deep crisis in the healthcare systems mainly because of limited access to devices for hypoxemic respiratory failure treatment. This forced engineers and researchers to undertake work to enable the production of safe and effective devices dedicated to high-flow oxygenation as well as non-invasive positive pressure ventilation.
The main aim of this study is to present the preliminary results of their work in the development of methods enabling production of helmets for oxygen therapy with devices generating pressure (CPAP, oxygen high-flow blender) and protocols for safe use of them.
Results: First step was to design optimal helmet parameters (size, ports locations) using computational fluid dynamics simulations with defined gas exchange and different pressures and flows. O_2 and CO_2 concentration changes as well as humidity and temperature distribution were analyzed (Picture 1).

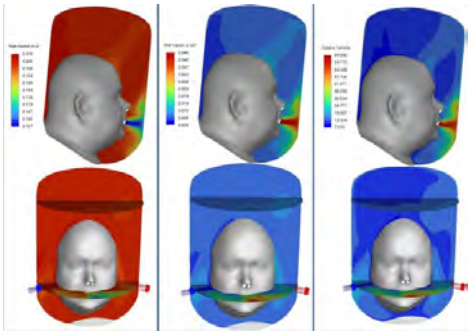

Figure 1. An example visualization of the distribution of O_2 and CO_2 and relative humidity inside helmet.

Based on those results selected polyurethane helmets were produced. Parallel manufacturing process of the connectors and PEEP valves with the use of a 3D printing technique with PET-G filaments was adopted.
In the next step helmets were tested on 3D-printed heads with measurement of O_2, CO_2, temperature, humidity and noise with different values of pressure (5-20cm H_2O) and flow (15-60lpm) and with different air dispersals. Finally helmet which allowed to keep CO2 concentration below 2% with 30l/min flow was chosen. Proposed protocols of its use were prepared based on ARDS network.
Prototypes were preliminary tested on 10 volunteers and used for treatment of 30 patients with COVID-19 hospitalized on ICU for whom passive oxygenation was not adequate. For all of them this form of therapy increased SpO2 up to 92% during first hour.
Conclusions: The designed prototype of helmet for oxygen therapy seems to be a good alternative in the absence of access to commercial solutions.
A study with aim to demonstrate the effectiveness of those helmets and protocols in patients with moderate respiratory failure is currently underway.

11AP04-02
Muscle activity of anesthesiologists during bag-mask ventilation and tracheal intubation – comparison between tasks performance in humans and intubation in a manikin

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Background and Goal of Study: The aim of the present study was to compare orotracheal intubation performed by anesthesiologists on a manikin and on patients using electromyographic assessment of muscles involved in tasks performance.
Materials and Methods: Eleven experienced anesthesiologists participated in the study. Participants performed intubation on a manikin and on an easy to intubate patients undergoing general anesthesia, during which, muscle activity of twelve muscles was recorded using a wireless EMG System. Activity of each muscle presented as percent of maximal muscle voluntary contraction amplitude (in millivolts) (MV%).
Results and Discussion: All anesthesiologists participating in the study found intubation on manikin to be different or totally different from intubation on patients (3 and 4 on a 1-7 Likert's scale). The activity of all twelve muscles assessed in this study, was low in both hands and in both tasks (performing intubation on a manikin and on patients). Mean MV% values ranged from 0.72 to 3.24% and median MV% values of 0.46% to 2.46%.
No statistically significant differences were found between muscles activity during intubation performance on manikin and on patients (Lt. biceps p=0.27, Rt. biceps p=0.65, Lt. deltoid p=0.76, Rt. deltoid 0.91, Lt. trapezius p=0.25, Rt. trapezius p=0.94, Lt. brachioradialis p=0.82, Rt. brachioradialis p=1.00, Lt. wrist flexor p=0.74, Rt. wrist flexor p=0.84, Lt. wrist extensor p=0.94, Rt. wrist extensor p=0.94).
Conclusion(s): In contradiction to participants subjective comments no difference was found between muscles MV% between manikin and patients orotracheal intubation. The results may be attributed to low sensitivity of the measuring system in view of the low muscle activity.

11AP04-03
Re-consideration for preventing unrecognized esophageal intubation: a review analysis

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Background and Goal of Study: Tracheal intubation is one of the most important procedures for acute care. Despite of progress and development of devices and monitors, esophageal intubation (EI) is not completely prevented and some of cases are mortal. Recognition technique of EI was reviewed in a literature.

Material and Methods: Two independent assessors searched MEDLINE (PubMed) in November 2022 to identify the reports involving detection of EI and comparison of techniques in clinical settings. The identification techniques were divided into three ways, auscultation (Au), esophageal detector device (EDD) and end-tidal carbon dioxide detection ($ETCO_2$). All intubation and identification were summarized, and total values were calculated.

Results and Discussion: From 100 screened titles, 9 repots were met for the criteria (Table 1).

Authors	Study	Total intubations	Eshophageal intubation: Auscultation n	Auscultation Correct identification	Esophageal detector device n	Esophageal detector device Correct identification	End-tidal carbon dioxide n	End-tidal carbon dioxide Correct identification	Trachal intubation: Auscultation n	Auscultation Correct identification	Esophageal detector device n	Esophageal detector device Correct identification	End-tidal carbon dioxide n	End-tidal carbon dioxide Correct identification
Takeda T, et al.[1]		150	13	12	13	12	13	13	137	125	137	114	137	110
Tong YL, et al.[2]	1	200			27	27	27	27					178	
	2	100			100	100	100	100						
	3	100			42	42	42	42			58	58	58	58
Grmec S, et al.[3]		345	9	7			9	9	336	332			336	308
Tanigawa K, et al.[4]		56			8	8	8	8			48	34	48	31
Tanigawa K, et al.[5]		65			5	5	5	5			66	47	65	29
Knapp S, et al.[6]		152	78	68	78	78	78	78	74	72	74	71	74	74
Bozeman WP, et al.[7]		100	1	0	1	1	1	1			99	98	99	86
Zaleski L, et al.[8]	1	300			90	99	90	90			270	250	270	270
	2	100			100	100	100	100						
	3	100			51	51	51	51			49	46	49	46
Ornato JP, et al.[9]		227					27	23					200	160

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3. Grmec S. Comparison of three different methods to confirm tracheal tube placement in emergency intubation. Intensive Care Med 2002; 28: 701-4.
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8. Zaleski L, Abello D, Gold MI. The esophageal detector device. Does it work? Anesthesiology 1993; 79: 244-7.
9. Ornato JP, Shipley JB, Racht EM, Slovis CM, Wrenn KD, Pepe PE, Almeida SL, Ginger VF, Fotre TV. Multicenter study of a portable, hand-size, colorimetric end-tidal carbon dioxide detection device. Ann Emerg Med 1992; 21: 518-23.

Table 1. The results of each study.

Totally 1995 cases of intubation were completed, and 491 cases were EI including intentional and experimental procedures. The sensitivity and positive predictive value (PPV) of identifying EI by Au, EDD and $ETCO_2$ were 87% (0.43), 99% (0.875) and 100% (0.621), respectively (Table 2).

Identifying techniques	Auscultation			Esophageal detector device			End-tidal carbon dioxide		
Actual intubation to	Esophagus	Trachea		Esophagus	Trachea		Esophagus	Trachea	
Identified as									
Esophageal intubation	87	117	0.426470588 **PPV**	454	82	0.875 **PPV**	489	298	0.621 **PPV**
Tracheal intubation	13	529	0.97601476 NPV	1	718	0.999 NPV	2	1155	0.998 NPV
	0.870 **Sensitivity**	0.819 Specificity		0.998 **Sensitivity**	0.898 Specificity		0.996 **Sensitivity**	0.799 Specificity	

PPV: positive predictive value, NPV: negative predictive value.

Table 2. The results of the total numbers of both esophageal and tracheal intubation, and the calculated values.

The cases of the current review included the patient under cardiopulmonary arrest. $ETCO_2$ monitoring is believed as the most reliable technique for detecting EI. But cessation of circulation reduces production of carbon dioxide, and the overall value of specificity was higher using EDD than using $ETCO_2$. Moreover, a few case reports pointed out a possibility where a detection of inappropriate capnography waveform was misleading even in the recent circumstances.

Conclusion: Appropriate and prompt identification of EI might be sometimes difficult even in recent medical systems. Multifaceted and continuous evaluation is absolutely required.

Reference:

Chrimes N, et al. Anaesthesia 2022; 77: 1395-1415. Ahmad I and Wong DJN. Anaesthesia 2022; 77: 1321-5.

11AP04-04

Emergency consultation of anesthesiologists for tracheal intubation at a university hospital

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Background and Goal of Study: Emergency tracheal intubation (ETI) is associated with high morbidities and complications. Airway management is thus an integral part of training for all doctors in our hospital. Despite vigorous training, anesthesiologists receive consultations to rescue failed ETI every month. We conducted a retrospective survey to study the performance of consultation for ETI in a tertiary hospital.

Materials and Methods: We retrieved data from electronic medical records and ETI registry in our department from September 2016 to December 2019. Patients aged 20 years or older were included.

Results and Discussion: 338 consultations were included. The average age was 64 years old. 66% of patients were male. ETIs were performed in general ward 49%, intensive care unit 35% and emergency department 16%. Indications were respiratory failure 75%, cardiopulmonary resuscitation 11%, shock 4%, gastrointestinal bleeding or hemoptysis 3% and others 7%. Anesthesiologists' successful rate was 98.5%. Five patients underwent emergent tracheostomy. Major complications occurred in five patients. Comparisons of both doctors' performance were listed in table 1. Causes of difficult airways and definite management were concluded in figure 1.

	Primary care doctors' performance		Anesthesiologists' performance	
Intubation tools	Direct laryngoscope	165 (85%)	Direct laryngoscope	43 (13%)
	Video laryngoscope	29 (15%)	Video laryngoscope	244 (72%)
			Fiberoptic intubation	51 (15%)
Number of attempts	No attempts	146 (43%)	1 time	272 (80%)
	1 time	45 (13%)	2 times	47 (14%)
	2 times	74 (22%)	3 times or more	19 (6%)
	3 times or more	61 (18%)		
Muscle relaxants	87 (26%)		286 (85%)	
Sedations	167 (49%)		134 (40%)	

Table 1. Details of tracheal intubations

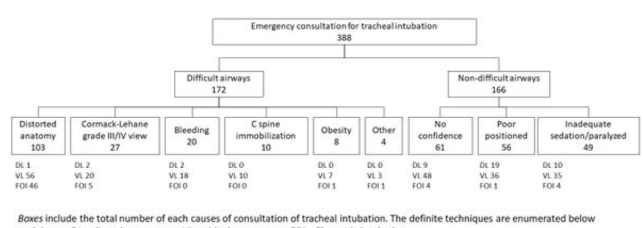

Figure 1. Airway management techniques and causes for emergency consultations of tracheal intubations.

Conclusion: ETI is challenging both for primary doctors and anesthesiologists. Nearly 50% of the consultations were due to poor skills, lack of confidence or inadequate patient sedation or paralyzed. The information can provide feedback to airway management programs. Videolaryngoscopy facilitates first-attempt intubation success. Therefore, videolaryngoscopy training should be emphasized.

11AP04-05
A pre-airway management decision-making-tool for video-assisted and awake tracheal intubation – a two-stage development and confirmatory diagnostic accuracy study (Expect-it trial)

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Background and Goal of Study: Pre-airway management decision-making tools might be more accurate for planning anaesthesia management than airway risk prediction tests. This study aimed to develop and implement the Expect-it decision-making tool and to compare if it's ability to predict post-intubation recommendations for direct laryngoscopy (DL_{REC}), videolaryngoscopy (VL_{REC}), or awake tracheal intubation (ATI_{REC}) is superior or at least non-inferior to the current clinical standard (experience-based decision-making).
Materials and Methods: This single-center prospective model development and confirmatory diagnostic accuracy study with a before-after design (development and confirmation cohort) included 1282 anesthetics in patients undergoing tracheal intubation in ear, nose and throat or oral and maxillofacial surgery. Regularized regression was used for variable selection. The decision-making tool relies on two multivariable regression models comprising 15 variable from four categories (previous tracheal intubation, physical examination, pharynx anomalies and nasendoscopy). Sensitivity and specificity (co-primary endpoints) of the Expect-it tool (confirmation cohort) for the prediction of DL_{REC}, VL_{REC}, and ATI_{REC} were compared with the clinical standard (development cohort).

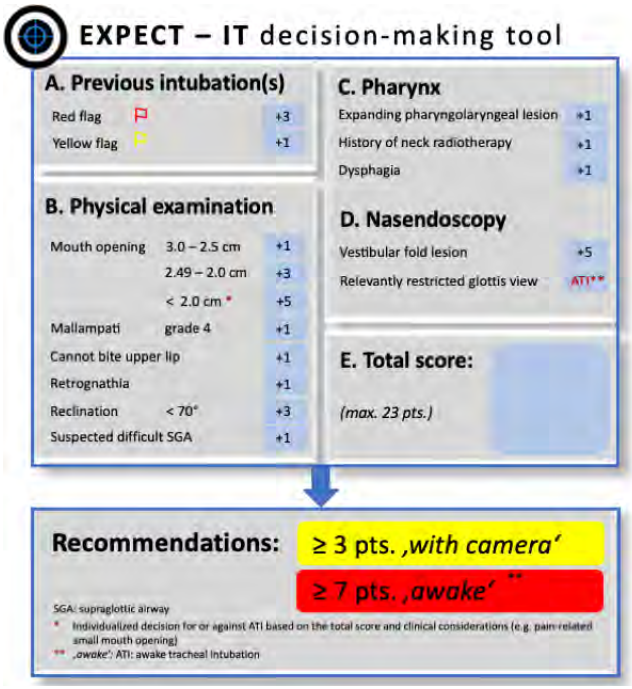

Figure 1.

Results and Discussion: The Expect-it tool achieved good discrimination for video-assisted (area under the ROC curve [AUC] 0.86; 95%-CI 0.81–0.90) and awake (AUC 0.97; 95%-CI 0.96–0.99) tracheal intubation recommendations. For ATI_{REC} sensitivity of the Expect-it tool was superior and specificity non-inferior, for DL_{REC} sensitivity was non-inferior and specificity superior and for VL_{REC} sensitivity was superior and specificity non-inferior to the clinical standard; hence the null hypothesis was rejected. Difficult laryngoscopy (1.9% versus 6.5%), failed DL (1.5% versus 7.5%) and airway-related adverse events (4.6% versus 11.3%) decreased after implementation of Expect-it ($p<0.001$ each).
Conclusions: The Expect-it decision-making tool predicted the recommended tracheal intubation technique more accurately than a non-algorithm based approach and hereby reduced adverse events.

11AP04-06
Comparison of fiberoptic bronchoscopic intubation using silicone and polyvinyl chloride double-lumen tubes

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Background and Goal of Study: Direct insertion of a double-lumen tube (DLT) using a flexible fiberoptic bronchoscope (FOB) is an option for DLT intubation. The different properties of polyvinyl chloride and silicone DLTs may affect railroading differently, which is the difficult process of fiberoptic intubation. Therefore, we aimed to compare intubation using polyvinyl chloride and silicone DLTs over an FOB.
Materials and Methods: Patients aged 19–75 years who required one-lung ventilation under general anesthesia were enrolled in this study. After induction of anesthesia, the anesthesiologist intubated the DLT using FOB. The primary outcome was the difficulty of railroading over the flexible FOB scaled into five grades (I, II-1, II-2, III, and IV). Additionally, the intubation time and mucosal damage were recorded.

	Polyvinyl Group (n=23)	Silicone Group (n=23)	P value
Age (years; median [range])	38 [22-58]	47 [41-61]	0.214
Sex (male/female)	15/8	17/6	0.522
Weight (kg)	63.1 ± 11.3	65.2 ±12.5	0.537
Height (cm)	168.3 ± 9.1	166.7 ± 8.5	0.526
ASA PS (I/II)	18/5	15/8	0.514
Thyromental distance (cm)	5.6 ± 0.8	5.7 ± 0.8	0.544
Mouth opening (cm)	4.6 [4.1-5.0]	4.4 [4.0-4.5]	0.168
C-L grade (I/II-1/II-2/III/IV) by direct laryngoscope	12/2/7/2/0	13/4/4/2/0	0.767

Table. Patient characteristics and airway assessment results.
Data are presented as mean (standard deviation), median [interquartile range], or number. Polyvinyl Group: tracheal intubation over fiberoptic brochoscope using a polyvinyl chloride double-lumen tube; Silicone Group: tracheal intubation over fiberoptic bronchoscope using a silicone double-lumen tube; C-L grade; modified Cormack-Lehane grade

	Polyvinyl Group (n=23)	Silicone Group (n=23)	Median difference (95% CI)	P-value
FOB insertion time (s)	9 [7-10]	9 [8-10]	0 (−2 to 1)	0.409
Railroading time (s)	15 [9-17]	7 [6-9]	7 (4 to 9)	<0.001
Time to tracheal intubation (FOB insertion time plus railroading time; s)	23 [19-28]	16 [16-18]	6 (4 to 10)	<0.001
Total time for correct tube positioning (s)	39 [32-44]	27 [26-35]	9 (5 to 14)	<0.001
Difficulty of railroading (I/ II -1/II-2/III/IV)	9/1/1/12/0	20/3/0/0/0		<0.001
Blood-stained tube during intubation (Y/N)	16/7	2/21		<0.001
Blood-stained tube during extubation (Y/N)	11/12	3/20		0.023
Sore throat (Y/N)	7/16	5/18		0.738
Difficulty swallowing (Y/N)	6/17	2/21		0.243
Hoarseness (Y/N)	2/21	3/20		>0.99

Table 2. Fiberoptic intubation data.
Data presented as medians [interquartile range], or numbers.
Polyvinyl Group: tracheal intubation over fiberoptic brochoscope using a polyvinyl chloride double-lumen tube; Silicone Group: tracheal intubation over fiberoptic bronchoscope using a silicone double-lumen tube;

Results and Discussion: A total of 46 patients participated in this study, 23 each in the silicone and polyvinyl groups. The difficulty of railroading over the FOB was significantly different between the two groups ($P < 0.001$). In the silicone group, the grades of difficulty in railroading were limited to I and II-1; 20 patients (87%) presented no difficulty in advancing the tube. In contrast, in the polyvinyl group, 13 patients (57%) had scores of II-2 and III. Both the intubation time and mucosal damage were significantly better in the silicone group than in the polyvinyl group.
Conclusion(s): Intubation using a silicone DLT over an FOB was easier and faster than that with a polyvinyl chloride DLT with lesser trauma around the glottis.

11AP04-07
Pediatric DSE (distance from skin to epiglottis) evaluation in airway management: is it worth the effort?

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Background and Goal of Study: Direct laryngoscopy in pediatric patients can be unexpectedly difficult, leading to serious complications in airway management. Preoperative scores predicting difficult intubation have often shown their limitations in terms of sensitivity and specificity. Recently, an ultrasound examination of the early airway, measuring the distance in centimeters from the epidermis to the epiglottis (DSE, Distance from Skin to Epiglottis), has been proposed as a possible preoperative predictor of difficult intubation in adults, whereas in pediatric field limited or no data is available. The aim of our preliminary study is to evaluate how routine videolaryngoscopy may perform as a clinical risk mitigator in pediatric patients' tracheal intubation in relation to DSE values.
Materials and Methods: 50 patients, aged 3 to 16 years, undergoing elective and emergency surgery under general anesthesia in E. Profili Hospital in Fabriano were recruited. After parental consent, each patient underwent preoperative DSE evaluation and neck circumference measurement. All patients were routinely intubated using a videolaryngoscope and visual findings were graded according to the Fremantle Videolaryngoscope Scoring System.
Results and Discussion:
• The distribution of DSE values in our sample followed a Gaussian curve, with the most frequent one found between 1.6 and 2 cm.
• A directly proportional relationship between DSE and neck circumference was only found from a DSE value greater than 2,5 cm.
• Relating DSE values to videolaryngoscopic view, we found a complete vision in 99.02% of cases regardless of DSE values.
• Videolaryngoscopy allowed tracheal intubation in every patient regardless of DSE value, and that was performed as a first attempt in 96% of cases.
• No surgery was postponed due to impossible intubation and no intubation led to perioperative complications.
Conclusion(s): Although being performed by an experienced team, DSE evaluation remains an ultrasound-based operator-dependent technique that requires a constant prompt availability of an ultrasound device and prolongs preoperative evaluation time of the non-always-cooperating pediatric patient. Routine videolaryngoscopy, while optimizing the view of the vocal cords and facilitating tracheal intubation, lowers the maneuver related clinical risk surpassing, both in terms of effectiveness and efficiency, the DSE evaluation.

11AP04-08
Tracheostomy care: an E-learning module

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Background: Within the cohort of patients that pass through a district general hospital's post anaesthesia recovery unit (PACU), patients with tracheostomies are seldom seen. PACU staff can easily become de-skilled and therefore under-confident when managing these patients. This was reflected in a questionnaire of staff within Torbay Hospital's PACU & theatre complex staff. We received 72 responses, covering 13 questions from the National Tracheostomy Safety Project[1]. Across all questions, for all staff members, the average score was 35%. These results demonstrated the issue and therefore our aim was to improve staff competence when managing this patient group.
Methods: After identifying the issue, senior theatre and PACU staff members met up to organise a solution to help train PACU staff in this area of care. Clinical staff wrote the script for the e-learning module and in conjunction with the hospital Learning Technology Team, filming and audio recordings were added. This was then edited together to combine pictorial, video and audio segments along with assessments at the beginning and at the end of the module to achieve certification.
Results: The module finished production and was then added to the e-learning database, 'The Hive' for all PACU and theatre staff to complete. A short list of multiple-choice questions were added to the module at the beginning and at the end, to gain an insight into the current levels of knowledge of the staff, but also to show the knowledge gained from completing the module. At the current time, 44 staff members have accessed the module, with 26 completing the pre-module quiz and 12, the post-module quiz. The average pre-module quiz result was 48.7% and the average post-module quiz result was 94.4%.

Conclusion: Overall the e-learning module has provided PACU staff with an online teaching platform to improve their understanding of tracheostomy care. Uptake has been moderate so far, but has shown a clear improvement to staffs' knowledge and we therefore hope this translates to patient care going forward. Overcoming of minor IT issues, including ensuring compulsory completion of the pre & post-module quizzes, to enable recipience of a completion certificate, will yield more outcome date. We also hope to explore the possibility for this module to be used in other hospital trusts within the South-West region.

Reference:

1. National Tracheostomy Safety Project [Internet]. http://www.tracheostomy. org.uk. [Accessed 11 April 2022]

11AP04-09
Predictive signs of difficult airways affecting airway management strategy in favour to awake fiberoptic tracheal intubation

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Background and Goal of Study: Airway management is the cornerstone of anaesthesia as the consequences of failure of airway management are devastating. Prediction of difficult airways can be challenging, and high accessibility of video assisted tracheal intubation has made most of the laryngoscopy and tracheal intubations easy. Aim of the study is to identify predictive signs of difficult airways when airway management strategy was changed in favour to awake fiberoptic tracheal intubation.

Materials and Methods: We conducted retrospective observational study and looked for General Anaesthesia (GA) cases with intubation where Awake Fiberoptic tracheal intubation was performed. Predictive signs for difficult airways were identified according to planned or urgently performed Awake Fiberoptic tracheal intubation. We also analysed adverse events like airway trauma, dislocation of endotracheal tube, oesophageal intubation and following ventilation issues after intubation. Statistical Package of Social Sciences (SPSS, $p < 0.05$).

Results and Discussion: In the period of 2018 -2021 we identified 135 cases where Awake Fiberoptic tracheal intubation was performed out of 50 186 cases with GA in our institution. The incidence of Fibreoptic intubation was 6.7 cases on every 10 000 GA annually. From 135 cases 102 (75.6%) were anticipated and awake. Patients mean age was 59.8 ± 14.08. Slightly more were males 54 vs. 48 with mean Body Mass index of 29.39 ± 6.5. Majority of cases were elective 90 (88.2%) vs 12 (11.8%) The most common predictive factors that were identified were previously known tracheal pathologies like, tracheal stenosis (n=32, 31%), tracheal dislocation (n=31, 30%), small mouth opening (< 30-35mm) (n=8, 7%) and Mallampati 2.7 ± 1.2. We did not identify any major adverse effects.

Conclusion(s): Estimated incidence of Awake Fiberoptic tracheal intubation in our institution is very low. The most common difficult airway predictive signs in favour to Awake Fiberoptic tracheal intubation were previously known tracheal pathologies, small mouth opening and relatively high Mallampati score.

11AP04-10
The accuracy of the data on endotracheal intubation in the National Hospital Ambulatory Medical Care Survey

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Background and Goal of Study: The National Hospital Ambulatory Medical Care Survey (NHAMCS) is a large sample of emergency department (ED) visits to hospitals throughout the United States of America. The accuracy and validity of these data on healthcare delivery have been questioned.1

An investigation of ED visits reported to have received endotracheal intubation (ETI) in the NHAMCS revealed errors in the recording of the performance of ETI and patient disposition.1 From 2000 to 2009 ETI was recorded in 875 of the 348,367 ED visits abstracted in the NHAMCS data.[2] However, 234 (26.7%) had dispositions which were incompatible with ETI.1

As the NHAMCS data provides unique insights it is important to determine whether its accuracy has improved.

Aim: This study investigates the frequency of apparent NHAMCS disposition discrepancies for visits with endotracheal intubation (ETI).

Materials and Methods: The NHAMCS data from 2014-2018 (101,376 ED visits) were reviewed to determine whether the ED visits for which ETI was reported to have been performed were associated with dispositions that were consistent with this (i.e. admission to a critical care unit, transfer to another non-psychiatric hospital or death).

Results and Discussion: Of 244 ED visits recorded as having ETI performed, 40 (16.4%) also required cardiopulmonary resuscitation, 1 was dead on arrival, 31 (12.7%) died in the ED. Thirty six (14.8%) were transferred to another non-psychiatric hospital. A total of 124 (50.8%) were admitted to critical care, operating rooms or cardiac catheter laboratories. The disposition of 192 visits (78.7%) was consistent with ETI. Review of the reasons for visit and the diagnoses of these visits were also consistent with the need for ETI. However, the dispositions of 52 visits (21.3%) were not consistent with ED ETI. These 52 visits included 9 for which the unit of admission of was recorded as unknown. Cross-reference with reasons for visit and diagnoses indicated errors in coding of both ETI and admission.

Conclusion(s): The ED disposition of one fifth of NHAMCS ED visits with ETI are inconsistent with this procedure. Concerns about coding remain. In view of the value of the NHAMCS data it is important to overcome these limitations.

Reference:

1. Green SM. Congruence of disposition after emergency department intubation in the National Hospital Ambulatory Medical Care Survey. Ann Emerg Med. 2013;61:423-426.e8. 10.1016/j.annemergmed.2012.09.010

11AP04-11
A fluoroscopic comparison between videolaryngoscope and macintosh laryngoscope for assessment of cervical spine mobility during tracheal intubation

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Background and Goal of Study: Laryngoscopy & tracheal intubation (LTI) requires extension of head and flexion of cervical joints, which can cause new onset neurological deficits in patients with cervical spine instability. The Video-laryngoscope is potentially more effective in reducing the cervical spine motion.
The primary objective of this study is to compare the degree of cervical spine motion fluoroscopically between Video-laryngoscope and Macintosh laryngoscope at three different time points during tracheal intubation.
Materials and Methods: After approval from IEC, 38 adult patients planned for elective surgery without any cervical spine pathology were randomized into two groups – Group VDL (Video-laryngoscopy) and Group MLS (Macintosh Laryngoscopy). The cervical spine movement during intubation was assessed by measuring angles - α (for movement at C1/C2) and β (for movement at C3) by lateral fluoroscopic images at T1 – Before intubation, T2 – during laryngoscopy at proper visualisation of vocal cords, T3 – post intubation. Additionally, intubation difficulty score (IDS), time taken for intubation and haemodynamic responses were also compared between the groups.
Results and Discussion: Both the groups were comparable with respect to patient demographics and airway characteristics. At T1, the mean alpha angles (84.05±0.80 vs 84.51±0.95; p=0.121) and beta angles (94.61±1.25 vs 94.82±1.31; p=0.617) were comparable between the groups.
The cervical spine motion was significantly lesser in Group VDL than Group MLS at both the time points T2 and T3, maximum movement being noted at T2 (10.37±1.61 degrees;12.28%).
The alpha angles at T2 were 78.08±0.67 vs 74.13±1.09 (p<0.001) and at T3 79.39±0.77 vs 76.51±1.06 (p<0.001). The beta angles at T2 were 92.55±1.10 vs 89.68±1.56 (p<0.001) and at T3 93.26±1.18 vs 91.74±1.15 (p<0.001).
Mean IDS was significantly lesser in Group VDL than Group MLS (1 vs 2.68; p<0.001). However, mean time taken for intubation was significantly more with VDL group (53.47±4.72seconds vs 43.89±3.35 seconds ;p< 0.001). Both the groups remained haemodynamically stable.
Conclusion(s): Compared with conventional Macintosh laryngoscopy, video-laryngoscopy results in significantly lesser degree of cervical spine movement and more ease of laryngoscopy and intubation, however time taken for intubation was more and both the groups remained haemodynamically stable.

11AP05-01
Successful use of transnasal humidified rapid-insufflation ventilatory exchange in a case of subglottic stenosis

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Background: Shared airway management in microlaryngeal surgery is challenging. Multiple airway management techniques have been described, but no gold standard exists. Transnasal Humidified Rapid Insufflation Ventilatory Exchange (THRIVE) during apnea is raising interest, but its use is limited by the lenght of the apnea time as published data report safety techniques of around 20 minutes. We report our technique to achieve a successful apneic oxygenation during a 55-minute procedure.
Case report: A 60-year-old female, ASA II (hypothyroidism and anxious syndrome), was proposed for dilation of a subglottic stenosis. Pre-oxygenation was performed with the Optiflow® MR810 during spontaneous breathing via nasal cannula (FiO_2 1.0) with a flow rate of 20 L/min for 3 min in a 45° head elevated position and increased to 40 L/min for 3 more minutes. Anesthesia was induced and then mantained with propofol, remifentanil and rocuronium. After loss of consciousness, jaw thrust with minimal mouth opening was applied to ensure a patent airway, and the high-flow nasal oxygen flow rate was increased to 60 L/min, and maintained throughout the apnea. Degree of inclination of head was reduced and the patient was ventilated via facemask to confirm it was easy.
The surgeon had difficulties during the laryngoscopy, which prolonged a procedure initially expected to be brief, and in between the attempts we ventilated the patient via facemask.
After surgery, the facemask was used to assist ventilation to wash out carbon dioxide. SpO2 remained above 98%, the highest PaCO2 value was 76.8 mmHg, highest lactate value was 0.6 mmol/L and lowest PH was 7.18.
After cessation of anesthetic infusion, the patient regained consciousness and was sent to the post-anesthesia care unit. The postoperative period was uneventful.
Discussion: In our case, THRIVE was effective in providing prolonged apneic oxygenation and tubeless anesthesia. Different from other reports, our patient was intentionally ventilated via facemask in three specific moments, allowing the prolongation of apneic oxygenation through 55 minutes without deleterious rise of carbon dioxide.
Reference:
Lucy Huang (2019). A review of the use of transnasal humidified rapid insufflation ventilatory exchange for patients undergoing surgery in the shared airway setting. Journal of Anesthesia
Learning Points: THRIVE may still be an answer for longer/complicated surgeries if brief ventilation via facemask is feasible during the procedure.

11AP05-02
Tracheal obstruction by nasal packing: one step short of extracorporeal resuscitation

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Background: Introduction of nasal packs (NP) is a common step in nasal procedures since they are used to prevent bleeding and synechiae. Their fixation is extremely important to avoid posterior aspiration and airway compromise.
Case report: A 46-year-old male with polymyositis underwent an elective septoplasty and inferior turbinoplasty in June 2021. A combined general anesthesia was administered and the intraoperative course was uneventful. At the end of surgery, a 7-cm NP was inserted bilaterally and external threads were tied over the nose.
Following extubation the patient presented agitation with manipulation of the nose requiring physical restraint. Soon afterwards he suffered a progressive drop of pulse oximetry until 75% with partial recovery once mask ventilation was initiated. At this point the loss of one NP was noticed and an examination of upper airway was performed with videolaryngoscopy before intubation, though NP wasn't found.
High airway pressures and the need of jet ventilation at FiO2 of 1 to maintain oxigenation over 80% raised the suspicion of aspiration. The use of a flexible endoscope confirmed a lower tracheal obstruction due to NP. A rigid bronchoscopy was immediately attempted but failed to progress inside the glottis. Furthermore, new orotracheal intubation couldn't be performed due to laryngeal edema and pulse oximetry was eventually lost.
Advanced CPR and emergent cricothyrotomy were initiated while femoral vascular access was obtained in case ECMO was needed. A 5 mm tube was inserted through cricothyrotomy and ventilation successfully restarted. Pulse was recovered and oxigenation rapidly improved to 100%. New rigid broncoscopy showed the NP in the subglottic space, from where it was easily removed.
The patient was admitted to ICU for controlled weaning. He presented no neurological damage and he was discharged after 48 h with no long-lasting complications.
Discussion: Airway obstruction is a life-threatening complication that can arise due to dislocation and aspiration of NP in nose procedures. Avoiding patient's manipulation of the nose and a post-fixation check of NP's external threads should be routinely performed. In extreme cases extracorporeal resuscitation should be considered.
Reference:
G.D. Perkins, et al., European Resuscitation Council Guidelines 2021.
Learning Points:
- Secure NP fixation and avoid nasal manipulation after nose surgery.
- Awareness of resuscitation techniques when ventilation is impossible.

11AP05-03
Case report: use of flow-controlled ventilation with the Evone® ventilator in minimally invasive surgery of laryngeal papillomatosis conditioning an 80% obstruction of the upper airway

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Background: The surgical management of laryngeal tumours is a challenge for Anaesthesiologists since they can lead to a difficult airway. When laryngeal tumours condition a high-grade obstruction of the upper airway it is often preferred to perform the surgery under tracheostomy, which can develop a negative impact on the patient. Flow-controlled ventilation (FCV) using the Evone® ventilator is a novel technique that enables an optimal ventilation of the patient through the Tritube®, a narrow endotracheal tube with an external diameter of 4.4 mm. The anaesthesiologist sets flow (F), end-expiratory pressure (PEEP), peak inspiratory pressure (PIP) and fraction of inspired oxygen (FiO_2) whereas respiratory rate (RR) and tidal volumes (VT) are calculated by the device according to the compliance of the respiratory system.
Unlike volume-controlled ventilation (VCV), expiration is actively performed, producing a linear decrease in the pulmonary airway pressure. We present a case in which this ventilation technique was successfully used.
Case report: 26-year-old woman affected by subglottic papillomatosis conditioning an 80% obstruction of the upper airway scheduled for partial laryngectomy using minimally invasive endoscopic surgery. Under standard monitorisation and high-flow nasal oxygenation, we performed conscious sedation and applied topic lidocaine on the oropharynx.
We proceeded orotracheal intubation with the Tritube® under spontaneous ventilation using a videolaryngoscope. Induction and maintenance of general anaesthesia were achieved with TIVA. Ventilation parameters were: F 12 L/min, FiO_2 0.3, PIP 14 cmH_2O, PEEP 6 cmH_2O, VT 430 mL, RR 14 breaths/minute.
Normocapnia and a pulmonary-protective ventilatory approach were assured throughout the procedure. Anaesthetic emergence was performed immediately after surgery. There were no post-operative complications and discharge was produced after 24 hours.
Discussion: FCV with the Evone® ventilator can be an alternative option to temporary tracheostomy when managing high-grade obstructions of the upper airway. Further research is needed in order to assess whether this technique results in a better outcome compared to current practice.
Reference:
Sebrechts T et al. Flow-controlled ventilation with the Evone ventilator and Tritube versus volume-controlled ventilation: A clinical cross-over pilot study describing oxygenation, ventilation and haemodynamic variables. Eur J Anaesthesiol. 2021.1;38(2):209-211.

11AP05-04
Does COVID19 execerbate postextubation negative pressure pulmonary edema?

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Negative pressure pulmonary edema(NPPE)occurs by increased intrathoracic negative pressure following inspiration against closed glottis or obstructed upper airway.[1] Postanesthetic laryngospasm is reported to be the reason in more than half of the cases.[2]
While both NPPE following general anesthesia and COVID-19 cause hypoxemia and respiratory distress,they can be easily misdiagnosed.
We aimed to discuss here a 17 year-old patient developed postanesthetic NPPE who had COVID19 infection history.
17 year-old male patient diagnosed with right hand phalanx fracture was scheduled for operative reduction. In his preoperative evaluation he has no comorbidities.Routine ASA monitoring was perfomed. After uneventful IV induction and adequate depth of anesthesia patient's trachea was intubated in the first attemp. Anesthesia was maintained with Sevoflurane and remifentanyl infusion. The surgery lasted approximately 1 hour with stable vital parameters and 750ml cristaloid infusion.After surgery was completed neuromuscular block was reversed and patient was extubated.
After that he devoloped laryngospasm accompained by cough, stridor and red frothy sputum afterwards, caused severe decrease in SpO_2 down to 60%.Although positive pressure mask ventilation was performed, SpO_2 could be increased up to 85%. He was transferred to recovery room with 10L/min oxygen and 85%SpO2. Nebulized adrenalin and salbutamol,40mg IV furosemide administered to patient.Patient was transferred to pediatric intensive care unit(PICU) with 8L/min oxygen mask, SpO_2%90. He was weaned off from oxygen 24hours later and transferred to inpatient care. He was discharged from hospital in his 3rd preoperative day.
NPPE is a highly underestimated in its incidence (0.01%).[2] There has been only a few cases in literature and most of them are young ASA1 patients undergoing minor operations.[2] Anesthesiologists should recognize it immediately to prevent major complications which may lead to cardiopulmonary arrest.
Furthermore, prolonged hypoxia is a well-known cause of a NPPE.[1] So COVID19 infections' itself may execerbate NPPE. Our patient also had a COVID19 infection with mild symptoms two months earlier than surgery. We recommend that anesthesiologists should be more careful about NPPE with patients who had COVID19 infection history.

References:

1. Silva [1]et all, Negative Pressure Pulmonary Edema: Report of case Series and Review of the literature, Anesthesiol2019
2. Holmes [1]Postoperative Pulmonary Edema in Young Athletic Adults AmJSportsMed1991

11AP05-05
Airway management in a patient with massive oral venous malformation: a case report

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Background: Vascular anomalies are classified in tumors or malformations. Head and neck anomalies are rare and might predict airway compromise.
Case report: A 44 year-old woman with a history of multiple vascular malformations (VMs) is scheduled for catheter embolisation of multiple VMs in the dorsum. The patient reported snoring and difficulties swallowing, and physical examination showed two VMs at the tongue. A computed tomography scan and a fiberoptic endoscopic evaluation showed the presence of a VM at the base of the tongue, located in a central position, falling into the vallecula. As a prone position was required by the surgical team, general anaesthesia with endotracheal intubation was planned. We induced the patient with propofol, remifentanil and rocuronium. Face mask ventilation was performed successfully and the patient was intubated with a 7.5 mm endotracheal tube with spiral reinforcement using a video laryngoscope with hyperangulated blade. The procedure went uneventful, the patient was extubated and discharged 6 hours later.

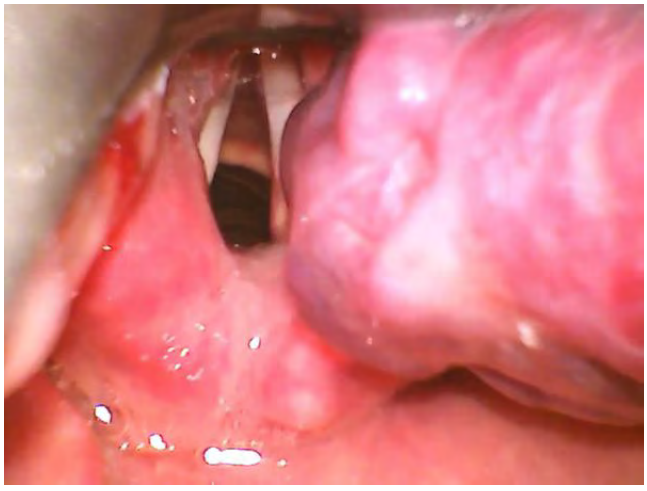

Fig. 1: VM visualised during videolaryngoscopy.

Discussion: Airway management should be planned thoroughly not only because these VMs may interfere with face mask ventilation and laryngoscopy, but because even minor manipulation might result in major bleeding[1]. Nowadays, with the upcoming development of videolaryngoscopy, the question is whether to perform awake fiberoptic intubation or to proceed with rapid sequence induction (RSI). If RSI is intended, supraglottic airway devices and surgical airway kit should be available in case of ventilation or intubation infeasibility. The use of a combination of videolaryngoscope and fiberoptic device during RSI or awake intubation has also been described and might have been an excellent choice for this case[2].

References:

1. Journal of Clinical Anesthesia, Vol. 4, Issue 6, 1992, Pages 498-502.
2. Anesthesiology 2022; 136:31–81.

Learning Points: Airway assessment and management should be carefully planned in patients with a history of head and neck VMs, especially with oral lesions. Guidelines for airway management should be followed and adjusted to our daily case practice.

11AP05-06
Prolonged use of High-Frequency Jet Ventilation (HFJV) provides adequate gas exchange during general anaesthesia both in supine and prone position

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Background: High-frequency Jet Ventilation (HFJV) has gained renewed interest in recent years for its ability to provide near-motionless organ conditions for ablation interventions. HFJV uses high respiratory frequency and low driving pressures via a thin cannula. One of the main challenges of HFJV is to avoid hypercarbia and barotrauma, particularly in patients with lung diseases. Herewith, we present two cases of prolonged use of HFJV during CT-guided tumour ablations in supine and prone positions in patients with respiratory comorbidities.

Case report: A 58-year-old man with BMI 31.2 kg/m^2 was treated with CT-guided cryoablation under general anaesthesia in the prone position for a 32-mm renal tumour. Its size and location required CO_2 dissection and laborious placement of ablation needles. After 3h of continuous HFJV in prone position, partial pressures of arterial O_2 and CO_2 were satisfactory (PaO_2 33.9 kPa, $PaCO_2$ 5.4 kPa, SaO_2 99.8%, FiO_2 60%).

A 73-year-old woman was treated with CT-guided radiofrequency under general anaesthesia in the supine position for a 19-mm hepatic tumour. Despite moderate persistent asthma and a previous lung resection (inferior left lobectomy), blood gas analysis was adequate after 115 minutes of HFJV (PaO_2 11.3 kPa, $PaCO_2$ 5.4 kPa, SaO_2 97.4%, FiO_2 50%).

The recovery room surveillance was eventless for both patients.

Discussion: Several interventions requiring immobility under general anaesthesia may benefit from the motionless breathing conveyed by HFVJ. Patients with respiratory comorbidities are often not candidates for HFJV because of concerns about barotrauma, air trapping or hypercarbia, which are mostly related to the potential obstruction of the expiratory flow.

Moreover, anaesthetists are sometimes prompted to switch from HFJV to conventional ventilation in published cohorts because of insufficient oxygenation or CO_2 clearance (1).

In our cases, HFJV did provide adequate gas exchange, despite prolonged administration (3h), patient position (supine and prone), obesity, previous lung surgery and asthma.

Reference:

Elkassabany et al. J Cardiothorac Vasc Anesth. 2012;26(3):433-8.

Learning Points: HFJV is feasible and very useful for percutaneous interventions. It can be safely provided even in patients with respiratory comorbidities both in supine and prone positions.

Patient's Consent: Written consent was obtained.

Conflicts of Interest: Nothing to declare

11AP05-07
Anticipated difficult intubation in a patient diagnosed with amyloidosis and cardiac involvement who was listed for urgent heart transplantation: a case report

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Background: Cardiac involvement is a common clinical presentation in patients with immunoglobulin light chain (AL) amyloidosis. Deposition of extracellular amyloid aggregates can compromise airway tissues as well, especially in the larynx.[1]

Case report: A 44-year-old male patient with AL cardiac amyloidosis was admitted with class III heart failure due to restrictive cardiomyopathy. After a regular response following diuretic treatment, the patient was considered for heart transplant (HT). During preoperative airway assessment the patient reported limited mouth opening; physical examination revealed a thyromental distance >5 cm, neck circumference <40 cm, and preserved cervical spine mobility. The main finding was an inter-incisor gap of 8 mm. Mallampati score and tongue size could not be evaluated.

We decided to perform awake nasal fiberoptic intubation and a percutaneous tracheostomy before performing the HT. We applied 2% lidocaine using the spray-as-you-go technique with a fiberoptic bronchoscope. After intubation was achieved, we induced general anaesthesia with a bolus of propofol and rocuronium.

General anaesthesia was maintained with propofol and remifentanil target controlled infusions. Percutaneous tracheostomy was performed by the surgical team safely and effectively. The patient required norepinephrine inotropic support during the procedure. The patient underwent an 18-day stay in the intensive car unit (ICU) on spontaneous ventilation through the tracheostomy cannula before HT occurred. Airway management during surgery was uneventful.

Discussion: Our main hypothesis was that amyloid deposits in the temporomandibular joint (TMJ) were the origin of mouth opening limitation. After neuromuscular blockade, mouth opening did not improve, which confirmed our hypothesis. Preoperative airway assessment predicted difficult face mask or supraglottic device ventilation as well as difficult intubation with either direct or videolaryngoscope.[2]

Flexible scope intubation is the gold standard for TMJ ankylosis.[3]

Performing a tracheostomy on the same day as the HT was avoided due to the high bleeding risk during extracorporeal circulation.

References:

1. Mayo Clin Proc. 2017;92(6):908-917.
2. Anesthesiology. 2022;136(1):31-81.
3. Ann Maxillofac Surg. 2016 Jan;6(1):54–7.

Learning points: Preoperative airway assessments are crucial in patients with cardiac amyloidosis. Anticipated surgical airways are a suitable option in scenarios like HT.

11AP05-09
Subglottic stenosis: an airway management case report

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Background: Subglottic stenosis (SS) consists of a narrowing of the airway diameter below the vocal folds and it is a rare but life-threatening condition that could be congenital or acquired. The most common cause of acquired SS is prolonged intubation and commonly occurs at the cuff of the tube. The recognition and management of these patients can pose a challenge for the anesthesiologist.
Case Report: A 26-year-old female patient was admitted for an urgent laparoscopic appendectomy. Her past medical history was significant for hypothyroidism and an esophageal atresia with elective admission to the intensive care unit of unknown duration. Furthermore, the patient also referred a tendency for recurrent respiratory infections since very young.
The pre-anesthetic evaluation revealed no apparent difficult airway stigmas.
After rapid sequence induction of anesthesia, an attempt at tracheal intubation was performed under direct laryngoscopy. A Cormack-Lehane grade I laryngoscopy was observed, and a 7.0mm endotracheal tube (ET) was attempted with difficulty in the progression below the vocal cords. Subsequent attempts were made with different operator and a 5.5mm ET but were not successful.
At this point, an AuraGain™ laryngeal mask (LM) was inserted without difficulty and a fibroscopy was performed through the LM with evidence of a SS.
Due to the nature of the surgery, we decided to proceed. The LM provided a good seal and allowed for controlled ventilation with acceptable peak pressures throughout the operation, including during pneumoperitoneum.
The procedure was uneventful, the patient made a full recovery and was referred to otorhinolaryngology.
Discussion: Despite being a rare entity, a SS presents a challenge for the anesthesiologist, especially if it is unknown, as in this case. The fact that this patient had an intensive care unit admission of unknown duration allied with the respiratory history were subtle clues of this finding. Therefore, taking a detailed medical history is essential.
Depending on the severity and location of the stenosis and the type of surgical procedure, there are a variety of choices for the perioperative airway management. In this case, placing a LM seemed to us the best option, due to the urgency of the surgery and the impossibility to pass an ET through the glottis.
Learning Points:
- Subtle findings with major impact in anesthesia management;
- Careful approach to specific and rare entities.

11AP05-10
High-flow nasal oxygen therapy: oxygenation proposal for sedation of patients suffering from advanced stage Amyotrophic Lateral Sclerosis

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Background: Sedation of patients suffering from Amyotrophic Lateral Sclerosis (ALS) can be quiet challenging. Dyspnea and dysphagia can result in hypoxemia and/or chocking. Choosing the best strategy in order to maintain an appropriate oxygenation is crucial for performing supportive treatments such as Percutaneous Endoscopic Gastrostomy (PEG). To the best of our knowledge this is the first case report of placement of PEG in ALS patient under High-Flow Nasal Oxygen (HFNO) therapy.
Case report: A 29-year-old female, ASA III, diagnosed with ALS 5 years ago, presenting with dysarthria and dysphagia besides quadriparesis was proposed for placement of PEG. Propofol and ketamine (total of 120 mg and 50 mg, respectively) was used for sedation and supplemental oxygenation was provided via nasal cannula (15L/min). Due to abundant accumulation of oral secretions and severe hypoxia (75%), the procedure was suspended. On the second try, 7 days later, we decided to preoxygenate and maintain the patient under HFNO (60L/min, FiO_2 93%). We sedated the patient with propofol and ketamine (total of 150mg, each) and SpO_2 was kept between 84-91% during the entire procedure. PEG was placed and weaning of HFNO was uneventful.
Discussion: Understanding the physiological changes and the risks of sedation of ALS patients is essential to choose the better strategy in order to avoid complications. We found case reports of placement of PEG in ALS patients under low flow oxygen therapy and non-invasive ventilation, but not under HFNO. HFNO improves oxygenation and prolongs safe apnea time when compared with facemask oxygenation [1].
Also, HFNO is believed to decrease dead space and, due to high flow, it creates positive nasopharyngeal pressure leading to an increase lung volume or recruit collapsed alveoli. The warm and humidified air prevents bronchoconstriction and improves mucociliary function, clearance of secretions and is associated with less atelectasis [2].
These features are especially important in ALS patients, since their ability to swallow and to cough is impaired and mucociliary clearance is weak.
References:
1. Song et al. BMC Anesthesiology (2022) 22:100
2. Nishimura Journal of Intensive Care (2015) 3:15
Learning points: HFNO should be seen as a good alternative to other conventional methods. Given the rarity and lack of recommendations or scientific evidence on how to proceed in these cases, we present a successful method, highlighting the HFNO as the great ally.

11AP06-02
Total left lung collapse and urgent laparotomy: preventing additional atelectasis during general anesthesia – a case report

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Background: Central airway malignancy can lead to atelectasis and lobar collapse. Inducing general anesthesia (GA) in such patients can be challenging, as it increases atelectasis. This case report describes the anesthetic approach of a patient with left lung collapse who presented for urgent laparotomy.

Case report: A 69-year-old female patient, with no known past medical history, presented to the ED with an incarcerated right crural hernia. CT scans confirmed the diagnosis and revealed total left lung collapse by a solid mass of suspicious malignancy in the left main bronchus.

Urgent laparotomy, with a xipho-pubic incision, segmental enterectomy and herniorrhaphy were proposed. ARISCAT Score predicted high risk (42,1%) for postoperative pulmonary complications (PPC). Standard ASA, anesthetic depth, and neuromuscular block (NMB) monitoring were applied. To avoid further atelectasis, intubation was performed during an 'awake' laryngoscopy. For this, bolus of a 20 mg/mL Ketamine and 20 mcg/mL Dexmedetomidine mixture were administered, until Video Laryngoscope tolerance. After topicalization of the larynx with 2% lidocaine, an orotracheal tube was introduced and GA induced. A lower thoracic epidural catheter was placed, for opioid-sparing analgesia.

Throughout the procedure, the patient remained hemodynamically stable, normocapnic and normothermic. At the end of surgery, she was extubated uneventfully. Non-invasive ventilation (NIV) was required for a few hours but was soon replaced for a nasal cannula (1-2 L/min). There were no further identifiable PPC during hospitalization.

Discussion: PPCs are common after laparotomy and increase mortality. Atelectasis develops with intravenous and inhalational anesthesia.[1] Ketamine may prevent it, mainly, due to chest wall muscle tone maintenance.[2] Other strategies include reducing perioperative opioids, appropriate use of NMB agents, postoperative NIV, and thoracic epidural analgesia. Strategies to reduce atelectasis during GA can modify prognosis and need to be addressed in high-risk patients such as this one.

Reference:

Tokics L, et al. Lung collapse and gas exchange during GA. Anesthesiology. 1987; 66; 157-67. Lagier D, et al. Perioperative Pulmonary Atelectasis: Part II. Anesthesiology. 2022; 136; 206-36.

Learning Points: Ketamine and dexmedetomidine during GA induction along with a thoracic epidural analgesia regimen present a valid alternative when urgent laparotomy is unavoidable in high-risk patients for PPC.

11AP06-03
Tritube endotracheal tube in management of the patient with predictors of difficult airway who is scheduled for removal of a long-standing foreign body. A case report

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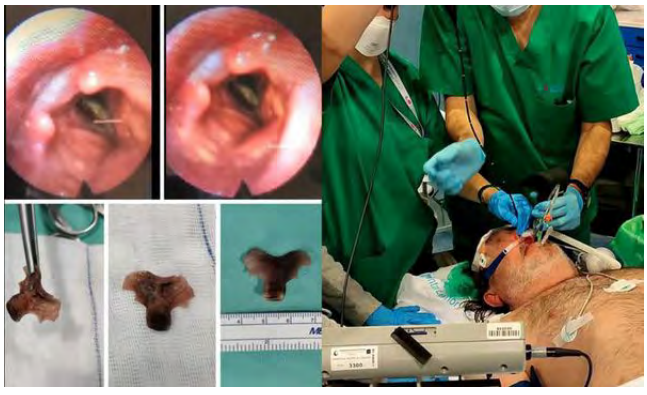
Background: Foreign body aspiration is rare in adults, and usually involves elderly patients with impaired airway protection mechanisms. Foreign body aspiration use to be the consequence of a lack of airway protective reflex due to contraction of the ventricular bands, with significant morbidity and mortality. Endoscopic treatment is the procedure of choice although some advocate surgery as a therapeutic method in chronic cases.

Case report: We present the case of a 56-year-old man who came to the emergency department with a sensation of hearing loss in the right ear. Examination revealed synechia and a foreign body in the subglottis. CT scan showed a linear hyperattenuated linear subglottic image contacting the anterior and posterior margin of approximately 2 cm with a small lower pseudonodular component with no malignancy criteria. Predictors of difficulty: obese, COPD, OSAHS with CPAP, Mallampati 4, teeth in poor condition, poor neck mobility, beard.

The patient was scheduled for surgery under general anaesthesia. Intubation was performed with Airtraq and Tritube placed under direct vision to the left of the foreign body, placing the balloon under it to avoid risks derived from bleeding during surgery or the piece falling into the carina or bronchi. Verification that the balloon was below the foreign body was performed by fibroscopy. The surgery was performed without incident.



Discussion: Due to the lack of specificity in the clinical presentation, foreign body are often evaluated with alternative diagnoses, which leads to a delay in treatment because they do not remember the history of aspiration. When there is no history of bronchoaspiration, a chest CT scan may help to detect. Foreign body removal is often difficult due to the presence of firm adhesions or granulomas, with

the added risk of impaction in the carina or bronchi, which can lead to asphyxia. Erosion of the tracheal or bronchial mucosa can lead to bleeding and even pneumomediastinum.
The Tritube is an endotracheal tube with an external diameter of 4.4 mm and cuff. Its small calibre and ventinova technology can be used for intubation and ventilation during surgical removal of the foreign body.

11AP06-04
Acute hypercapnic respiratory failure following the administration of palonosetron

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Background: Palonosetron, the 5-hydroxytryptamine 3 (5-HT3) antagonist, is commonly used antiemetics for both prophylaxis and rescue treatment for postoperative (PONV).
We present a case involving hypercapnia after palonosetron injection.
Case report: A 86-year-old man with hypertension was proposed for reversal of ileostomy. He was a nonsmoker with no history of pulmonary disease, but currently taking anti-tuberculosis medication. Anesthesia lasted 2 hours and 30 minutes.
After extubation, he was transferred to the ICU, during which the patient cooperated with breathing commands and arrived fully awake. Upon arrival to the ICU, oxygen is supplied via a face mask at flow rate of 6 L/min and arterial blood gas (ABG) sample is obtained. 0.075 mg of palonosetron was administered to prevent PONV, followed by 2 g of propacetamol for headache.
Over the next 30 minutes, the patient's consciousness deteriorated and he did not respond to verbal commands with an oxygen saturation of 98% by pulse oximeter. A repeat ABG showed hypercapnia with normal PaO2 and he was placed on noninvasive positive pressure ventilation (NIPPV).
Arterial CO2 tension dropped from over 94 to 33mmHg within a span of 2 hours from the start of NIPPV with concomitant improvement of patient's consciousness. NIPPV setting was subsequently adjusted downward in a gradual manner. NIPPV was applied for 6 hours and then replaced with a facial mask, after which his ABG values were still within an acceptable range (Table 1).

Elapsed time from palonosetron administration	Upon admit before administration	1 hours	3 hours	8 hours
pH	7.29	7.00	7.37	7.37
$PaCO_2$ (mmHg)	44	94	33	35
PaO_2 (mmHg)	118	116	237	84
HCO_3 (mEq/L)	20.4	22.8	18.4	20.0
Consciousness	Fully awake	Non-responsive	Fully awake	Fully awake
Ventilation mode	Facial mask 6L/min	Facial mask 6L/min	NIPPV (PS:5 cmH_2O, PEEP: 5 cmH_2O FiO2:0.7)	Facial mask 6L/min

NIPPV: noninvasive positive pressure ventilation, PS: pressure support, PEEP: peak end-expiratory pressure

Table 1. Arterial blood gas measures and ventialtion mode.

Discussion: There is evidence that 5-HT neurons are central respiratory chemoreceptors and the hypercapnic ventilatory response is reduced in mice with 5-HT neuron loss.[1]
In the present case, palonosetron was the drug most likely to cause hypoventilation due to the correspondence between the timing of its administration and the onset of symptoms.

Reference:
Hodges MR et al. The role of medullary serotonin (5-HT) neurons in respiratory control J Appl Physiol. 2010;108:1425-32.
Learning points: Despite normal anesthetic recovery, respiratory depression may occur for various reasons. Therefore, vigilance is always required.

11AP06-05
Negative transpulmonary pressure during positive pressure ventilation might be caused by airway closure instead of atelectasis – a case report

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Background: Several targets can be used to titrate positive end expiratory pressure (PEEP) after lung recruitment manoeuvres (LRM), including driving pressure, respiratory system compliance, lower inflection point of the volume vs. pressure curve, and also transpulmonary pressure (P_{tp}). It is usually assumed that a positive P_{tp} avoids atelectasis [1], whereas a negative P_{tp} occurs when alveolar pressure remains higher than airway pressure.
Conceptually, a negative P_{tp} is associated with collapse of peripheral airways or airway closure. The measurement of P_{tp} requires assessment of pleural pressure (P_{pl}) or its surrogate, oesophageal pressure (P_{es}) [2], which can be obtained with an air-filled tube connected to a pressure transducer [3]. P_{tp} at end inspiration (P_{itp}) = airway plateau pressure minus P_{es}. P_{tp} at end expiration (P_{etp}) = PEEP minus P_{es}.
Comparison between positive pressure ventilation (PPV) and spontaneous breathing (SB) opens de discussion on the existence of airway closure during PPV.
Case report & discussion: We report on a patient with obesity undergoing a pneumoperitoneum (PP) of 15 mmHg in beach chair position. Volume controlled ventilation with I/E = 1:2 and a tidal volume of 6 ml/kg LBW was used. A LRM was performed during tidal PPV by stepwise increase of PEEP from 0 to 20 cmH_20, followed by stepwise decrease of PEEP.
The P_{tp} during LRM were compared with SB before awakening. The P_{es} is usually 4 to 7 cmH20 higher than P_{pl}(2). Therefore we deducted 7 cmH_20 to avoid overdosing the PEEP and named this P_{tp}(cor).
During PPV and PP the P_{itp}(cor) & P_{etp} (cor) changed during LRM with a PEEP of 0; 5; 10; 15; 20; 15; 10; 5; 0 from -10 &-23 to -9 &-18; -5 &-10; 1 &-3; 3 & 6; 8 & 2; 1 &-2; -8 &-14 and -10 &-17 respectively. A PEEP of 15 was sufficient after a LRM with a PEEP of 20.
During PPV with 10 PEEP after PP it was 8 & 4 and during SB with 5 PEEP 13 & 8, zero PEEP 9 & 7 and ETT open 10 & 3.

During SB, P_{tp} was rather positive, suggesting that negative pressure ventilation might be useful to prevent airway closure. A PP during PPV required relatively high PEEP levels to achieve positive P_{tp}, which was more difficult during expiration than during inspiration indicates airway closure instead of atelectasis.

References:
1. Eichler L et al. Obes Surg. 2018;28:122-129
2. Pasticci I et al. J Appl Physiol 2020;128:78-86
3. Massion P et al. Intensive Care Med Exp. 2021;17:47

Learning points:
Airway closure and not atelectasis might be the problem of PPV during PP

11AP06-06
When regional anaesthesia fails in a predictable difficult airway

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Background: Rheumatologic diseases (RMDs), such as juvenile idiopathic arthritis, can lead to important anatomical changes associated with difficulty in approaching the airway.[1]

Case report: A 36-year-old female, with juvenile idiopathic arthritis and obstructive sleep apnea syndrome, was proposed for osteosynthesis of a tibial fracture under neuraxial anesthesia. The patient had a predictable difficult airway due to retrognathism, class 4 mallampati, limited mouth opening and reduced cervical mobility. Twenty minutes after performing the spinal block, the patient maintained little tolerance to the surgical incision and an incomplete neuraxial anaesthesia was assumed. Sedoanalgesia was tried as a complement to the previous technique. After administration of fractionated bolus of propofol, ketamine and fentanyl, the patient experienced respiratory arrest. Face mask ventilation was ineffective. The initial step was to approach the airway with direct laryngoscopy, which was unsuccessful. Other ineffective efforts were made with a videolaryngoscope, showing a grade 4 Cormack classification. Between attempts, patient position was optimized. The use of a supraglottic device was not feasible, with an inadequate fit due to her anatomical conformation. The patient became hemodynamically unstable. The emergency team and the otorhinolaryngologist were paged. A last blind attempt was made by a second anesthesiologist, using a McCoy blade and a frova before the surgical approach of the airway, with success.

Discussion: Knowledge of a difficult airway algorithm and it's early recognition allows us to create a structured plan and have solutions for possible complications.[2] A thorough preoperative assessment with a complete physical examination of the patients with RMDs is crucial to evaluate the severity of the disease and its implications in the airway management.

References:
1. Klinkhardt, C., Tanaka, P., & Adriano, A. Anesthesia for Patients with Juvenile Idiopathic Arthritis Current Practice: A Review. *The Open Orthopaedics Journal*, *14*(1);
2. Law, J. A., Broemling, N., Cooper, R. M., Drolet, P., Duggan, L. V., Griesdale, D. T. The difficult airway with recommendations for management–part 2–the anticipated difficult airway. *Canadian Journal of Anesthesia*, *60*(11), 1119-1138.

Learning Points: Prompt declaration of a "Can't Intubate, Can't Oxygenate" status is mandatory when the best effort to approach an airway has been unsuccessful and can dictate the survival of a patient.

11AP06-07
Airway and ventilation anesthesia concerns in Escobar syndrome

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Background: Escobar syndrome (ES) is a rare autosomal recessive disorder, characterized by cervical pterygia and craniofacial dysmorphism. Other problems such as kyphoscoliosis, limited cervical movement, pectus excavatum and pulmonary hypoplasia make anesthetic care a challenge. As a result of airway, pulmonary and chest deformities, airway management and ventilation become progressively more difficult with increasing age.

Case report: 15-year boy, 29 kg, ES, was admitted for definitive surgical correction of scoliosis. Previously performed 3 surgeries (bars placement and lengthening), without anesthetic complications. X-rays showed 12 levels thoracic scoliosis. Preoperative evaluation was unremarkable.

On airway assessment: restricted mouth opening, Mallampati II, Upper lip bite test I and no cervical mobility limitations. After ASA standard monitorization and anesthesia induction, we proceed to airway management with videolaryngoscopy (VL).

We faced a difficult airway: limited mouth opening and complete structures left deviation, Cormack-Lehane III, with BURP maneuver, was optimized for Cormack-Lehane IIb and we achieved orotracheal intubation.

After that, he has an event of desaturation with difficulty in ventilation associated with important hemodynamic instability. Immediately was asked help, increased FiO2 and flows. Pulmonary auscultation showed bilateral wheezes, so we administered corticosteroid and bronchodilator therapy.

After clinical stabilization, considering this complication and surgical complexity that required a prone position, was decided not to proceed with surgery. He was transferred to Pediatric Intensive Care Unit.

On a 2-month follow-up: he has the same functional capacity as before without respiratory symptoms. We plan a preoperative anesthetic evaluation to optimize care to be successful in next intervention.

Discussion: ES characteristics should be considered for safe and effective anesthetic management and anticipate the risk of difficult airway management and ventilation, regardless of anesthetic history. In this clinical scenario, we used VL in airway management. After intubation, due to severe bronchospasm and surgery complexity was decided to defer surgery.

Learning Points: When anesthesiologists faced rare diseases, like ES, should consider that airway deformities intensify with age. Preoperative evaluation is essential in anticipating possible difficulties and is an opportunity to implement strategies to manage airway and ventilation.

11AP06-08
Head and neck arteriovenous malformations and surgical treatment: airway management evolution

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Background: Proper airway (AW) management in head and neck surgeries is one of the main concerns of the anesthesiologist. Surgical treatment of arteriovenous malformation (AVM) appears to be effective, but has a high rate of complications and second look surgeries. Bleeding and AW viability are the most feared complications for anesthesiologists[1]. The paradigm shift based on our experience could be an example.

Case report: A total of fifteen patients with AVM have been treated with surgery for eight years. All the patients reviewed were treated with embolization before the surgery. Initially, five of the patients were operated with orotracheal or nasal tube. A surgical tracheotomy was made in the other ten patients before surgery. In the first group, when a second surgical procedure was required, an emergency surgical tracheotomy was performed because of bleeding or AW edema, which took place to a critical situation.

Meanwhile, when a tracheostomized patient in the second group had complications like bleeding or required second surgical treatments, the AW management was not an issue at all. For this reason, in our daily practice, we have protocolized tracheostomy previous AVM surgery or embolization.

Discussion: Prior studies to our review demonstrated that embolization 48-72 hours before surgery decreased bleeding during or after surgery[2]. However, there are not standards regarding the possibility of surgical tracheotomy in order to prevent the risk of AW compromise or reintubation due to the need of second surgeries. Thanks to AVM embolization and tracheostomy prior to surgical intervention, we have obtained better results and less length of hospital and critic units stay, although a detailed statistical study has not been done.

References:

1. Apfelbaum JL, Hagberg CA, et. al. American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Practice guidelines for management of the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. Anesthesiology. 2013;118(2):251-703.

2. J.Y. Kim, D.I. Kim, et. al. Surgical treatment for congenital arteriovenous malformation: 10 years' experience. Eur J Vasc Endovasc Surg. 2006; 32:101-106.

Learning points: High index of airway complications like bleeding or edema occurs after AVM surgery. Surgical tracheotomy before the surgery had reduced that and had improved airway management in second-look surgeries.

11AP06-09
Respiratory Failure in PACU due to residual neuromuscular blockade

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Background: Neuromuscular blockade is associated with improved airway conditions for intubation and superior conditions for surgical interventions[1].

Residual neuromuscular blockade is defined by a TOF-ratio <0.9 using quantitative neuromuscular monitoring and has an incidence of up to 26% in Portugal (2013)[2].

Case report: A 75-year-old woman underwent laparoscopic left colectomy due to colorectal cancer. She had hypertension, diabetes mellitus, dyslipidemia, obesity grade 2 (105kg) and hypothyroidism. Laboratory studies, thyroid and renal function were normal. Anaesthesia was induced with propofol, rocuronium and fentanyl, and maintained with desflurane. A perfusion of rocuronium at rate 13ml/h (2mg/ml) was maintained until 30 minutes before surgery ended.

At the end of the surgery qualitative neuromuscular monitoring was TOF-2 (Train-Of-Four 2 twitch) and 200mg sugammadex was given. She was extubated without complications. For post-operative analgesia was administered paracetamol 1000mg, parecoxib 40mg, metamizol 2000mg and tramadol 100mg. After 1 hour at PACU, the anesthesiologist was called by the PACU nurse because of a change in her behavior and difficulty breathing.

At arrival, the patient wasn't breathing and did not respond to painful stimuli. Reintubation decision was made, and the patient was ventilated. After reviewing the patient history, 200mg of sugammadex was administered and after waiting 1 minute the patient was following orders and bucking the endotracheal tube.

After explaining the situation to the patient, the endotracheal tube was removed and the patient was able to breathe normally. She was transferred to the intermediate care unit for follow-up. After 3 days at the intermediate care unit, the patient was transferred to the surgery ward and after 5 days was discharged to home.

Discussion: Residual neuromuscular blockade is an important factor for critical respiratory events during PACU stay. This case clearly shows the need for using quantitative monitoring as a daily practice while using non depolarizing neuromuscular blocking agents despite the use of sugammadex.

References:

1. Murphy, G. S. et al. (2022) doi:10.1097/ALN.0000000000004044

2. Esteves, Simão et al. (2013), doi:10.1097/EJA.0b013e32835dccd7

Learning points: In this clinical case we report the importance of use quantitative neuromuscular monitoring even in cases where sugammadex is used. Qualitative neuromuscular monitoring is not recommended to guide sugammadex dose.

11AP06-10
The unexpected difficulties of an airway approach – a case report

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Background: Pregnancy poses a challenge for airway management because of its anatomical and physiological changes and association with higher rates of failed intubation. Adequate planning is the cornerstone to avoid morbidity and mortality. It includes ensuring the availability of the portable storage unit for difficult airway management.
Case Report: A 37-year-old pregnant patient was admitted to the labor ward with the diagnosis of placental abruption with fetal death and disseminated intravascular coagulation. An urgent cesarean delivery was proposed for hemorrhage control. No stigma of difficult airway were found during evaluation so rapid sequence induction of general anesthesia was performed and proceeded by an intubation attempted. Direct laryngoscopy with a Macintosh blade identified a Comarck-Lehane grade 3, as only the epiglottis was visible. At this point, the difficult airway algorithm was initiated and help from the most experienced anesthesiology was asked. Patient's positioning was improved and a second and third failed attempts were performed with a videolaryngoscope and different blades. A frova was requested from the portable storage unit for difficult airway and was unavailable. Between each attempt ventilation and oxygenation were maintained resorting to a face mask and a supraglottic device. The patient then regurgitated, so it was decided to wake her up and successful awake intubation with bronchofibroscopy was performed. The remaining procedure and extubation was uneventful.
Discussion: Obstetric patients present an increased potential for unpredictable difficulty airway, aggravated by a lower tolerance to apnea and an increased risk of gastric regurgitation. Creating a plan for a safe airway management and ensuring that all equipment is immediately available in the portable storage unit is mandatory. Recognizing the situation, asking for specialized help and knowing when to interrupt the procedure are key points to minimize undesirable outcomes.
References:
1 - https://doi.org/10.1111/anae.13260;
2 – https://doi.org/10.1097/ALN.0000000000004002
Learning Points:
- Planning an airway management should consider the possibility of an unexpected difficult airway and the plan should be discussed with the obstetric team.
- The difficult airway algorithm as well as the portable storage unit for difficult airway should be reviewed frequently.

11AP06-11
The bleeding upper airway: a multidisciplinary approach to bleeding of unknown origin

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Background: Airway management in cases of severe bleeding in the upper airway may be challenging, and its failure is a relevant cause of airway-related death.[1] This report describes a case of suspected airway bleeding, highlighting the importance of a multidisciplinary approach in decision making regarding airway management.
Case report: A 51-year-old man was admitted to our emergency room presenting cough with severe oral bleeding of no identified source, dysphagia, and dysphonia. He had a personal history of arterial hypertension, cigarette smoking, and alcohol-associated liver disease with portal hypertension and esophageal varices.
He was coughing up bright red blood and there were doubts whether its source was from his respiratory or gastrointestinal tract. In order to secure the airway, awake orotracheal intubation was emergently done under fibroscopy. Upper gastrointestinal endoscopy showed no alterations. Evaluation by otorhinolaryngology was not conclusive and gauze packing was performed to achieve hemostasis. A CT scan of the neck and thorax was performed and showed a neoformative mass in the base of the tongue causing partial obstruction of the airway, as well as imagiological findings of aspiration pneumonia. He was then admitted in the intensive care unit.
Discussion: Establishing a definitive airway must be a priority when bleeding in the airway is suspected. It can be proven difficult because of impeded vision, and multiple strategies must be previously outlined, as traditional airway management may be impossible. Awake flexible videoguided intubation was the chosen technique, as airway assessment suggested that intubation after rapid sequence induction (RSI) might fail, mostly because of profuse upper airway bleeding. An experienced anesthesiologist, intensivist, and otorhinolaryngologist should be part of the team managing and securing the bleeding upper airway.
References:
1. Kristensen, M. S., & McGuire, B. (2020). Managing and securing the bleeding upper airway: a narrative review. Canadian Journal of Anesthesia/Journal canadien d'anesthésie, 67(1), 128-140.
Learning points: Securing emergent airway can help in preventing aspiration and asphyxiation. Despite its limitations, airway evaluation is critical to decide whether an awake technique, rather than a RSI, would be a safer approach. A stepwise approach to secure the airway should be followed, as well as a multidisciplinary discussion to manage intra and postoperative care.

Transfusion, Haemostasis and Thrombosis

12AP01-01
Thromboelastometry analysis of the heparin-like effect in the intra-operative period of orthotopic liver transplantation: an observational clinical trial

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Background and Goal of Study: Orthotopic liver transplant (OLT) can be followed by significant coagulopathy and the heparin-like effect (HLE). However, as the HLE may lead to important changes in blood coagulation, the objective of this study was to assess the prevalence of HLE in a cohort of patients undergoing liver transplantation.
Materials and Methods: This was a observational study including 50 patients ≥ 18 years of age who were submitted to OLT and monitored using ROTEM® delta, including 36 patients with altered INTEM coagulation time (CT) and 14 patients with normal INTEM CT. Samples were collected during the procedure to analyse the HLE.
Results and Discussion: Mild to moderate HLE was observed in 34% (17/50) of patients during surgery. Severe HLE was observed 10% (5/50) during surgery. Total 1-year survival was 80% (40/50) and mortality, 20% (10/50) (4% (2/5) with severe HLE in at NP; 5.9% (1/17) with mild/moderate HLE in OS and in at NP, respectively, and in 11.8% (2/17) at AP, died 1-month postoperative). The transfusion of patients with severe HLE was (median [IQR]: red blood cells 3 [0.5-9.2] units), and those with mild/moderate HLE was (median [IQR]: red blood cells 1 [0.0 -2.0] and cryoprecipitate 10 [9.0-15.0] units). In the INTEM CT analysis, the average neohepatic phase (327.9 ± 161.1 s) was significantly prolonged when compared to OS (266.5 ± 134.4 s) and AP (253.02 ± 75.4 s); P = 0.013, respectively.
Conclusion(s): The prevalence of HLE was considerable in neohepatic phase. In severe HLE, a high risk of mortality was identified in the neohepatic phase and a higher frequency of transfusion of red blood cells regardless of the surgical phase.
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12AP01-02
Prophilatic correction of fibrinolysis with epsilon aminocaproic acid diagnosed by tromboelastometry during orthotropic liver transplantation

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Background and Goal of Study: Orthotropic liver transplantation is a highly complex procedure, with may also be difficult to control intraoperatively in patients with coagulopathies.
The present study aimed to evaluate the correction of hyperfibrinolysis with epsilon aminocaproic acid and coagulation management through thromboelastometry (ROTEM) during orthotropic liver transplantation
Materials and Methods: Patients were randomized into 2 groups: one group received aminocaproic acid (20 mg/kg/h) before surgical incision until the end of orthotropic liver transplantation, and a control group received a similar volume of 0,9% saline solution. Blood was collected for fibrinolysis analysis and coagulation shock using the ROTEM assays (EXTEM and FIBTEM).
Results and Discussion: Twenty-four patients received aminocaproic acid and twenty-six received saline. In the analysis of the fibrinolytic and hemostatic coagulation profile by ROTEM. hiperfibrinolysis was significantly less frequent in the group of patients treated with aminocaproic acid (P<0,001) when compared to those in the control group . In the other EXTEM and FIBTEM analyses, there was no significant difference.
Conclusion(s): Although the administration of aminocaproic acid did not reduce the transfusion of blood products and/or synthetic products administration, this drug effectively treated hyperfibrinolysis and no complications related to this use were observed.
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12AP01-03
Burn induced coagulopathy in severely burned patients - Croatian national burn center report

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Background and Goal of Study: Acute hyperinflammatory state after severe burn injuries affects clot formation and may lead to burn induced coagulopathy (BIC). According to some studies, BIC is associated with increased morbidity and mortality, but the incidence, prognostic value and clinal significance of BIC remain unclear due to different criteria and study designs in previous studies.
This retrospective study was designed to document blood coagulation alterations of severely burned patients.
Materials and Methods: Patients eligible for this study were adults (18 years and older), with total body surface area (TBSA) burned 20% or higher who were admitted to the Burn intensive care unit (BICU) from 1 Jan 2016 to 1 Sep 2022. Exclusion criteria were first-degree burns, electrical injuries, use of anticoagulants prior to burn injury and missing data of coagulation tests <12 hours after the injury.
Out of 193 patients admitted to the BICU, 50 patients were included in the study.
The following BIC diagnostic criteria were applied: an international normalized ratio (INR) > 1.5 [or prothrombin time (PT) < 60%], activated partial thromboplastin time (APTT) > 45 seconds, platelets < $100x10^9$/L or fibrinogen < 1 g/L on admission. Results are expressed as mean and standard deviation.
Results and Discussion: Patients were divided into three groups due to the extent of TBSA burned. Out of 50 patients included in the study, 5 patients (10%) met our criteria for BIC; 4 patients had an elevated PT and 1 had an elevated APTT. None of them had elevation of both parameters. All 50 patients had normal fibrinogen and platelet levels. Results are shown in Table 1.
Similar studies presented opposing results, Sherren et al demonstrated that 39.3% of severely burned patients met criteria for coagulopathy on admission. On the other hand, Lu et al concluded that major burn injury was not associated with BIC.

	PT (%)	INR	APTT (sec)	Thrombocytes (G/L)	Fibrinogen (g/L)
20-40% TBSA (N=28)	87.57 ± 14.97	1.08 ± 0.1	24.64 ± 2.73	262 ± 98	2.83 ± 0.85
40-60% TBSA (N=11)	91. 45 ± 12.68	1.05 ± 0.07	24.99 ± 2.85	325 ± 183	2.99 ± 1.47
>60% TBSA (N=11)	78.73 ± 13.87	1.13 ± 0.11	27.93 ± 6.16	349 ± 154	2.73 ± 0.56

Table 1.

Conclusion: Our study showed that severe coagulation alterations are not common in severely burned patients. Due to insufficient understanding of the pathophysiology and opposing study results, consensus on how best to diagnose BIC is still lacking. Further research using newer technologies such as Thrombin generation assay and Rotational thromboelastometry is highly recommended.

12AP01-04
Haemostasis patterns in patients with acute-on-chronic liver failure and acute decompensation of cirrhosis including thromboelastometric tests with and without the addition of protac: a pilot study

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Background and Goal of Study: Thromboelastometry is considered the best method to assess haemostasis in liver disease, but its diagnostic performance could be improved by adding protein C activators such as thrombomodulin or Protac®.
We assess the changes in ROTEM parameters after the addition of Protac® in patients with acute-on-chronic liver failure (ACLF), acute decompensation (AD), and healthy individuals (HI), to define a different haemostasis pattern, considering standard and velocity ROTEM parameters, and to assess whether Protac® can improve this pattern definition.
Materials and Methods: In a pre-test, we investigated whether diluted EXTEM reagent improves the effect of Protac® on clotting time (CT)-ratio with and without Protac®. Consecutively 10 ACLF, 20 AD patients and 21 HI were included in the main study. Comparison between groups were conducted with either the Fisher Exact test or the Mann-Whitney test. ROC curve analyses were performed to differentiate patients with liver disease from healthy subjects.
Results and Discussion: Standard EXTEM was used in the main study. INTEM CFT, INTEM A5 (inverse), and INTEM TPI (inverse) were the best parameters to differentiate liver disease from HI (ROC AUC, 0.921, 0.906, and 0.928, respectively; all *P-values < 0.001*). Combining INTEM CFT with EXTEM LI60-ratio only slightly improved the diagnostic performance (ROC AUC, 0.948; *P<0.001*). EXTEM LI60 and INTEM maxV-t were the best parameters to differentiate between ACLF and AD patients (ROC AUC, 0.743, *P=0.033*; and 0.723, *P=0.050*; respectively). Combining EXTEM LI60 + INTEM maxV-t moderately improved the diagnostic performance, (ROC AUC, 0.81, *P<0.001*).
Conclusion(s): ROTEM velocity, fibrinolysis parameters and calculated indices improve the diagnostic in combination with standard parameters (e.g., CFT and A5). Ratios calculated with and without Protac® (e.g., EXTEM LI60-ratio) only slightly increased the diagnostic performance to discriminate haemostasis patterns.
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2. Tripodi A, Primignani M, Lemma L, Chantarangkul V, Dell'Era A, Iannuzzi F, et al. Detection of the imbalance of procoagulant versus anticoagulant factors in cirrhosis by a simple laboratory method. Hepatology. 2010;52(1):249-55.

12AP01-06
Monitoring the impact of splenectomy on coagulation and platelet function in adult liver transplantation recipients with rotational thromboelastometry (ROTEM Delta and Platelet). An observational study

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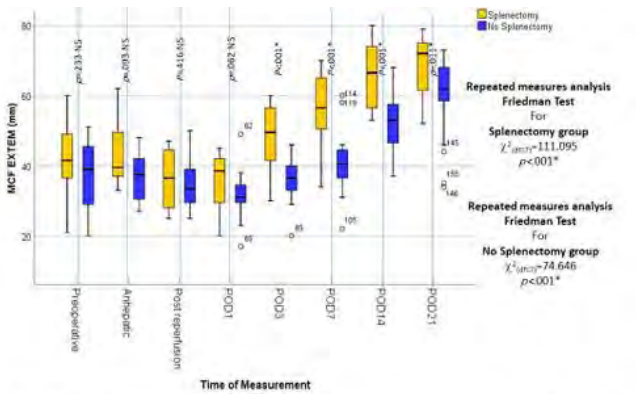
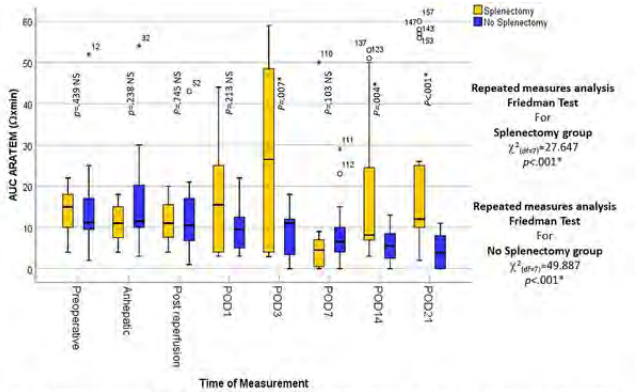
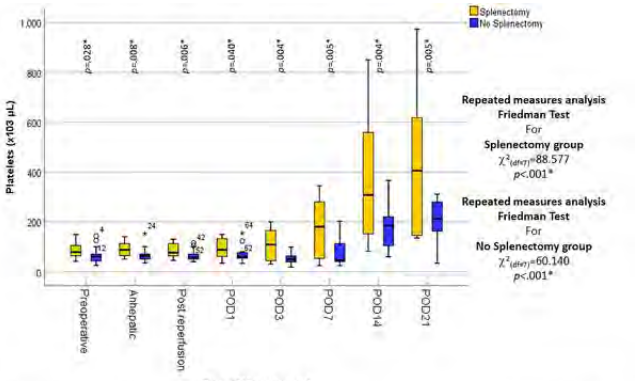
Background and Goal of Study: Splenectomy during living donor liver transplant increase portal vein flow and reduce small for size graft syndrome. Primary aim was to assess splenectomy effect on platelets functions by the rotational thromboelastometry (ROTEM Delta and Platelet).
Methods: PACTR201908864897857. Splenectomy (n=20) vs. no splenectomy (n=20). Platelets numbers and ROTEM platelet function parameters as area under the curve (AUC) for ARATEM, ADPTEM and TRAPTEM (Ohm.min) were monitored, as well as ROTEM MCF (mm) for EXTEM and INTEM. Times: perioperative and postoperative days (POD) 1, 3, 7, 14 and 21. Heparin infused for 2 PODs at 60-180 U/kg/day. LMWH sc (40 mg/24h) POD 3-21. Oral Acetyl salicylic acid (ASA) if platelets >50 (x10^3 μL).
Results and Discussion: Platelet count and functions were low preoperative, but significantly increase by POD 14 and 21, particularly following splenectomy.
Platelet count correlated with AUC ARATEM, ADPTEM and TRAPTEM (p<0.001), and with MCF EXTEM and INTEM (p<0.001). ASA effect was only observed among ARATEM but not with ADAPTEM and TRAPTEM. In splenectomy gp one recipient suffered from portal vein thrombosis and another from hepatic artery thrombosis. No platelets were infused at any time.
Conclusion(s): Platelet number and function recovers fully in two weeks and this increase was significant following splenectomy This happens prior to hospital discharge when recipients are least monitored.
Acknowledgements: Eman Awad. Anesthesia, Menoufia University, Egypt. Klaus Goerlinger, Medical Director TEM Innovations, Munich, Germany



Box and whisker graph of MCF EXTEM (mm) in the studied groups (Normal reference 50-72 mm), the thick line in the middle of the box represents the median, the box represents the inter-quartile range (from 25th to 75th percentiles), the whiskers represents the minimum and maximum after excluding outliers (black-filled circles).



Box and whisker graph of AUC ARATEM (Normal reference rage: 70-153 Ωxmin) in the studied groups, the thick line in the middle of the box represents the median, the box represents the inter-quartile range (from 25th to 75th percentiles), the whiskers represents the minimum and maximum after excluding outliers (black-filled circles).



Box and whisker graph of Platelets (x 10^3 µL) in the studied groups, the thick line in the middle of the box represents the median, the box represents the inter-quartile range (from 25th to 75th percentiles), the whiskers represents the minimum and maximum after excluding outliers (black-filled circles).

12AP01-07
The antiplatelet effect of oral acetyl salicylic acid as monitored by rotational thromboelastometry following transplantation with and without splenectomy. An observational study

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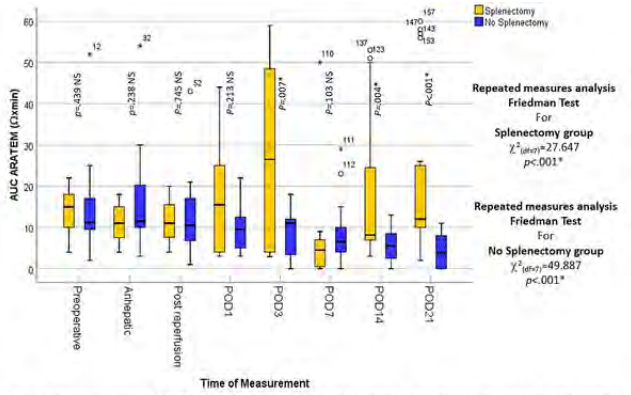
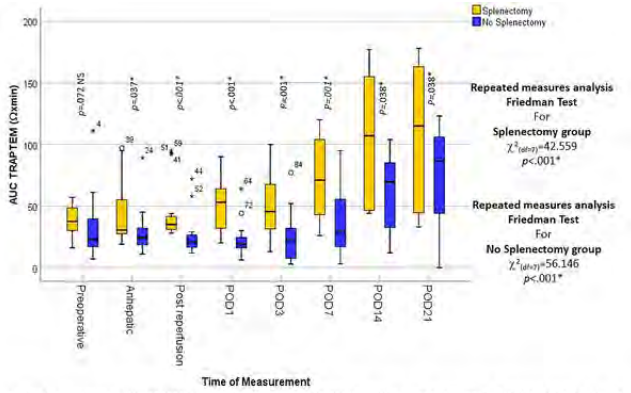
Background and Goal of Study: Splenectomy results in thrombocytosis. Primary aim was to assess the postoperative effect of oral acetyl salicylic acid (ASA) as monitored by rotational thromboelastometry (ROTEM Delta and Platelet) among recipient with and without splenectomy
Methods: PACTR201908864897857. 40 consecutive recipients: Splenectomy (n=20) vs. No splenectomy (n=20). Platelet function was monitored with the area under the curve (AUC in Ohm.min) of ARATEM (activation with archidonic acid), ADPTEM (adenosine diphosphate) and TRAPTEM. Oral ASA was administered postoperative whenever platelet count were >50 (x10^3 μL).
Results: ASA administered earlier in splenectomy group 8/20 on POD 3 vs. 0/20 in no splenectomy gp. On POD7 14/20 in Splenectomy gp required ASA while only 10/20 in non-splenectomy gp.

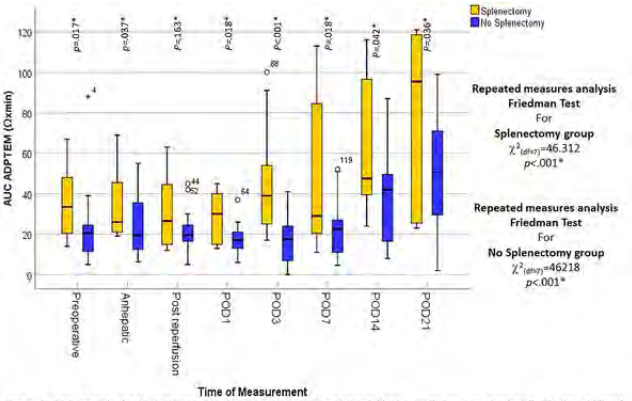
On POD14 and 21 20/20 in each gp. ASA reduced the increase in AUC of ARATEM between POD 7 and 21, but exerted no effect on ADAPTEM and TRAPTEM as in figures. No postoperative platelet or blood were transfused.



Box and whisker graph of AUC ARATEM (Normal reference rage: 70-153 Ωxmin) in the studied groups, the thick line in the middle of the box represents the median, the box represents the inter-quartile range (from 25th to 75th percentiles), the whiskers represents the minimum and maximum after excluding outliers (black-filled circles).



Box and whisker graph of AUC TRAPTEM (normal reference range: 55-154 Ωxmin) in the studied groups, the thick line in the middle of the box represents the median, the box represents the inter-quartile range (from 25th to 75th percentiles), the whiskers represents the minimum and maximum after excluding outliers (black-filled circles).



Box and whisker graph of AUC ADPTEM (normal reference range: 40-112 Ωxmin) in the studied groups, the thick line in the middle of the box represents the median, the box represents the inter-quartile range (from 25th to 75th percentiles), the whiskers represents the minimum and maximum after excluding outliers (black-filled circles).

Conclusions: Splenectomy significantly increased platelet count and functions on POD 3, but not before. This postoperative period need to be monitored to avoid excessive increases. ASA depressive effect was only expressed by ARATEM, while other platelet activation pathways as ADPTEM and TRAPTEM were least affected' Few individual recipients demonstrated platelet hyperactivity.

Acknowledgements: Alaa Aiad Anesthesia and Heba Abdallah Clinical Pathology, Menoufia University, Egypt

12AP01-08
High volume colloid infusion and restrictive fibrinogen substitution are risk factors for intraoperative allogeneic blood transfusion in pediatric and adolescent scoliosis surgery

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Background and Goal of Study: Corrective procedures in pediatric and adolescent scoliosis surgery (PASS) are associated with a high risk of allogeneic transfusions, which have multiple adverse effects on patient outcome. We aimed to identify modifiable risk factors for allogeneic transfusion in PASS patients.

Materials and Methods: We retrospectively analyzed all long-distance PASS procedures performed at our institution from 07/2018-06/2020. Descriptive statistics were reported as median (IQR, min-max). 35 potential risk factors were investigated using simple logistic regression. Parameters showing significant association ($p<0.05$) with the need for allogeneic transfusion were analyzed using multiple logistic regression to investigate their role as independent risk factors.

Results and Discussion: We analyzed 124 patients (incl. 22 patients with Duchenne muscular dystrophy and 20 with spinal muscular atrophy) of whom 72 received intraoperative allogeneic transfusion with a volume of 12.1 (11.85; 4.26-60) mL/kg. Four patients received fresh frozen plasma and in one patient thrombocytes were transfused. 106 patients received autotransfusion using intraoperative blood salvage (IBS) of whom 68 also received allogeneic blood. Patients with and without allogeneic transfusion did not significantly differ in preoperative standard laboratory results (hemoglobin, platelet count, INR, pTT, fibrinogen, factor XIIIa activity). Table 1 shows selected results.

	All patients (n=124)	Allogeneic transfusion (n=72)	No allog. transfusion (n=52)	p-value
Age [years]	14,13 (2,98; 13,08-20,75)	13,75 (2,94; 10,75-20,75)	15,25 (4,07; 11,33-21,33)	0,0119
Cobb angle pre OP [°]	80 (37,5; 16-143)	88,5 (39,75; 32-143)	72 (34,25; 16-142)	<0,0001
Hemoglobin pre OP [g/dL]	14 (1.8; 9.8-17)	13.8 (1.85; 11-17)	14.2 (1.7; 9.8-16.7)	n.s
Platelet count pre OP [10^3/µl]	265 (79; 111-540)	268 (103; 132-540)	255 (71; 111-425)	n.s.
Fibrinogen pre OP [mg/dL]	256 (86,7; 153-484)	254 (89,2; 153-484)	264 (84,7; 167-424)	n.s.
Factor XIIIa activity [%]	74 (20; 34-127)	73 (17; 34-122)	74,5 (22; 47-127)	n.s.
Fibrinogen substitution [mg/kg]	71,17 (68,23; 0-312,5)	93,75 (88,13; 0-312,5)	45,23 (55,69; 0-142,9)	<0,0001
Ratio: RBC volume (incl. IBS) / fibrinogen substitution [mL/g]	170,5 (144; 0-1170)	222 (113; 105-1170)	45,23 (55,7; 0-142,9)	<0,0001
ISB volume [mL/kg]	6,26 (7,4; 0-33,75)	8,31 (8,62; 0-33,75)	4,16 (6,67; 0-19,42)	0,0009
Minimum MCF (maximum clot firmness) FIBTEM [mm]	12 (4; 4-25)	11 (5; 4-25)	12,5 (4, 7-22)	0,0415
Hemoglobin post OP [g/dL]	9,5 (2,28; 5-16,8)	9,5 (2,26; 6,1-15,9)	9,6 (2,28; 5-16,8)	n.s.
Fibrinogen post OP [mg/dL]	173 (66,5; 46-307)	163 (65; 46-256)	198 (61,2; 120-307)	<0,0001

Table 1.

We identified the following independent risk factors (AUC-ROC curve 0.9188):
1. Duration of surgery,
2. Colloid infusion >33mL/kg,
3. Ratio of red blood cell volume (allogeneic + IBS) to fibrinogen substitution (mL/g).

Because of its retrospective design conclusions should be drawn carefully.

Conclusion(s): Our results support a liberal fibrinogen substitution regimen in PASS patients and underline the problems that come with the infusion of large colloid volumes. Duration of surgery depends on the degree of deformity and is modifiable only to a certain degree.

12AP01-09
Perioperative direct oral anticoagulants monitoring: monACOD survey

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Background and Goal of Study: Nowadays both vitamin K antagonist and direct oral anticoagulants (DOAC) are used for chronic oral anticoagulation. Lack of routinely monitoring is one of the main benefits offered by DOAC. Nevertheless, some circumstances may require DOAC monitoring by a specific test. Thus, the European Society of Anaesthesiology and Intensive Care (ESAIC) and the European Society of Regional Anaesthesia & Pain Therapy (ESRA) recommend measure the DOAC plasmatic level before performing a deep block or a neuraxial anaesthesia in patients with renal disfunction.

Nevertheless, the knowledge and the availability of these test is unknown. Then, we aimed to establish the chance of perioperative DOAC monitoring in real life.

Materials and Methods: We designed a transversal and observational study based on a survey that we sent to the Spanish Anaesthesiologist by means of the *Sociedad Española de Anestesiología, Reanimación y Terapéutica del Dolor*. We performed a descriptive analysis with Excel program (Microsoft, Redwood, Mississippi, USA).

Results and Discussion: Between the 4th of May and 23rd of July 2022, 149 questionnaires were fulfilled, the 67% of them about a public hospital with more than 300 beds. A method for DOAC monitoring was available only in 21% of cases, being the viscoelastic test the most common test (18%). It should be pointed out that 48% of hospitals didn't have any method for DOAC monitoring. Besides, 31% of Anaesthesiologist who answered were unaware about these test availability in their own hospital.

When asking by group of drugs, anti-Xa DOAC (rivaroxaban, edoxaban, apixaban) plasmatic levels may be measured with specific antiXa test in 39% of hospitals, but only 18% were 24x7 available. In addition, 49% of Anaesthesiologist couldn't give this information. Somewhat worse is the situation with dabigatran, that can be monitored only in 21% of cases and 7x24 in 8%

This survey reflects how difficult can be implementing ESAIC/ESRA recommendations in Spain due both to the low availability of specific test and to the lack of awareness between our colleagues. Then, there is high need of training and promotion about how and when DOAC plasmatic levels should be assessed.

Conclusion(s): This survey shows not only the little availability, but also the scarce knowledge, about the ACOD monitoring among anaesthesiologists.

Reference:
Eur J Anaesthesiol 2022;39:100-32.

Acknowledgements: To our colleagues who has answered the survey.

12AP01-10
Prothrombin complex concentrates use and blood product transfusions in liver transplantation: a systematic review and meta-analysis

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Background and Goal of Study: Prothrombin complex concentrates (PCCs), which are a heterogeneous group of plasma-derived products with partly purified vitamin k-dependant clotting factors, are increasingly used to correct coagulation defects. Using PCCs over fresh frozen plasma (FFP) offers several advantages, including a low infusion volume, immediate availability, and lack of blood group specificity. The utility of PCCs is unclear in patients with end-stage liver disease. The main aim of this systematic review was to assess the effectiveness of PCCs in reducing transfusion requirements in patients undergoing LT.

Materials and Methods: This systematic review of non-randomized trials was performed according to PRISMA guidelines. We systematically searched CENTRAL, PubMed/MEDLINE, Embase, Scopus and grey literature up to 5th August 2022. The primary outcome was the mean number of transfused units for each blood product, including red blood cells (RBCs), FFP, platelets (PLTs), and cryoprecipitate in patients who received PCCs compared to patients who did not receive PCCs. Secondary outcomes included incidence of thrombosis, acute kidney injury (AKI) and haemodialysis, hospital and intensive care unit (ICU) length of stay (LOS). The risk of bias was assessed through the Newcastle-Ottawa scale, and random effect meta-analysis was used in the analyses.

Results and Discussion: Five cohort studies comprising 663 patients were included in this review.

PCCs use, compared to no PCCs, did not affect transfusions of RBCs (MD:0.27, 95%CI:-1.88,2.42;p=0.81;I^2=93%), FFP (MD:-1.53, 95%CI:-3.78,0.71;p=0.18;I^2=87%), and cryoprecipitate (MD:0.13, 95%CI:-0.54,0.80;p=0.71;I^2=0%) units.

A greater amount of PLTs was administered in the PCCs group (MD:0.88, 95%CI:0.26,1.49;p=0.005;I^2=0%).

One study showed the incidence of haemodialysis was reduced in the PCCs group (3.8%vs 35.6%). No significant difference in AKI incidence, thrombosis, hospital and ICU LOS between the two groups was detected.

Conclusion(s): Currently, we only have preliminary observational studies on the use of PCCs showing no efficacy in reducing RBCs, FFP and cryoprecipitate transfusions during LT. The greater requirements of PLTs in the PPCs groups should be interpreted with caution, as the quality of the evidence is limited by selection bias. Randomised controlled trials (RCTs) on PCCs use in this setting are needed to establish the optimal composition, dose and timing for effective administration and safety.

12AP01-11
Procoagulation status and coagulation factor levels in patients experiencing thromboembolic events in a randomised, controlled Phase 2 study of fibrinogen concentrate and cryoprecipitate for treatment of bleeding in patients undergoing major cytoreductive surgery

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Background and Goal of Study: The prospective, randomised, controlled Phase 2 FORMA-05 study compared efficacy and safety of human fibrinogen concentrate (HFC) versus cryoprecipitate for maintaining haemostasis in bleeding patients undergoing cytoreductive surgery for pseudomyxoma peritonei. In this *post-hoc* analysis we assessed coagulation status and coagulation factor levels in patients who developed thromboembolic events (TEEs) during the study.
Materials and Methods: Patients undergoing PMP surgery with predicted blood loss ≥2 L were randomised to HFC (4 g) or cryoprecipitate (2 pools of 5 units), as needed. Assays EXTEM A20 and FIBTEM A20; plasma fibrinogen, coagulation factor and von Willebrand Factor (VWF) levels; and platelet count were measured perioperatively
Results: Patients received cryoprecipitate (N=23) or HFC (N=21). No patients in the HFC group developed TEEs. In the cryoprecipitate group, 2 patients experienced deep vein thrombosis (DVT) and 5 patients experienced pulmonary embolism (PE). The DVT patients appeared to have a preoperative procoagulant status, indicated by FIBTEM A20 (*Figure 1*), higher preoperative plasma fibrinogen (80.4% vs. 60.7%), and platelet count (65.4% vs. 59.7%) compared with patients who did not experience TEEs. The five patients who developed PE showed a disproportionate increase in VWF measured by ristocetin cofactor intraoperatively (post-administration) which was retained postoperatively (*Figure 2*).
Conclusion(s): No major differences in fibrinogen concentrate or coagulation parameters were seen in patients treated with HFC versus cryoprecipitate. However, patients who developed DVT appeared to have a more procoagulatory status prior to surgery, and patients developing PE had higher VWF cofactor levels after surgery start. Further research may allow pre-operative identification of these patients to minimise TEE risk.

12AP01-12
Analysis of intraoperative consumption of blood components and blood products in orthotopic liver transplantation (OLT) during the introduction of rotational thromboelastometry monitoring with ROTEM™ in a medical center: retrospective cohort

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Background and Goal of Study: In 2015, we incorporated ROTEM™ delta (Tem International, GmbH, Germany) at our institution for the monitoring of OLT patients. Our goal is to determine whether there was a reduction in blood component consumption in the intraoperative period since this approach was taken.

Materials and Methods: Single center retrospective cohort study including all adult patients (≥18 years old) who underwent OLT between January 2014 and December 2019. Medical records were reviewed collecting date of surgery, laboratories values, number of intraoperative blood products transfused (packed Red blood cells (pRBC), plasma (FFP), platelets (PLT) cryoprecipitate (CRY), fibrinogen concentrate (FC), prothrombin complex concentrates (PCC), ROTEM™ monitoring and 30-day mortality. Median and interquartile range (IQR) were established for each variable. To analyse the ROTEM™ monitoring effect, Multivariate Nonparametric Analysis of Variance for multiple outcome variables and multiple linear regression with quadratic transformation of the independent variable time were used to model the consumption of blood components over time. A p-value > 0,05 was considered significant (Stata 14.1 (StataCorp, Texas, USA) and R software (The R Foundation)).
Results and Discussion: We included 176 adult patients who underwent OLT. A significant reduction in blood components units is shown in Table 1. In the multivariate analysis, the use of ROTEM™ showed a significant effect for the reduction of blood products transfused during the intraoperative period (p= 0,0001) (Figure 1). Post-hoc tests showed statistically significant differences between groups with and without ROTEM™. 30-day mortality showed no significant differences (p=0,240).

Blood products	2014 (n=27)	2015 (n=23)	2016 (n=29)	2017 (n=36)	2018 (n=26)	2019 (n=35)	p value
Hemocomp. (U) median (IQR)	38 (16-58)	38 (20-43)	18 (7-23)	6,5 (1-18)	4,5 (0-15)	2 (1-7)	0,0001
pRBC	5 (2-8)	6 (3-8)	2 (0-4)	2 (0-4)	1,5 (0-5)	2 (1-4)	0,0001
FFP	14 (8-21)	12 (6-17)	6 (2-8)	1 (0-5,5)	0 (0-4)	0 (0-2)	0,0001
PLT	9 (6-16)	12 (6-14)	7 (4-12)	0 (0-7)	0 (0-4)	0 (0-0)	0,0001
CRY	7 (0-15)	5 (0-10)	0 (0-7)	0 (0-0)	0 (0-0)	0 (0-0)	0,0001
FC (g) median (IQR)	0 (0-2)	2 (0-2)	2 (0-3)	2 (0,5-4)	1,5 (0-4)	2 (1-4)	0,0062
PPC (x10^3 IU) median (IQR)	0 (0-1,5)	0 (0-1,2)	0,5 (0-1)	1 (0-1,5)	0,75 (0-2)	1 (0-1)	0,6687

Table 1.

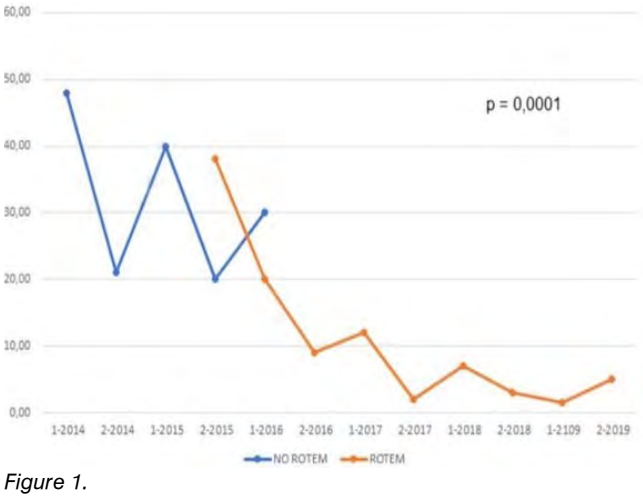

Figure 1.

Conclusion: Our study showed a significant reduction in total and individual intraoperative consumption of blood components in patients undergoing OLT with the introduction of ROTEM™ as a haemostatic monitoring method.

12AP02-02
Transfusion-associated circulatory overload prior to deceased donor kidney transplantation: is there a role for POCUS?

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Background: Blood transfusions are often necessary for surgical patients and pose a risk for serious adverse events. Amidst them, transfusion-associated circulatory overload (TACO) and transfusion-related acute lung injury (TRALI) are the leading causes of morbimortality[1]. In both scenarios, early diagnosis is mandatory to improve outcomes. In the operating theatre (OT), where diagnostic tools may be limited, point-of-care ultrasound (POCUS) could prove essential.
Case report: A 66-year-old male with membranous glomerulonephritis and chronic kidney disease (CKD) on peritoneal dialysis was admitted for kidney transplantation from a deceased donor. Anticoagulation with warfarin due to chronic pulmonary embolism was reversed with 10ml/kg of fresh frozen plasma. On admission to the OT, the patient presented orthopnoea, tachypnoea, hypoxemia, tachycardia, and hypertension. Auscultation revealed diffuse rales and crackles. POCUS showed B-lines and preserved cardiac contractility. Treatment with diuretics, vasodilators and non-invasive ventilation was unsuccessful. He was intubated and underwent haemodialysis in the OT, removing 3L of fluids. TACO was confirmed with the improvement of respiratory function and changes to POCUS pattern, which showed A-lines predominantly. Transplant surgery was carried out uneventfully. At ICU, continuous dialysis and mechanical ventilation were maintained for 72 hours, and discharge occurred on the seventh postoperative day.
Discussion: POCUS might be essential during emergencies in the OT, where transfers for imaging in other facilities may be unfeasible. For this patient, delays could compromise the kidney transplant's success.[2] Also, TACO and TRALI are life-threatening complications with challenging differential diagnoses, and the transplant should be suspended in the case of TRALI. Moreover, clinical aspects that define TACO, such as rapid improvement after diuretic administration, may be of limited use in CKD patients. Although radiographs remain the suggested approach in the literature[1], POCUS hastened diagnosis and treatment in this case, making it possible to proceed with the transplant and favourably impact patient outcome.
References:
1. https://doi.org/10.1182/blood-2018-10-860809
2. https://doi.org/10.1007/s11916-020-0847-0
Learning Points: Although not a part of current protocols, POCUS may accelerate diagnosis and guide the treatment of selected transfusion reactions.

12AP02-03
Generalized tonic-clonic seizure after tranexamic acid (TXA) therapy in elective orthopedic surgery

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Background: Antifibrinolytic drugs, such as tranexamic acid (TXA), have been increasingly used to reduce the risk of bleeding.[1] However, its use is associated with a higher incidence of postoperative seizures. This case report aims to highlight a possible adverse effect of TXA and emphasize the importance of its recognition to avoid subsequent adverse outcomes.
Case report: We present a 72-year-old male patient with hypertension and iatrogenic hypothyroidism, no neurological history, with gonarthrosis proposed for Total Knee Arthroplasty under neuroaxis block by sequential technique, with 12,5mg hyperbaric bupivacaine and 0,0025mg sufentanil for the subarachnoid block and subsequent administration of 67,5mg epidural ropivacaine. During the surgical procedure, a single dose of 1.5g intravenous TXA was administered. Antibiotic prophylaxis was performed with cefazolin (3g). 1g paracetamol was also administered. The surgery was uneventful.
No intercurrences occurred for the first 7 hours, when the patient presented with a 5-min tonic-clonic seizure of spontaneous resolution. In the following 48h no new neurological episodes were detected and the patient was discharged. To date no new neurological episodes have occurred.
Discussion: TXA is associated with an increased risk of postoperative seizures, which typically occur within the first 5 to 8h after administration, are usually tonic-clonic and persist for a few minutes. Risk factors include high doses of TXA, female gender, and age over 70.[2] Nevertheless, low doses of TXA are also associated with an increased risk of seizures.[1]
In this case, tranexamic acid was probably the most likely cause of this seizure. Thus, we present this case to alert to the possibility of seizures after low doses of TXA administration, in patients with few risk factors.
References:
1. Lin, Z., & Xiaoyi, Z. (2016). Tranexamic acid-associated seizures: A meta-analysis. *Seizure*, *36*, 70–73. https://doi.org/10.1016/j.seizure.2016.02.011
2. Lecker, I., Wang, D. S., Whissell, P. D., Avramescu, S., Mazer, C. D., & Orser, B. A. (2015). Tranexamic acid–associated seizures: Causes and treatment. *Annals of Neurology*, *79*(1), 18–26. https://doi.org/10.1002/ana.24558
Learning Points: Antifibrinolytic drugs remain an important and effective intervention in reducing blood loss. However, they have some side effects, such as seizures, and it's important to quickly recognize them to act and prevent further occurrences.

12AP02-04
Not everything is what it seems: rebalanced hemostasis in hepatic transplantation

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Background: Patients with liver disease acquire a complex disorder of hemostasis. Routine coagulation tests are frequently abnormal and point to a hypocoagulable state, leading to unnecessary blood products transfusions. It has been shown that changes in both pro and antihemostatic pathways are present, known as a hemostatic rebalance, which explains both hemorrhagic and thrombotic state[1].
We described a case of emergent hepatic transplantation in a patient with severe alteration of coagulation times in whose case viscoelastic tests proved otherwise.
Case report: A 45-year-old male, without previous medical history, in severe acute liver failure after wild mushroom consumption. Analytics showed a severe prolongation of coagulations tests without active hemorrhage. The patient proceeded to urgent liver transplantation where viscoelastic tests played a key role. Thromboelastogram results contradicted the laboratory findings supporting the decision to proceed with the proposed procedure without prophylactic correction of the coagulation abnormalities with no complications throughout.
Discussion: The prophylactic correction of hemostatic abnormalities before invasive procedures is a common conduct that may not be supported by viscoelastic tests[1].
Viscoelastic testing is widely accepted for hepatic transplantation and in which conventional coagulation tests are not useful[2].
Their usage alters the course of action, guiding transfusions throughout the different phases of the transplant[3].
This case points out the true value of viscoelastic testing in a patient that conventional coagulation tests pointed erratically to a probleeding state.
References:
1. Ton Lisman, Robert J. Porte; Rebalanced hemostasis in patients with liver disease: evidence and clinical consequences. Blood 2010; 116 (6): 878–885.
2. Lara N. Roberts; Rebalanced hemostasis in liver disease: a misunderstood coagulopathy. Hematology Am Soc Hematol Educ Program 2021; 2021 (1): 485–491.
3. Achintya D. et all. Cirrhotic coagulopathy: A rebalanced hemostasis. Cleveland Clinic Journal of Medicine Sep 2022, 89 (9) 523-533.
Learning points: Rebalance hemostasis is a concept that plays an important role in patients with severe liver disease. Point-of-care viscoelastic testing is a vital tool in the management of this patients that stand in a fine balance between hemorrhagic and thrombotic complications allowing precise corrections in the hemostasis process, aiming for a patient-tailored transfusion strategy.

12AP02-07
Perioperative management of IgA deficient patients

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Background: Patient blood management reduces blood product (BP) consumption in the periop setting. However, high bleeding risk interventions require the availability of BPs. Patients with selective IgA deficiency (SIgAd) are susceptible to allergic reactions (AR). Severe IgA-related anaphylactic transfusion reactions (ATR) have been published for SIgAd patients with anti-IgA antibodies; here IgA deficient BPs are indicated.
Case Report: A 39-year-old pregnant patient (G2P1) presented with a medical history of several ARs following the intake of non-NSAIDs. The allergological work-up showed a SIgAd. The PBM was decided on an interdisciplinary basis; the diagnostic and treatment plan (DTP) was aligned accordingly (flow chart not shown due to space). Laboratory re-evaluation of the IgA levels confirmed prior findings (IgA*<0.01g/L). Due to persistent breech presentation of the fetus, a caesarean section (CS) was indicated and scheduled for the 38 week of pregnancy. Washed RBCs were provided as we assumed a potential clinical benefit in a multi-allergic, pregnant SIgAd patient. Anaesthesia induction and the course of CS were uneventful. Carbetocin (1mg/kg) and tranexamic acid (10mg/kg) were administered prophylactically. However, the patient developed a grade II AR following the administration of 0.05mg/kg piritramide, which was effectively treated.
Discussion: SIgAd is the most common immunodeficiency disease, but little is known about the causality between the presence of anti-IgA antibodies as a trigger of ATRs. [1,2]
Finally, no BPs were required and one could debate whether the time and effort invested in the DTP was worthwhile, especially since the patient had neither an ATR nor an immunisation risk. The patient's multiple ARs determined the decision for the extended diagnostics and made it reasonable to us to choose the safest treatment pathway.
This decision was made in the knowledge that two RBCs would be discarded well before their shelf life expired - given the shortage of products, this is a point that should also be included in the risk-benefit analysis. The patient had an AR associated with a pain medication. In patients susceptible to ARs, any administration of medication must be followed with increased attention.
References:
1. Yazdani, R. et al. (2017), Scandinavian journal of immunology 85 (1), S. 3–12.
2. Sandler, S. et al. (2015), Transfusion 55 (1), S. 199–204.
- Indication for washed RBCs -Co-morbidities associated with sIgAd relevant for anaesthesia

12AP02-08
Evaluation of the treatment of preoperative anemia in orthopedic surgery during 2022

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Background and Goal of Study: Preoperative anaemia is common in the surgical patient. Orthopedic surgery is responsible for a high consumption of blood products. As preoperative hemoglobin (Hb) is the main independent predictor of blood transfusion, treatment of anemia before surgery is essential. We decided to audit the results during ongoing 2022, once conditioning due to Covid-19 has ended.
Materials and Methods: All patients scheduled for orthopedic surgery are screened for anemia. We audited patients undergoing hip and knee arthroplasty as these are the most common procedures. Givent the evidence that
Hb is an independent predictor of transfusion as well as postoperative morbidity, it seems reasonable to consider a Hb value lower than 13 g/dl as inappropriate. We therefore treat anaemic patients depending on the type of anaemia with EPO, iv iron or other nutrients. In our audit we checked preoperative Hb value, Hb value after treatment, minimum postoperative Hb and need for transfusion.
Results and Discussion: 14 patients scheduled for primary hip or knee arthroplasty were found anemic. Mean preoperative Hb was 11.8 g/dl. After treatment mean Hb value raised up to 12.5 g/dl. For organizational reasons, not all patients could be treated at the appropriate time. If we set a cut-off point at 20 days of treatment before surgery, we observe that mean Hb increase was of 1.5 g/dl, while if treatment started later mean increase was of just 0.1 g/dl. Hb globally dropped to a mean of 10.3 g/dl. None of the treated patients were transfused, but 23% of our treated patients avoided transfusion due to preoperative anaemia treatment and following increase of Hb value.
Conclusion(s): Treatment of preoperative anemia is a key point in saving allogeneic blood. Thanks to a multimodal approach, transfusion rate has been gradually decreasing in recent years. Despite having a small number of patients, we note that not only treatment is important, but it is also important to do it in advance, setting a cut-off of minimum 3 weeks before surgery. We believe it will be useful in the future to determine the impact of preoperative anemia treatment on an accelerated functional recovery in these patients, as well as as well as continuing to audit our work in order to be able to confirm what these preliminary figures indicate.
Reference:
Canillas et al. “Patient blood management” in orthopedic surgery. Rev Esp Cir Ortop Traumatol 2015 May-Jun;59(3):137-49.

12AP02-09
Preoperative anemia and long term outcomes after colorectal surgery in a well-established enhanced recovery after surgery program

J. Ripolles-Melchor[1], J. De Ramón-Suárez[1], P. Chaib-Gutierrez[1], A. Ruiz-Escobar[1], C. Moreno-de-Alborán[1], A. Abad-Gurumeta[1]
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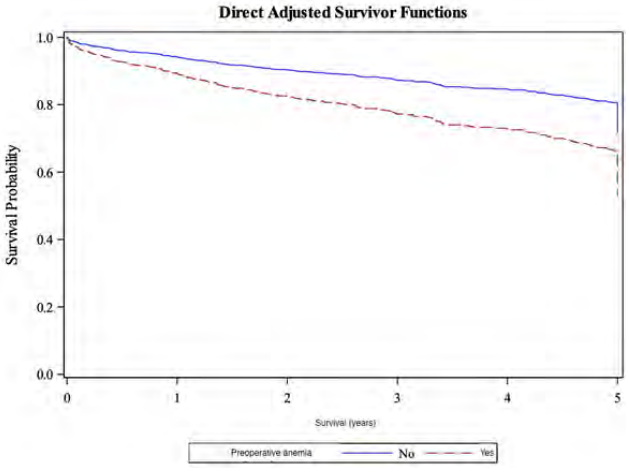
Background and Goal of Study: Preoperative anemia is common in patients with colorectal cancer (CRC) and is increasingly optimized before surgery. Our goal was to evaluate the prevalence and short- or long-term effects of preoperative anemia in patients undergoing CRC surgery in the context of a well-established enhanced recovery after surgery (ERSA) program (1).
Materials and Methods: Patient demographic data, operative details, and postoperative outcomes were recorded. overall survival calculated with the Kaplan-Meier log rank method and Cox proportional hazard regression based on anemia preoperative anemia.
Results and Discussion: A total of 750 patients with a mean age of 70± 12.6 years were included. The mean preoperative Hb was 12.6±2 g/dL. 368 Patients were preoperatively anemic, more patients with preoperative anemia received intraoperative and postoperative RBC transfusion.
Anemic patients did not have more postoperative complications but had a shorter hospital stay compared to anemic patients. (6 (IQR 5-11) vs 7 (IQR 5-13)). Anemic patients at the time of surgery had lower OS at 5 years (53.9% vs. 44%, $p < 0.05$). median survival time was 5 [IQR 0.8-5] years in non-anemic patients and 3.42 [IQR 0.5-5] years in patients with preoperative anemia. Although modifiable, preoperative anemia is still common, despite the introduction of patient blood management programs and recognition in ERAS guidelines as a key treatable perioperative element, its optimization is not yet well established.The results of this study show the importance of recognizing and treating preparative anemia with long-term oncologic outcomes.



Conclusion(s): Patients with preoperative anemia have a higher risk of non-survival at 5-year follow-up compared to patients without preoperative anemia in patients undergoing CRC surgery within an ERAS program.
Reference:
1. Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review. JAMA Surg. 2017;152(3):292-298.

12AP02-10
Long-term effects of anemia at discharge after colorectal surgery in the context of a well-established enhanced recovery after surgery program

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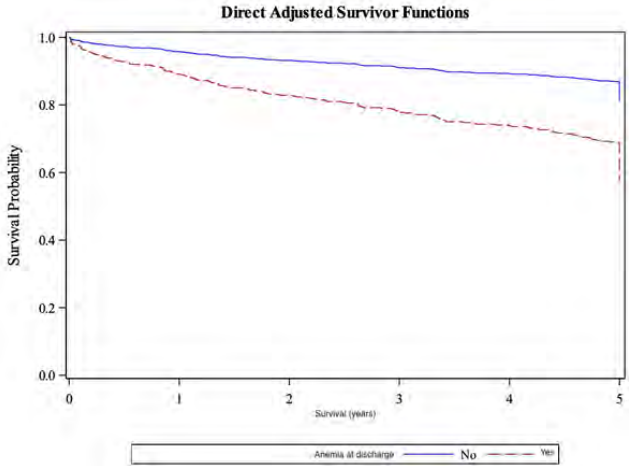
Background and Goal of Study: Little attention is given to the prevalence and consequences of postoperative anemia. We aimed to evaluate the prevalence and short- or long-term effects of anemia at discharge after colorectal surgery in the context of a well-established enhanced recovery after surgery (ERAS) program.
Materials and Methods: Patient demographic data, operative details, and postoperative outcomes were recorded. overall survival calculated with the Kaplan-Meier log rank method and Cox proportional hazard regression based on anemia at discharge.
Results and Discussion: A total of 750 patients with a mean age of 70± 12.6 years were included. The mean Hb at discharge was 11.6± 1.8 g/dL. 9.2% patients received perioperative RBC transfusion.
Anemic patients at discharge did not have more postoperative complications but had a longer hospital stay compared to anemic patients. (7 (IQR 5-13) vs 6 (IQR 5-11)). Anemic patients at discharge had lower overall survival (HR 95 CI 2.663 (1.619- 4.379) p < 0.001). median survival time was 5 [IQR 1.1 -5] years in patients without anemia at discharge and 4.2 [IQR 0.6-5] years in those patients with anemia at discharge.These results imply that ERAS programs should rethink the approach to anemia, not only focusing on the management of preoperative anemia, but also on the management of postoperative anemia, since its presence reduces the probability of survival at 5 years.



Conclusion(s): Anemia at the time of discharge after elective colorectal cancer surgery within an ERAS pathway is common and has a negative impact on long-term overall survival.

12AP02-11
Investigation and management of preoperative anaemia in an international cohort of patients undergoing major abdominal surgery

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Background and Goal of Study: Preoperative anaemia is frequent in surgical patients and it is associated with poor outcomes. International guidelines recommend detection and treatment of preoperative anaemia before elective surgery. Adoption of these guidelines may vary between centres and countries.
The aim of this analysis was to assess adherence to preoperative management of anaemia and the association with postoperative outcomes in an international cohort of patients undergoing major abdominal surgery.
Materials and Methods: POSTVenTT was a prospective, multicentre, international observational cohort study, including adult patients undergoing major emergency or elective abdominal surgery with two 2-week recruitment periods in 2021, and 30 day follow-up after discharge.
The primary outcome was the proportions of patients managed according to Australian National Blood Authority patient blood management guidelines.
Secondary outcomes included anaemia prevalence, post-operative complications, length of hospital stay, re-admission within 30 days of discharge. Anaemia was defined using the World Health Organisation criteria.
Results and Discussion: Overall, 5182 patients underwent major abdominal surgery at 98 centres across 10 countries (Australia, Egypt, Finland, Italy, Jordan, Libya, New Zealand, Spain, Syria, and Yemen). Mean age was 56 (SD 16.9); 3009 (58.1%) were female and 3492 (67.4%) underwent elective surgery. Across the total cohort, 1405 (29.1%) had preoperative anaemia, ranging from 22.0% (Finland) to 56.1% (Syria), and differed significantly between countries (p<0.001). Overall 3654 (70.7%) patients were investigated and managed according to published guidelines, ranging from 43.3% to 79.4% between countries (p<0.001). The percentage of patients with identified preoperative anaemia that were investigated with iron studies ranged from 0% to 31.8% (p<0.001). The proportion of patients with identified preoperative anaemia that was treated with IV iron ranged from 0% to 20.0% (p<0.001). Adherence to the guidelines for the investigation and management of anaemia was associated with a lower rate of intraoperative transfusion (3.1 vs. 10.7%, p<0.001), postoperative transfusion (4.6 vs. 15.8%, p<0.001), and postoperative complications (18.4 vs. 26.2%, p<0.001).
Conclusion: Adherence to the guidelines for the investigation and management of anaemia varied between countries and may be a driver of differences in outcomes.

12AP02-12
Bleeding and transfusion outcomes in a double-blind randomised comparison of two four-factor prothrombin complex concentrates for vitamin K antagonist reversal before urgent surgery with significant bleeding risk (LEX-209)

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Background and Goal of Study: Four-factor prothrombin complex concentrates (4F-PCCs) are effective for reversal of vitamin K antagonist (VKA) anticoagulation. The Phase 3 LEX-209 study compared investigational 4F-PCC (Octaplex, Octapharma) to control 4F-PCC (Beriplex,CSL Behring) for urgent VKA reversal before surgery.
Materials and Methods: Patients were ≥18 years, on VKA, had International Normalised Ratio (INR) ≥2.0 and needed urgent surgery with significant bleeding risk (≥50 mL). A single 4F-PCC dose of 25, 35 or 50 international units (IU)/kg was given for baseline INR of 2–<4, 4–6 or >6. Primary endpoint was hemostatic efficacy at surgery end, objectively assessed by a blinded independent adjudication board. Additional endpoints included intraoperative red blood cells (RBC), plasma and platelet transfusions, and blood loss.
Results and Discussion: Patients were randomised to investigational (N=105) or control (N=103) 4F-PCC. Baseline characteristics were similar between groups. Median dose was 25 IU/kg; median (range) infusion time 12 (8–50) minutes for investigational 4F-PCC, 13 (7–30) minutes for control. Intravenous infusion rate was 0.12 mL/kg/minute (~3 IU/kg/minute), up to a maximum of 8.4 mL/minute (~210 IU/minute) for both 4F-PCC. Median (range) time from infusion start to surgery start was 1.42 (0.25–15.25) hrs in investigational and 1.50 (0.42–18.50) hrs in control group. Most common surgery type was gastrointestinal. Investigational 4F-PCC was non-inferior to control for effective hemostasis (94.3% vs. 94.2%, proportion difference 0.001, 95% confidence interval [CI] −0.080, 0.082, p<0.001). Low proportions of patients in investigational 4F-PCC (4, 3.8%) and control group (3, 2.9%) received RBC during surgery (proportion difference 0.009, 95% CI −0.068, 0.086), all of whom had expected maximum blood loss ≥200 mL and received concomitant vitamin K. Mean RBC volume given during surgery was similar (5.99 vs. 5.76 mL/kg), and no patients received plasma or platelets. Mean (95% CI) intraoperative blood loss was 195.5 (164.5, 226.4) mL for investigational 4F-PCC and 173.9 (147.4, 200.3) mL for control. Few patients had unexpected intraoperative blood loss: 4 (3.8%) in investigational group (1 due to surgical complications), and none in the control.
Conclusion(s): Investigational 4F-PCC for urgent VKA reversal was hemostatically non-inferior to control 4F-PCC, with low transfusions in patients undergoing urgent surgery with significant bleeding risk.

12AP02-13
Alternative blood transfusion triggers: O2ER, ScvO2, what else?

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Background and Goal of Study: Liberal and restrictive transfusion strategies have benefits and disadvantages in different patient groups. Herewith, the main trigger for blood transfusion is the level of hemoglobin.
The aim of study: to evaluate the effectiveness of using alternative blood transfusion triggers: venoarterial carbon dioxide gradient (ΔCO_2), oxygen extraction ratio (O_2ER), central venous oxygen saturation ($ScvO_2$), arterial lactate (Lac).
Materials and Methods: A prospective observational study that included 103 oncological patients with anemia in the ICU over 18 years of age (64 (62.14%) women, 39 (37.86%) men). Patients on Mechanical ventilation, receiving vasopressor and/or inotropic support, shocks of any etiology, childhood, and pregnancy were excluded from the study. Median age was 57 [45.5; 64]. All patients received RBC transfusion, the trigger was the hemoglobin level (Hb). $ScvO_2$, Lac, O_2ER ((CaO2 – CcvO2)/CaO2)*100%)), ΔCO_2 (PvCO2-PaCO2), Hb were measured before and one hour after transfusion. Based on the level of ΔCO2 patients were divided into 2 groups: I <6 (34 patients (33%)) and II- ≥6 (69 patients (67%)).
Results and Discussion: Initial ΔCO_2 in group I were 4.2±1.2, in group II - 8.5±2.3; positive dynamics in decreasing of ΔCO_2 was in the II group (8.5 to 6.8 at p<0.015), while I group showed a "negative" trend- increasing of Δ CO2 (4.2 to 5.5 units at p<0.001). O_2ER in group II was significantly higher (38.1±8.8) compared to group I (32.2±7.5), however in both groups there was a significant positive trend after transfusion (I-27.6±5, 4%, II-31.5±7.9, p<0.05). $ScvO_2$ initially significantly differed between the groups and was higher in I group (I-65.4±8.1, II-60.3±8.5; p=0.033), after transfusion there was a significant positive dynamics in both groups (I- 70±5.4, II-66.6±7.9, p<0.05). Lac did not differ between groups both before transfusion (I-1.2±0.8, 1.4±0.9; p>0.05) and after (I-1±0.7, II-1 .3±0.8, p>0.05), the Lac level did not show significant changes after transfusion (p>0.05).
It is important that the level of Hb before blood transfusion did not differ in patients in both groups (I-67.2±12.3, II-71.4±10.2, p=0.520), while alternative triggers were ΔCO2, ScvO2, O2ER- initially significantly differed between groups, and their dynamics after transfusion was positive in O2ER and ScvO2 in both groups, while ΔCO2 showed a positive response to transfusion only in the group with a score ≥6.
Conclusion(s): The level of Hb remains the main, but at the same time imperfect trigger of RBC transfusion. Various alternative triggers may play a role in the decision to transfuse, but as our study has shown, the use of these indicators together gives the best result.

12AP03-01
Preoperative states and hemodilution: factors affecting hemostasis in cardiac perioperative period

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Background and Goal of Study: Coagulopathy is a serious complication in the cardiac perioperative period, which is associated with postoperative morbidity and mortality. Multiple factors are deemed responsible for its development although which of these factors is the most responsible remains unknown. Furthermore, no available methodology allows for a pre-estimation of coagulation profiles after cardiopulmonary bypass.
We developed and tested the reproducibility of a regression model using hemodilution ratio to estimate the plasma fibrinogen level (Fbg) and platelet counts (Plt) after cardiopulmonary bypass (CPB).
Materials and Methods: Our study was approved by the institutional review board and comprises two parts.
In part 1, 131 patients (Group 1) who underwent cardiovascular surgery requiring CPB were included.
In this period, blood work including hemoglobin (Hb), Plt, and Fbg levels, was performed on the immediate preoperative day (pre) and after protamine administration post CPB (post) as a routine procedure at our hospital.
Hemodilution ratio (D) was calculated as the ratio of the lowest Hb during CPB to its preoperative value. The estimated Fbg and Plt values post CPB were calculated by multiplying D with the preoperative values. Regression analysis was performed between the estimated and measured values to obtain the regression formula.
In part 2, 112 other patients (Group 2) were included. Fbg and Plt after CPB were estimated using the formula obtained in part 1. Bland-Altman analysis was performed between the estimated and measured values for each parameter.
Results and Discussion: In part 1, the mean hemodilution ratio (D) was 0.6±0.08 and the following regression formula were obtained:
$[Fbg]post = 0.74*D*[Fbg]pre + 9$, $R^2 = 0.78$
$[Plt]post = 0.63*D*[Plt]pre + 2.3$, $R^2 = 0.60$
The receiver-operator characteristic curve demonstrated that the preoperative cutoff value for Fbg<150 and Plt<50 post CPB was 314 (mg/dL) and 150 ($x10^9$/L), respectively.
In part 2, the mean bias (estimated minus measured value) and limit of agreement for Fbg and Plt was -7.8±78.2 (mg/dL) and -2.3±52.4($x10^9$/L), respectively.
Conclusion(s): Our results suggest that preoperative status and hemodilution are the major factors affecting hemostasis during cardiac perioperative period. Our estimation method may facilitate preoperative risk stratification for coagulopathy, early planning, and commencement of hemostatic interventions.

12AP03-02
Reduction of transfusion requirements and length of hospital stay in patients undergoing major planned surgery after the implementation of Patient Blood Management (PBM) in Spain

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Background and Goal of Study: Red blood cell (RBC) transfusion represents the mainstay to correct anemia, however, it is also an overused procedure (1). Patient blood management (PBM) is a proactive, patient-centered, and multidisciplinary approach to manage anemia, optimize hemostasis, minimize iatrogenic blood loss, implement strategies of pre-habilitation and a restrictive transfusion policy to improve patient outcomes and preserving his own blood (2).
Materials and Methods: This is an observational retrospective study including adult patients who underwent major planned surgeries (hip or knee replacement, major abdominal surgery, and cardiac valve) in two Spanish hospitals (Bellvitge University Hospital, Barcelona, and Valladolid University Clinical Hospital).
Two separate cohorts: pre-PBM cohort (surgeries performed during the 3 years period before PBM program use) and post-PBM cohort (surgeries performed during the 3 years period after PBM implementation).
For all surgeries included in the study, patient's demographics, surgery details, iron deficiency anemia, treatments received, RBC transfusions, LOHS and other clinical outcomes were collected. Logistic regression models were performed to assess the impact of PBM program and LOHS was compared between study cohorts using the Student t test.
Results and Discussion: Data from 8,080 surgeries were included (3.780 surgeries included in the pre-PBM cohort and 4.300 in the post-PBM). RBC transfusion rate after the surgery was 35.3% (n=1,336) for pre-PBM cohort, decreasing to 30.1% (n=1,296) for post PBM cohort (p<0.0001).
The logistic regression model showed that PBM implementation was associated with a lower need for RBC transfusions (OR 0.854, CI 95%: 0.754-0.966). LOHS was reduced after PBM implementation from a mean SD of 13.6 to 11.6 days (p<0.0001). Intravenous iron was used in a higher percentage of patients in the post-PBM cohort compared with pre-PBM cohort.
Conclusion(s): The current study showed how implementation of the PBM program for major elective surgeries was associated with a reduction of post-surgery RBC transfusion rate and ofthe LOHS, resulting in the improvement of safety and quality, and in the reduction of healthcare costs.
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12AP03-03
Positive impact of implementing a patient blood management program in a neurosurgical department in France

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Background and Goal of Study: Morbidity and mortality of surgical patients increase with the severity of anemia and the number of blood transfusions. Patient blood management (PBM) programs have been developed to preserve patient blood, for detection and management of anemia and iron deficiency, minimization of blood loss and optimization of physiological tolerance of anemia. The objective of the PERIOPES study was to review the management of anemia, iron deficiency and blood transfusions in patients undergoing scheduled surgery. We report here the data obtained in a neurosurgery department from a university hospital.
Materials and Methods: This was a cross-sectional study. Data of consecutive surgical patients were retrieved from their chart before (January 2017–October 2019; n=124) and after (January 2020–July 2022; n=95) implementation of the PBM program.
Results and Discussion: At preoperative anesthesia visit, Hb level was assessed in all patients while iron assessment was reported in only 26% of patients before and 73% after PBM implementation (Table 1). Treatment of iron deficiency with intravenous iron increased from 0% to 23%. Transfusion rate decreased from 23% to 10% (single-unit red blood cell transfusion increased from 25% to 71%). The length of stay decreased from 7 to 6 days.

	January 2017–October 2019 N=124	January 2020–July 2022 N=95
Men/women	47%/53% 58 / 66	33%/67% 31 / 64
ASA 1–2	75% ASA 1 => 40 ASA 2 => 53 ASA 3 => 31	64% ASA 1 => 22 ASA 2 => 39 ASA 3 => 34
Hb assessment at anesthesia consultation	100% 124	100% 95
Anemic patients	23/124 (19%)	23/95 (24%)
Iron deficiency assessment (CST and/or serum ferritin)	26% 32	73% 69
CST assessment	24% 30	69% 66
Iron ferritin assessment	23% 28	73% 69
Iron deficiency	22/32 (69%)	47/69 (68%)
Duration between anesthesia visit and surgery, mean	39.9 days	46.5 days
Preoperative IV iron treatment	0% 0	23% 22
Transfusion rate	23% 28	10% 9
Single-unit transfusion	25% 10 / 40	71% 10
Length of stay, mean	7 days	6 days

Conclusion(s): Our observational study showed that iron deficiency, which is its main cause of anemia, was often not assessed and few patients were properly treated. After PBM implementation, there was an increase of iron deficiency assessment and preoperative IV iron treatment. Transfusion rate decreased with an increase of single-unit transfusion.
Acknowledgements: Chantal Du Manoir, Koffi Cobbold, Samia Belarbia, Gilles Rezzadori

12AP03-04
Tranexamic acid & hip fracture in a PBM program: 4 years of experience in one center

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Introduction: Acid Tranexamic use has been demonstrated in term of reducing perioperative bleeding, postoperative blood loss and red blood cell transfusion in hip fracture with no higher rate of complications (1)(2).
So, its use has been become a strategy of PBM (Patient Blood Management) program. We wanted to know how antifibrinolytics were being used in our centre and which were the impact in transfusion, mortality, and length of stay of these patients.
Material and Methods: An observational, non-interventional study for the follow-up of the PBM program in our centre. The study was approved by the ethical committee of the Research Foundation. We used data collected of all patients with hip fracture under surgery over 65 years old from 2017 to 2020. Statistical analysis was only descriptive.
Results:

	2017	2018	2019	2020
N	201	226	192	180
Age (years)	83,1	82,1	83,42	83,94
Sex (male %)	26,11	27,6	30,97	26,85
Type of fracture				
Intracapsular	44,93	38,91	40,27	40,74
Extracapsular	55,07	61,09	59,73	59,26
Time until surgery (days)	2,92	2,01	1,95	2,02
Treatment with antifibrinolytics (%)	14	7	15	20
Transfusion rate (%)	46,3	44,7	44,3	47,2
Only unity transfusion (%)	45	68	73	72
Mortality (%)	4	3,3	4,9	4,2
Lenght of stay	15,08	14,7	12,74	10,29
Readmission (%)	3	1,8	7,1	5,8

799 patients were collected in 4 years. The use of antifibrinolytics was constant around 15% with an increase in 2020 to 20%. Transfusion rates have no significant changes as well as the transfusion index. It is observed a tendency of less complication and less length of stay. Mortality was similar every year.
Conclusion: Despite the evidence about the antifibrinolytics use in these patients, its use is not very extended in our centre. There is not apparently association in worse mortality with TXA and there is a clear tendence of less length of stay.
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12AP03-05
Assessment of the knowledge level of the professional as regards Patient Blood Management in Parc Tauli Hospital. The MAPBM project

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Background and Goal of Study: The MAPBM project (Maturity Assessment Patient Blood Management) involves the use of a matrix that evaluates the maturity of the centre as regards blood transfusion practice. This tool includes a questionnaire to be completed by physicians to determine their level of knowledge of patient blood management strategies in their centre.
The aim of the present study was to determine if the knowledge of the PBM practice in our hospital, was increasing during the evaluated years.
Materials and Methods: The results of the survey carried out in our hospital between the year 2016 and 2020, were considered. Four of the ten questions included were selected and these were about : 1, being aware of the existence of a bloodsaving program in the hospital; 2, the existence of a protocol for optimising preoperative anaemia; 3, the blood transfusion protocol used in our centre; 4, taking into account other data in addition to haemoglobin when deciding to transfuse.
Results and Discussion: Overall, 358 questionnaires were completed between 2016 and 2020: 29.1% by anaesthesiologists, 25.7% by surgeons, 43% by other medical specialists and 2.2% by haematologists. The knowledge of the bloodsaving program in our hospital increased during the five studied years among the medical specialists and the surgeons group, being anaesthesiology the specialty with the highest rate.
The anesthesia service showed high knowledge rates in relation with the protocol for preoperative anaemia, every evaluated year (90-100%). An increase in knowledge was shown among the surgeons, whereas only 65-80% of the medical specialists admitted being familiar with the protocol.
The report about knowing the transfusion protocol showed variable percentages during the 5 years. Most physicians considered other factors besides the haemoglobin value for the decision to transfuse.
Conclusions: The results showed good knowledge of the PBM practice in our center and are satisfactory in comparison with the results of a national study conducted in 2019 (1).
However, our results show considerable room for improvement and it is necessary the dissemination of information and of knowledge of the PBM program regularly and to establish training for the new members.
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12AP03-06
Effect of hyperbilirubinemia on the accuracy of continuous non-invasive haemoglobin measurements: a retrospective cohort study

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Background and Goal of Study: In this retrospective cohort study, we investigated the effect of hyperbilirubinemia on the accuracy of non-invasive haemoglobin concentration (SpHb) in liver transplantation recipients.
Materials and Methods: Data from 299 liver transplantation patients were analysed between 2018 and 2022. SpHb measurements were classified into groups according to the latest serum bilirubin levels: normal (<1.2 mg/dL), mild-to-moderate hyperbilirubinemia (1.2–3.0 mg/dL), and severe hyperbilirubinemia (>3.0 mg/dL).
Results and Discussion: A total of 1,609 pairs of SpHb and laboratory haemoglobin data were analysed. The Bland-Altman analysis showed a bias of 0.34 (95% confidence interval, -2.56, 3.24) g/dL, 0.70 (-1.94, 3.33) g/dL, and 1.32 (-1.02, 3.66) g/dL for the normal, mild-to-moderate, and severe hyperbilirubinemia groups, respectively. The four-quadrant plot indicated reliable trending ability for SpHb regardless of bilirubin levels with high concordance rates (94%, 96%, and 92% for the normal, mild-to-moderate, and severe hyperbilirubinemia groups, respectively).
In the error grid analysis, the major error was more frequent in the severe hyperbilirubinemia group (49%) than in the normal (25%) and mild-to-moderate hyperbilirubinemia (29%) groups ($P<0.001$).
False positive transfusion triggers were less than 1% in all groups, although the false negatives were 18/18 (100%), 45/50 (90%), and 71/90 (79%) in the normal, mild-to-moderate, and severe hyperbilirubinemia groups, respectively ($P=0.035$).
Conclusion(s): SpHb monitoring was acceptable for measuring and tracking Hb levels in the normal and mild-to-moderate hyperbilirubinemia groups. However, inaccuracies were observed in the severe hyperbilirubinemia group, except for trending ability. The high false negative rates of transfusion triggered by SpHb in all groups require caution.
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Acknowledgements: This work was supported by the Ministry of Health & Welfare, Republic of Korea (grant number: HI21C1074) and by the Ministry of Science and ICT (MSIT), Korea, under the Information Technology Research Centre (ITRC) support program (IITP-2018-0-01833) supervised by the Institute for Information & communications Technology Promotion (IITP).

12AP03-07
Coagulopathy and bleeding prevention in patients with acute aortic dissection

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Background and Goal of Study: Acute aortic dissection is one of the most complex pathology in cardiac thoracic surgery. It may cause life threatening conditions and even death. Surgically managed patients are at high risk of poor outcomes, with mortality rates up to 30% in the first 24 h. Despite improvements in patient diagnosis and surgical techniques, aortic repair is still associated with high morbidity and mortality. Among all complications of aortic surgery, postoperative bleeding is one of the most dangerous. Besides coagulopathy due to aortic pathology, large doses of heparin, hemodilution, surgical trauma, prolonged contact of blood with a cardiopulmonary bypass circuit may exacerbate coagulopathy after surgery. Postoperative disorders of the hemostasis lead to prolonged hospitalization in intensive care units and increased mortality. we would like to share with our experience of management of coagulopathy bleeding after aortic surgery.
Materials and Methods: Seventeen patients with aortic dissection, who received prothrombin complex concentrate (PCC group) (1500 IU) preventively in the intraoperative period just after heparin reversion were compared with control group (n=15, data of medical records retrospective analysis). All patients had same pathology and underwent aortic surgery. Anesthesia management was traditional in both groups.
Results and Discussion: Initial level of coagulation screens parameters was comparable. Significant difference was detected in the immediate postop period in international normalized ratio, in the PCC group (1.17 [1.12-1.3] vs 1.07 [0.88-1.02]; p = 0.003) and fibrinogen level (3.34 [2.6-3.84] g/L vs 2.75 [2.2-3.0] g/l; p = 0.002). Intraoperative bleeding volumes in PCC group and control: 637 [284-1307] ml vs 712 [417-1420] mL (p =0.07), volume of postoperative bleeding in the PCC group was smaller (488.58 [280-630] ml vs (643 [457-1324] ml; p = 0.013). Blood transfusions in the postoperative period (PCC group vs control group): Plasma 6 U vs 13 U, Red blood cells 2 U vs 8 U[LA1] (p<0.05).
PCC group TEG in the immediate postoperative period was in the normal range. In the control group signs of hypocoagulation was detected in 33% (5 patients).
Conclusion(s): Preventive administration of PCC in the intraoperative period volume of bleeding and blood products transfused in patients with acute aortic dissection.

12AP03-08
Efficacy of ferric derisomaltose and of IV plus topical administration of tranexamic acid in reducing blood transfusion in patients with hip fracture (the HiFIT trial): a multicentre, 2x2 factorial, randomized, double-blind controlled trial

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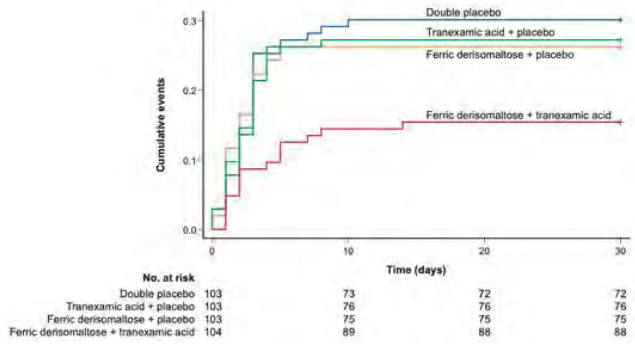
Background and Goal of Study: Anaemia and blood transfusion are associated with poor outcomes after hip fracture. We evaluated the efficacy of intravenous iron and tranexamic acid in reducing blood transfusions after hip fracture surgery
Materials and Methods: In this double-blind, randomised, 2x2 factorial trial, we recruited adults hospitalised (12 tertiary care centres in France) for hip fracture who had preoperative haemoglobin concentrations between 9.5 and 13 g/dL. We randomly allocated participants (1:1:1:1), to ferric derisomaltose (20 mg/kg IV) and tranexamic acid (1g bolus followed by 1 g over 8 hours IV at inclusion and 3 g topically during surgery), iron plus placebo (normal saline), tranexamic acid plus placebo, or double placebo. Unblinded nurses administered study drugs; participants and other clinical and research staff remained blinded to treatment allocation. Primary outcome was percentage of patients transfused during hospitalisation (or day 30).
Results and Discussion: Of 413 patients, 104 received iron plus tranexamic acid, 103 iron plus placebo, 103 tranexamic acid plus placebo, and 103 double placebo between March 2017 and June 2021. Among patients on double placebo, 31 (30.1%) were transfused versus 16 (15.4%) on both drugs (relative risk 0.51 [95% confidence interval 0.30−0.88]; p=0.012). Twenty-seven (26.2%) on iron (p=0.54) and 28 (27.2%) on tranexamic acid (p=0.64) were transfused. The probability pf being transfused was reduced by 50% in iron+TXA vs double placebo group (figure, log-rank test p=0.011). Haemoglobin levels were higher in patients receiving either drug versus double-placebo. Among prespecified safety endpoints, severe postoperative anaemia (haemoglobin <8 g/dL) was more frequent in the double placebo group, without any other difference (including infection, thrombosis or anaphylactic events).



Conclusion(s): Compared with double placebo, ferric derisomaltose plus tranexamic acid halved the transfusion rate in patients with hemoglobin between 9.5 to 13 g per deciliter undergoing scheduled hip fracture surgery.

12AP03-09
Coagulation management during liver transplantation in adults

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Background and Goal of Study: Liver cirrhosis is associated with severe coagulation disorders, and optimal coagulation management remains one of the greatest challenges in liver transplantation. Some patients during liver transplantation require active replacement of coagulation factors to control bleeding.

The aim of the study was to specify conditions when fresh frozen plasma (FFP), cryoprecipitate, platelets transfusion, and coagulation factors concentrates are used in adult patients during liver transplantation[1].

Materials and Methods: We studied retrospectively 226 adult patients with liver cirrhosis operated in our Center. We studied activated partial prothrombin time (APPT), prothrombin index (PI), international normalized ratio (INR), level of serum fibrinogen A (FGA), platelets count (PLT), thromboelastography (K; R; α angle; MA; LY30), the volume of FFP, cryoprecipitate, platelets transfused, and coagulation factors concentrates used intraoperatively.

Results and Discussion: Patients were aged 42.6±9.4 (24-67) yo, and weight 64.0±9.8 (48-82) kg. BMI was 23.3±2.9, and MELD score was 17.1±4.4.

154 (68.1%) of patients had severe coagulopathy and active bleeding, all these patients were transfused FFP, cryoprecipitate, platelets, and concentrates of coagulation factors. Triggers for coagulation management were significant coagulopathy and bleeding. The mean volume of bleeding was 3312±2345.7 ml (1500-5500).

Trigger for FFP transfusion was blood loss over 1500 ml and coagulopathy with APPT 87.8±35.8 sec; PI 28.5±13.0%; INR 3.17±0.91; R 8.7±3.6 min; K 5.1±2.6 min.

The trigger for cryoprecipitate transfusion was active bleeding over 1320 ml with a level of FGA lower than 0.56±0.74 g/l and α angle lower than 44.0±14.2 degrees.

The trigger for platelets transfusion was active bleeding over 1850 ml with PLT lower than 24.3±12.2×10^9/mcl and decreased MA 24.6±10.8 mm.

Trigger for concentrates of coagulation factors use were bleeding over 4720 ml and coagulopathy with APPT 98.7±45.2 sec; PI 18.4±19.8 %; INR 5.69±3.75; FGA 1.1±2.7 g/l; R 14.4±7.9 min; K 12.4±8.3 min; α angle 25.0±26.9 degree.

Conclusion(s): 68% of adult patients who underwent liver transplantation require coagulation factors replacement to control bleeding during surgery.

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12AP03-10
Thrombotic events after CRS with HIPEC in a prospective cohort of patients: extended thromboprophylaxis is highly recommended

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Background and Goal of Study: Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) is an aggressive procedure associated with alterations in the haemostatic system leading to perioperative transfusion. Patients have increased risk of thrombotic and haemorrhagic complications due to advanced stage cancer, extensive surgery, chemotherapy, long hospitalization and low mobilization. The incidence of thrombosis with thromboprophylaxis ranges 0.2% to 13.6%.

We aimed to assess the incidence of thrombotic complications in patients undergoing CRS with HIPEC receiving pharmacological thromboprophylaxis during 4 weeks after discharge.

Materials and Methods: All patients undergoing CRS-HIPEC from 2019/03 to 2022/04 in our centre were prospectively included. Thromboelastometry (ROTEM) was performed at the end of procedure. Intraoperative compression stockings were used. Thromboprophylaxis was started the day before and continued 8 hours after surgery until 4 weeks after discharge. Thrombotic complications like deep vein thrombosis, thromboembolism and catheter related complications were recorded. Patients were followed-up to 90 days after surgery; at that time, computerized axial tomography was performed and assessed for incidental thrombosis.

Results and Discussion: A total of 99 patients were included, mean age of 63 (27-85), 63% were female, 85% ASA II. Follow-up of 30 days after discharge was completed in 88 patients and in 74 patients for 90 days. All of them completed thromboprophylaxis treatment 4 weeks after discharge. Thromboelastometry values show high maximum clot firmness (MCF)-extem 65 (18-75) and MCF-fibtem 14 (5-29). Despite this prothrombotic profile, only 1 patient experienced deep vein thrombosis (1%). Notwithstanding early introduction of pharmacological thromboprophylaxis, there were no other haemorrhagic-related events.

Conclusions: Although, patients having large and aggressive CRS with HIPEC showed a prothrombotic state proven by viscoelastic tests, the incidence of thrombotic events is very low. Intraoperative compression stocking followed by an early start of thromboprophylaxis maintained for 30 days after discharge might be a good strategy to prevent thrombotic events.

Reference:

Int J Colorectal Dis. 2022 Jan;37(1):17-33

12AP03-11
Postoperative bleeding in patients undergoing cytoreductive surgery with hyperthermic intraperitoneal chemotherapy: a single center prospective study

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Background and Goal of Study: Cytoreducive Surgery (CRS) and Hyperthermic intraperitoneal Chemotherapy (HIPEC) has been classically associated with coagulation disorders with a 4% incidence of life-threatening postoperative bleeding. (1,2,3) The aim of this study is to assess the incidence of postoperative bleeding complication and the association with thromboelastometry (ROTEM) parameters after surgery.

Materials and Methods: Prospective study in patients undergoing CRS and HIPEC at Hospital Clinic of Barcelona from 2019 to 2022. Hemoglobin (Hb) levels before and after surgery and at discharge, and ROTEM parameters after surgery were recorded. Packed Red blood cells (PRBC) transfusion and clinically meaningful bleeding complications up to 3 months after surgery were assessed. We also compared the clinical, demographic and ROTEM characteristics in patients with and without bleeding events. Data expressed in mean±SD and n(%).

Results and Discussion: 99 patients were included. 63% were women, mean age of 64±14years, and most of them ASA II (86%). Hb level dropped after CRS from 13.1± 1.7g/dl to 12.4±1.6 g/dl, but only 6 patients (6%) required intraoperative RBC transfusion. Viscoelastic parameters at the end of surgery suggested a prothormbotic profile with a high maximum clot firmness (MCF)-extem 65±7 and MCF-fibtem 14±5. 10 patients (10%) had postoperative bleeding complications, 1 required transfusion of > 2 RBC and 3 had organ dysfunction associated. The overall Hb at discharge was 12.4±1.6 g/dl. There were no clinical or thromboelastometric significant differences between patients with or without bleeding complications.

	Age (years)	Hb before surgery (g/L)	MCF EXTEM (mm)	MCF FIBTEM (mm)	Hb end Surgery (g/dL)	Hb at discharge (g/dL)
No bleeding (89)	64±14	13.2±1.6	64.99±0.82	14.4±0.5	12.3±0.2	12.3±1.7
Bleeding (10)	65±12	12.2±0.6	67.20±1.3	14.7±2.1	12.4±0.6	12.4±1.3
p value	p = 0.882	p = 0.136	p = 0.164	p = 0.896	p = 0.950	p = 0.94

Conclusion(s): In adult patients having CRS-HIPEC, we observed an important incidence of postoperative bleeding, despite the thromboelastometric prothrombotic profile after surgery. There were no significant differences between patients who bleed and did not. Other factors different from coagulopathy might be related to postoperative complications.

References:

1. Araña, LF. et al. Cir Esp. 2015; 93(8):496-501
2. Sommariva A. Updates Surg. 2022 Oct;74(5):1715-1723.
3. Lundbech M. International Journal of Colorectal Disease (2022) 37:17–33

12AP03-12
Iron deficiency in sepsis patients based on reticulocyte hemoglobin and hepcidin concentration

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Background and Goal of Study: Satisfactory levels of iron are necessary for adequate immune function and hemoglobin (Hb) synthesis, crucially important in sepsis. Anemia that develops in sepsis patients is categorized as anemia of inflammation (AI); however, sepsis patients may also suffer from mixed types of anemia, especially AI combined with iron deficiency anemia (IDA). Diagnosis of iron deficiency (ID) is complicated in sepsis patients because iron markers are affected by systemic inflammation.

The study aimed to determine the prevalence of ID/IDA in sepsis patients based on reticulocyte (Ret) Hb equivalent (Ret-He) and hepcidin concentration.

Materials and Methods: This prospective clinical study was conducted in a 10-bed mixed medical-surgical ICU in a tertiary care teaching hospital between September 2021 and August 2022. We enrolled consecutive patients diagnosed with sepsis or septic shock and increased procalcitonin concentration (>0.5 ng/mL). The initial diagnosis of ID/IDA was based on Ret-He and Hb concentration, whereas hepcidin was determined retrospectively. The study was approved by the Ethics Committee of the Medical University of Silesia in Katowice, Poland (PCN/CBN/0022/KB1/06/II/20/21).

Results and Discussion: We analyzed data from 90 study subjects. The median age in the study group was 65 (IQR 51–72) years. The prevalence of ID and IDA was approximately 7 and 47%, respectively. Median Ret-He in the study subjects with and without ID/IDA was 26.5 and 33.4 pg, respectively ($p < 0.01$).

Significant differences between these two groups were also shown in Hb, hematocrit, mean cell volume, mean cell Hb (MCH), and number of Rets. The most accurate in prediction of ID/IDA was Rets number (AUROC 0.69, 95%CI 0.58 – 0.78, $p < 0.01$) with cut-off ≤ 0.07 $10^6/\mu$L, whereas AUROC for hepcidin was 0.62 (95%CI 0.51–0.72, $p = 0.049$) with cut-off ≤ 493 pg/mL.

The logistic regression model, adjusting for factors having a potential impact on hepcidin production and elimination, showed very good diagnostic accuracy for the prediction of IDA (AUROC=0.84, 95%CI 0.74–0.91, $p < 0.01$) and was based on RBC ($p<0.01$), Rets percentage ($p<0.01$), and MCH ($p=0.05$).

Conclusions: Based on Ret-He, more than half of sepsis patients hospitalized in the ICU may have either ID or IDA. A number of Rets may be used to diagnose ID and IDA when Ret-He is unavailable. Hepcidin concentration seems to be a poor predictor of IDA in sepsis patients.

12AP03-13
Iron deficiency in sepsis patients managed with divided doses of iron dextran

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Background and Goal of Study: Hospital-acquired anemia (HAA) in the Intensive Care Unit (ICU) is mainly due to blood withdrawal for laboratory diagnostics. If the amount of stored iron is inadequate, iatrogenic blood loss may lead to iron deficiency (ID) or iron deficiency anemia (IDA). Iron deficiency impairs hemoglobin (Hb) synthesis and immune function, which are crucial for sepsis patients. We aimed to assess the impact of iron dextran on reticulocyte (Ret) Hb equivalent (Ret-He) and Ret subpopulations indices in patients with sepsis or septic shock hospitalized in the ICU.

Materials and Methods: This prospective clinical study was carried out in a mixed medical-surgical ICU in a tertiary care hospital between September 2021 and August 2022. We enrolled patients with sepsis or septic shock with procalcitonin concentration >0.5 ng/mL diagnosed with ID or IDA based on Ret-He and Hb concentration. Study subjects received divided doses (0.2g) of iron dextran (three times a week) until normalization of Ret-He, which was determined every 3-5 days. The study was approved by the Ethics Committee of the Medical University of Silesia in Katowice, Poland (PCN/CBN/0022/KB1/06/II/20/21).

Results and Discussion: The study population included 35 subjects. The median increase in Ret-He after 2 doses of iron dextran was 3.0 (IQR 1.9–6.1) pg ($p<0.01$). The median time to normalization of Ret-He was 4 (IQR 3–5) days. All other Ret indices changed significantly after two doses of iron dextran (p for all <0.01). However, neither percentage of Rets [Me 1.51 (IQR 1.15–2.09) vs. Me 1.42 (IQR 1.06–2.37) %, $p=0.39$], nor their number [Me 0.05 (IQR 0.04– 0.07) vs. Me 0.05 (IQR 0.03–0.06) $10^6/\mu$L, $p=0.88$], varied significantly following iron supplementation.

Conclusions: Iron supplementation with divided doses of iron dextran in iron-deficient sepsis patients relatively quickly normalizes Ret-He and stimulates the replenishment of reticulocyte subpopulations. Further research is needed to explore the risk-benefit profile of intravenous iron in this clinical setting.

Perioperative Medicine

13AP01-01
Cold Agglutinin disease – the importance of optimal perioperative temperature management

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Background: Cold agglutinin disease (CAD) is a rare form of autoimmune hemolytic anemia caused by cold-reactive immunoglobulins. It results in red cell agglutination at reduced temperature leading to hemolysis.
Patients with CAD need optimal perioperative temperature management to avoid exacerbations of the disease.
Case report: A 87 year-old female was proposed to a femoral intramedullary nailing for a femoral shaft fracture.
The patient was diagnosed with CAD ten years ago and had regular hematology follow-up. She had stable hemoglobin (Hb) levels around 7-8g/dL and was medicated with chlorambucil.
The preoperative results showed a Hb of 6.9g/dL, with no other significant changes.
Perioperative efforts were made to maintain normothermia. Tympanic temperature was checked before transporting the patient to the OR. The patient was transported covered with warm blankets to the operating room (OR) that was prewarmed at 27°C. Two forced-air convective warming blankets were placed under and over the patient's body for prewarming and active warming during the surgery. Intravenous fluids were continuously warmed at 39°C.
Upon arrival at the OR, following the recommendations of immunohemotherapy, the patient received one unit of red blood cells warmed at 39°C.
After induction of general anesthesia, central temperature was monitored continuously with an esophageal temperature probe and was maintained between 36.5-37.2°C during the procedure.
Surgery lasted an hour and a half and was uneventful.
At the end of the surgery, the patient was transferred to the postanaesthetic care unit covered with warm blankets, where she remained for 3 hours with active warming and regular temperature monitoring. On the 2nd postoperative day, the patient had a Hb level of 6.0 g/dL and 2 units of red blood cells were administered. She was discharged from the hospital 9 days after the surgery with a Hb level of 9.5g/dL.
Discussion: Patients with CAD may present with mild anemia and circulatory symptoms. Under exposure to cold environments, the disease can be exacerbated. Anesthetized surgical patients are particularly at risk for hypothermia.
The perioperative approach should include every effort to maintain the peripheral and core temperatures above the thermal threshold to prevent hemagglutination and hemolysis.
Reference:
Korean J Anesthesiol. 2021Aug1;74(4):358
Learning Points: Patients with CAD need multidisciplinary perioperative management to avoid exacerbations of the disease.

13AP01-02
De novo Takotsubo cardiomyopathy in the postoperative period - case report

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Background: Takotsubo cardiomyopathy (TTSC) is characterized by an acute and transient myocardial ischemia and left ventricular (LV) dysfunction caused by increased sympathetic stimulation.[1] TTSC occurs in about 2-9/100,000 people in the general population annually and in up to 1/6,700 cases in the perioperative period.[1] We report a case of a postoperative diagnosis of TTSC in a patient submitted to urgent orthopedic surgery.
Case report: A 62-year-old female patient, ASA II, with a history of diabetes, hypertension and local anesthetics (LA) allergy, was proposed for surgical correction of a foot fracture. On admission, the patient was asymptomatic and all preoperative exams were normal. General anesthesia with tracheal intubation was performed given the patient's history of LA allergy which precluded a loco-regional technique. Multimodal analgesia with paracetamol, tramadol, ketamine and ketorolac was implemented. The surgery was uneventful and the patient was successfully extubated. In the PACU, the asymptomatic patient began to show low SpO2, inverted T waves on the V2-V6 derivations and prolonged QTc with no ST-T segment alterations on the EKG. An emergent chest angio-CT revealed pulmonary edema with no signs of a thrombotic event. Serum cardiac enzymes rose. An emergent echocardiogram showed apical and LV mid-segments hypokinesia with moderate to severe depression of LV function. A presumed diagnosis of TTSC was made by the cardiology team on call. The patient was transferred to the ICU and in the following days was weaned of oxygen and the cardiac enzymes normalized. A coronary angiography was performed and showed no signs of obstructive coronary artery disease. A follow-up echocardiogram 5 days later showed full recovery of LV function. The patient was later discharged home.
Discussion: Many risk factors associated with the development of TTSC have been reported in the literature.[1] In our case, the patient's female gender, the use of ketamine and the absence of a loco-regional technique for better postoperative pain control could have contributed to the development of TTSC. Still, the prompt approach by the anesthesiology team allowed for rapid referral and treatment of the patient.
Reference:
1. Hessel, E.A. Takotsubo cardiomyopathy and its relevance to anesthesiology: a narrative review. *Can J Anesth/J Can Anesth* 63, 1059–1074 (2016)
Learning Points: Anesthesiologists should have a high index of suspicion for TTSC in the postoperative period.

13AP01-03
Anesthetic management in severe hemodynamic instability in pheochromocytoma resection, with intra-aortic balloon and extracorporeal membrane oxygenation: a case report

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Pheochromocytomas are catecholamine-secreting tumors. Optimal perioperative management is essential: hormonal status assessment and preparation, careful conduction of anesthesia, and intensive postoperative care[1]. In this report, a patient with pheochromocytoma developed severe hemodynamic changes requiring IAB and ECMO support.

Male, 47 yo, ASA III, laparoscopic adrenalectomy. Preoperative alpha adrenergic blockade (doxazosin) followed by beta (metoprolol) were initiated. In the OR, monitoring: cardioscope, oximeter, BIS, thermometer, invasive blood pressure and cardiac output; large caliber peripheral venous access and central venous vein. Total intravenous general anesthesia: remifentanyl, fentanyl, lidocaine, propofol and rocuronium. After performing the NMB: hypertension (300x180 mmHg), tachycardia (180-140 bpm) and bilateral mydriasis. Intubation was postponed; nitroprussiate and esmolol were started. After BP decrease, OTI was performed. Desaturation and increased peak pressure on mechanical ventilation were detected, with diffuse crackles on auscultation. Pulmonary aspiration of 500 ml and furosemide was administered. The case was cancelled and the patient was referred to the ICU after hemodynamic stabilization. Heart failure was confirmed (Takotsubo syndrome) and EF 28%. Therefore, IAB was installed. The patient evolved with multiple system failure and 7-minute PCR. The team chose for ECMO support. Meanwhile, metyrosine was started, associated with alpha and beta adrenergic blockade. After two weeks, the surgery was rescheduled. In the operating room, previously OTI, standard monitoring + BIS, IAB and TEE. Cisatracurium was used. Despite maintenance of intraoperative pressure lability, it was controlled without difficulties.

Rocuronium was probable trigger for the condition, there is one report with a similar description[2]. Metyrosine (inhibits tyrosine hydroxylase) was used as an alternative preparation, limiting the rate of catecholamine formation. In this scenario, ECMO and IAB proved to be effective in cardiac recovery allowing adrenergic blockade before tumor resection.

References:

1. Naranjo J et al.. Perioperative Management of Pheochromocytoma. J Cardiothorac Vasc Anesth. 2017
2. Jeong CW et al. Was a hypertensive crisis in a patient with pheochromocytoma caused by rocuronium?: A case report. Korean J Anesthesiol. 2009

Learning Points: The importance of preoperative care when dealing with pheochromocytoma.

13AP01-04
Reverse takotsubo cardiomyopathy induced by epinephrine-contained irrigation solution during shoulder arthroscopy: a case report

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Background: Takotsubo cardiomyopathy (TCM) is characterized by significant but often reversible systolic dysfunction mainly triggered by intense emotional or physical stress. Epinephrine use has been implicated in inducing TCM in various circumstances, of which only one described fatal TCM during arthroscopy[1].

Case report: A 62-year-old healthy male was admitted for an elective arthroscopic repair of a rotator cuff tear using an epinephrine-contained irrigation solution. Forty-five minutes into the surgery, the patient developed ventricular arrhythmias accompanied by hemodynamic instability requiring intensive vasopressor support (Figure 1).

A bedside TTE revealed moderate to severe LV dysfunction, significant basal and middle LV wall motion abnormalities, and apical sparing (Figure 2C). Emergent coronary angiography demonstrated normal coronaries (Figure 2A) and findings corresponding to a reverse variant of TCM (Figure 2B).

Sedated, ventilated, and hemodynamically supported, the patient was transferred to ICCU. Concurrent with hemodynamic stabilization under conventional supportive treatment, the patient was weaned from vasopressors and mechanical ventilation.

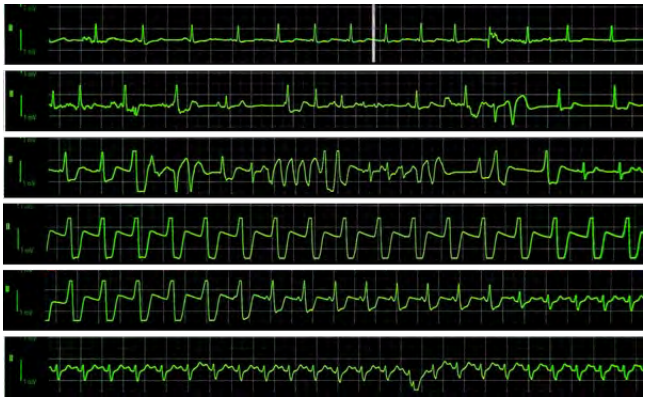

Figure 1. Intraoperative continuous ECG monitor

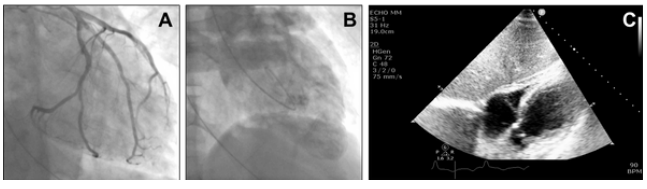

Figure 2. Coronary angiography and transthoracic echocardiography

Discussion: Arthroscopy is a widely used technique in orthopedic surgery. Adding epinephrine to irrigation solution improves visualization by reducing bleeding. Despite this benefit, risks still exist. Albeit rare, rapid systemic absorption may lead to potentially devastating cardiac risks if inappropriately recognized and treated.

Reference:

Gicquel-Schlemmer B, et al. *Orthop Traumatol Surg Res* 2015; **101**:981–982.

Learning Points: The growing body of evidence makes awareness of this potential complication crucial and raises safety concerns regarding the risk-benefit of this practice.

13AP01-05
From preoperative chest radiography to Castleman's disease: a case report

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Background: Castleman's disease is a rare disorder of unknown cause. The hyaline-vascular variant of the disease is generally asymptomatic and diagnosed incidentally.[1]
Case report: A 23-yo man, ASA II due to smoking and hashish abuse was proposed for surgical treatment of humerus diaphysis fracture. There was no previous anesthetic history and functional capacity was greater than 4 METs. Physical examination and preoperative blood sample analysis were normal. On the preoperative chest radiography a hypotransparency on the left side was noticed (fig.1). There was doubt about the possibility of bronchial lumen invasion of the mass, so the case was discussed with a radiologist. Together with the surgical team it was decided to postpone the surgery and perform a chest CT. The CT scan showed a rounded left perihilar mass of 45x40mm with no lumen or vascular invasion (fig.1).

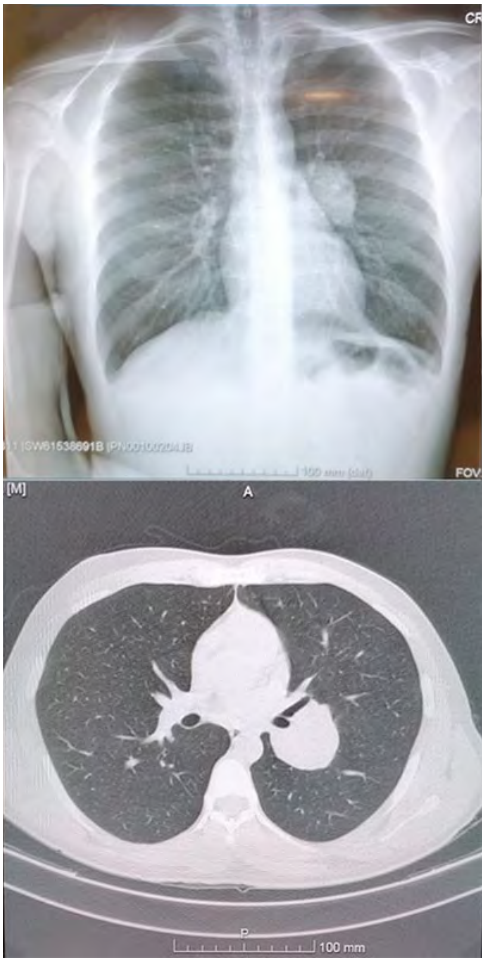

Fig.1

The surgery was then performed under balanced general anesthesia without incidents intra and postoperative. Posteriorly the patient was evaluated by thoracic surgery and in the suspicion of a neuroendocrine tumour, the decision was to perform a left pneumectomy. No complications were found during the surgical act nor the postoperative period. The surgical sample's anatomopathological examination revealed Castleman's disease hyaline-vascular variant.
Discussion: In smoking individuals the incident of abnormalities on chest X-rays may be higher than general population. Just in rare cases the preoperative chest X-rays influenced the anesthetic management[2]. However, it can still be an occurrence as described in this case.
References:
1. Ehsan N, Zahra F. Castleman Disease. [Updated 2022 Sep 23]. In: StatPearls;
2. De Hert S, Staender S et al. Pre-operative evaluation of adults undergoing elective noncardiac surgery. Eur J Anaesthesiol. 2018 Jun;35(6):407-465.
Learning points: We highlight the importance of preoperative evaluation and the thoughtful analysis of chest X-rays. Anesthesiologists may profit from multidisciplinary team discussion when abnormalities are found. In this case, the description of the pulmonary mass prior to surgery allowed to ensure patient's safety and provide the best care.

13AP01-06
Thymectomy in a patient with Miastenia Gravis – a case report

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Background: Myasthenia gravis (MG) is an autoimmune disease of the postsynaptic neuromuscular junction. Perioperative management need to focus on interactions with the disease and anesthethic medications, mainly neuromuscular agents (NMBAs). Thymectomy is part of MG therapy in selected patients.[1]
Case report: A 44-yo man, ASA IV due to MG with double vision, previous episodes of dysphagia and moderate dyspnea was proposed for thymectomy, scheduled first in the morning. The patient medication included pyridostigmine 30mg (4/day), prednisolone 80mg (1/day), azathioprine 100mg (2/day) and iv immune globulin (1/3 weeks). Prior to surgery, plasmapheresis was performed. There was no history of aspiration, myasthenic crisis or endotracheal intubation. Standard ASA monitoring plus bispectral index, invasive arterial pressure and neuromuscular monitoring were established. TCI (propofol and remifentanil) was used for induction and maintenance of general anesthesia and intubation was achieved without the use of NMBAs. However, during the procedure, due to difficult surgical conditions, neuromuscular block was required – total of rocuronium 60mg. The surgery lasted for 2h30min, the patient remained haemodynamic stable through the procedure and was then transferred to the intensive care unit (ICU) on invasive ventilation. At ICU, extubation was achieved after 24h once confirmation of reversal of NMBAs was obtained, there were no incidents to report.
Discussion: Providing anesthesia for patients with MG is a challenge to the anesthesiologist and the perioperative period should be managed with a multidisciplinary team. As performed in this case, preoperative optimization can include plasmapheresis in an effort

to reduce the risk of postoperative myasthenic crisis. When surgical paralysis is required, a reduced dose of nondepolarizing NMBAs is generally administered.[2] Postoperatively admission to the ICU was decided due to patient characteristics and type of surgery. The decision should be made case by case.

References:

1. Kveraga R et al. Anesthesia for the patient with myasthenia gravis. UpToDate, 2022.
2. Collins S et al. Anesthesia and Perioperative Considerations for Patients With Myasthenia Gravis. AANA Journal. Dec 2020;88(6).

Learning points: The perioperative period should be managed in an effort to avoid myasthenic or cholinergic crisis. NMBAs should be avoided but when used it is crucial to ensure that there is no residual curarization before extubation.

13AP01-07
Undiagnosis Wolff Parkinson white preanesthesic assement. What now?

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Background: Pre-anaesthetic assessment is essential to optimize and evaluate specific anaesthetic risks according to each patient. For this purpose, medical history (MH) is examined, and tests such as electrocardiogram (EKG) are carried out, to detect any potential heart pathologies. Wolff Parkinson White (WPW) is a cardiac conduction disorder consisting of an accessory pathway that's able to conduct electrical impulses and is associated with supraventricular arrhythmias with rapid ventricular rates.

The existence of an algorithm to manage the preoperative diagnosis of this type of pathology is essential in order to avoid delaying oncological interventions.

Case Report: 26 years old male scheduled for partial glossectomy for squamous cell carcinoma of the tongue attended pre-anaesthesia assessment. MH of childhood leukaemia in remission and bronchiolitis obliterans with bronchodilator treatment and chronic domiciliary oxygen. He was heart asymptomatic (NYHA I).

EKG showed alterations suggestive of a pre-excited pattern(delta wave, short PR) and cardiology assessment was requested as a priority. Considering patient was asymptomatic the cardiologist didn´t request additional tests, only giving recommendations on how to manage tachycardias if they occurred. Procedure was not delayed and was completed without incident.

Discussion: Anaesthesiologists are qualified to suspect and diagnose pathologies previously unknown.The prevalence of pattern suggestive of WPW is estimated to 0.13-0.25% in general population, of which only 2% show symptoms (WPW syndrome). It's common to find incidental EKGs with pre-excitation data in patients without symptoms. These patients present a low risk of tachyarrhythmias and cardiac arrest.

However, the perioperative context carries a risk for these patients to manifest symptoms (sympathetic stimulus reactive to stress, pain, surgical aggression, sympathomimetic drugs), so patients with comorbidities are susceptible to develop tachyarrhythmias and they would be candidates for assessment by cardiology.[1]

Reference:

1. Heart Rhythm. 2012 Jun;9(6):1006-24

Learning Points: Pre-anaesthetic evaluation is essential to determine health status of patients prior to surgery. It´s common to find EKG alterations suggestive of WPW by accident, so it´s important to assess the benefit of potential oncologic surgery delay due to cardiologist´s evaluation in asymptomatic patients, as presumably only symptomatic patients will receive treatment.

13AP01-08
Management of sunitinib chronic treatment in preanesthetic assesment

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Background: Tyrosine kinase inhibitors are drugs approved for the treatment of renal cell carcinoma and gastrointestinal stromal tumors, although they are being investigated as therapy for other tumors. Therefore, it is possible that, as anesthesiologists, we find ourselves with patients receiving these drugs preoperatively. It is well known that proper perioperative medication management is related to better short- and long-term outcomes.

Case Report: A patient who was admitted for laparoscopic resection of liver segment number VII. He is a 46 years-old former smoker ASA III male with a history of renal tumor in the right kidney two years before underwent right radical nephroureterectomy. In subsequent follow-up studies, the presence of small, slow-growing pulmonary nodules was observed, so treatment with sunitinib (Sutent) was started. In a subsequent control CT, growth of a hypodense mass was observed in segment number VII of the liver, a candidate for surgical removal for study. ECG showed sinus rhythm with incomplete right bundle branch block. Routine laboratory tests did not show abnormalities of interest.

Discussion: Sunitinib is a tyrosine kinase inhibitor used in the treatment of progressive renal cell cancer. Sometimes these patients must undergo surgical procedures, related or not to their disease. Actually, most anesthetists are not familiar with the perioperative management of this drug but preoperative suspension should be considered and when to do so. According to the technical data sheet of the drug itself (Sutent), it should be discontinued at least 3 weeks before surgery, since it can cause glycemic decompensation, impaired renal function, liver damage, coagulation disorders and alterations in wound healing, among others[1].

Reference:

1. Sutent, Prescribing information.

Learning Points: Every anesthesiologist should consider what is the proper perioperative management of any drug, even if they are not familiar with it. Tyrosine kinase inhibitors are a good example and, in many cases, such as sunitinib (Sutent), we must refer to the drug's data sheet as there is no other evidence of sufficient quality to establish a recommendation.

13AP01-09
Perioperative stroke in non-cardiac, non-neurologic and non-vascular surgery

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Background: Perioperative stroke (PS) has an incidence of 0.1–1.9% in non-cardiac, non-neurologic, and non-vascular surgeries and approximately 50% occur in the first 24 hours.
Case report: A 65-year-old man, ASA-PS III, planned for total laryngectomy, bilateral lymph node dissection and hemithyroidectomy, due to a carcinoma of the piriform sinus. His medical history was significant for diabetes mellitus II, dyslipidaemia, arterial hypertension, peripheral arterial disease, and smoking. He had a previous myocardial infarction and stroke. Pre-operative tests showed: right bundle branch heart block on ECG, normal ventricular ejection fraction on echocardiogram (echo) and left vertebral artery occlusion on carotid doppler (CD). A total intravenous general anaesthesia was performed with target-controlled-infusion of propofol and remifentanil. During surgery, the patient remained hemodynamically stable. The procedure lasted approximately 4 hours, with no complications reported. The patient woke up perspiring profusely. The following day, he presented with disorientation, right hemiparesis, and tonic-clonic seizures. Brain CT showed ischemia with no signs of haemorrhage. Once it took place only few hours after surgery, decision was made not to perform thrombolysis, so the patient was kept on aspirin and prophylactic enoxaparin. Brain MRI revealed multiple infarcts in the left hemisphere. Echo, CD and Holter didn't show *de novo* alterations.
Discussion: The risk of PS can vary with patient risk factors, type of surgery, and intraoperative hypotension or hypoxia. This case reports an aggressive surgery close to noble vessels, with several neck positionings, in which controlled hypotension was used to facilitate surgical technique, in a patient with cardiovascular risk factors. Although cerebral hypoperfusion could be a cause, thromboembolic stroke is more common and is the most suggested diagnosis by test results, as the lesions are spread over multiple territories. Stroke recognition is often delayed in the perioperative. In this case, the inexplicable excessive perspiration could have been a clue, but the patient's inability to speak may has contributed to this worse outcome.
Reference:
Ko SB. Perioperative stroke: Pathophysiology and management. *Korean JAnesthesiol*. 2018
Learning points: The risk assessment is an important message to convey with patients. PS is a detrimental outcome and both anaesthesiologists and surgeons should be aware of its possibility.

13AP01-10
Monomorphic ventricular tachycardia (VT) in a patient with hip prosthesis infection – Wait or proceed?

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Background: The pre-operative medical assessment is part of an interdisciplinary review of the medical conditions that a patient present in the context of their functional status. Ventricular arrhythmias are among the most common cardiac rhythm disturbances encountered in clinical practice.[1]
Case report: A 71-year-old male, ASA III, with smoking and alcoholic habits, medical history of obesity, hypertension, type 2 DM, dyslipidaemia and status after right total hip arthroplasty was admitted with acute bacterial prosthesis infection. The patient was proposed for an urgent revision of prosthesis.
In the OR, monitoring revealed frequent monomorphic VT (HR 140bpm), with a MAP of 60mmHg, without changes of conscious level, chest pain or dyspnoea.
Blood gas analysis revealed hypokalaemia of 3,1mmol/L, which was corrected.
Magnesium sulphate 2g, paddle monitoring and amiodarone 300mg were started.
A multidisciplinary discussion took place and an electrical cardioversion with rhythm control to HR 70bpm was achieved. Echocardiogram didn't reveal significant structural heart disease or left ventricular systolic dysfunction.
The next day, he underwent surgery without complications. Methicillin-resistant *S. aureus* was isolated. 3 months of IV antibiotic was concluded.
Discussion: Monomorphic TV generally carries an excellent prognosis, sudden death is rare.[1] Metabolic derangement or drug toxicity can cause this condition and should be adressed.[2]
Sympathectomy and hypotension subsequent to subarachnoid blockade and adrenergic discharge associated with surgical manipulation could trigger a malignant arrhythmia.
Despite the need for infectious focus control, as the initial VT had haemodynamic repercussion and could evolve to a malignant arrhythmia, even after cardioversion to sinus rhythm, stabilization of the patient in the ICU was prioritized.
References:
1. Prystowsky EN, Padanilam BJ, Joshi S, Fogel RI. Ventricular arrhythmias in the absence of structural heart disease. J Am Coll Cardiol. 2012 May 15;59(20):1733-44.
2. Sohinki DA, Mathew ST. Ventricular Arrhythmias in the Patient with a Structurally Normal Heart. J Innov Card Rhythm Manag. 2018 Oct 15;9(10):3338-3353.
Learning points:
VT in structurally normal hearts are typically monomorphic.[1-2]
There are reversible causes that can result in monomorphic VT.[2]
A multidisciplinary approach is essential to weigh risks and benefits of the possible interventions and determine the best management course for the patient.

13AP01-11
Spinal cord ischemia after TEVAR procedure - the role of the anesthesiologist

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Background: Spinal cord ischemia (SCI) is a rare and devastating complication after thoracic endovascular aortic repair (TEVAR). Clinical presentation is paraplegia reversible but it can progress to permanent. High clinical suspicion is needed for prompt diagnosis with MRI-imaging[1].

High-risk patients for medullary ischemia should be identified so that prophylactic measures can be implemented[2].

Case report: We present a case of a 77-year-old male patient, personal history of arterial hypertension, dyslipidemia, smoking, ischemic stroke without sequels and abdominal aortic aneurysm admitted in the post-anesthetic care unit (PACU) after TEVAR procedure, under general anesthesia.

At day one postoperative, he complained about decreased muscle strength and a slight drop of right (R) leg was observed in straight leg raise test. As soon as SCI was suspected, urgent neurology evaluation was performed by a neurology team. Physical examination showed grade 3Left (L)/2R in leg flexion, grade 3L/3R in foot dorsiflexion, plant reflex in flexion/L and indifferent/R hypoesthesia of lower limbs bilaterally up to the inguinal region, without any other neurological deficits. A thoracolumbar MRI was requested and confirmed medullary ischemia at T12 level. Thus, a L3-L4 lumbar catheter was placed for cerebrospinal fluid (CSF) drainage (goal: CSF pressures 8-12mmH2O) and median arterial pressure (MAP) was maintained in 90-100 mmHg.

At day two the patient had significant improvement of neurological deficits under lumbar drainage and the catheter was clamped in 48-hours. He stayed in PACU for four days until he was transferred to the surgical ward with completely full motor and sensorial function. Lumbar drain was removed five days after the diagnosis without complications. A follow-up appointment was performed two weeks after hospital discharge and the patient was performing physical rehabilitation program to improve his physical status.

Discussion: SCI is a major complication after TEVAR and has a serious impact on patients' life quality. Anesthesiologists have an important role in diagnosis and management of this complication. A high clinical suspicion is required and an early diagnosis is essential to implement therapeutic strategies to improve medullary perfusion pressure, such as blood pressure support and reduction of spinal cord canal pressure with lumbar drain.

References:

1. doi: 10.21037/jtd.2018.10.99
2. doi: https://dx.doi.org/10.25751/rspa.14906

13AP01-12
Post-operative management of tracheal laceration in a Rett syndrome patient

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Background: Rett syndrome is a neurodevelopmental disease, characterized by progressive central nervous system deterioration manifesting with intellectual disability, seizure and movement disorders, respiratory (abnormal breathing pattern) and other organ dysfunctions.[1,2]

Case report: A totally dependent 40-year-old patient with Rett Syndrome underwent dental destartarization under general anesthesia with sevoflurane and orotracheal intubation, with no apparent complications. At PACU admission she developed marked right hemifacial edema and subcutaneous emphysema extending to the thoracic region and upper limbs but was otherwise stable. A CT-scan showed pneumomediastinum in relation to an image suggestive of posterior tracheal laceration, extending 3 cm upwards of the carina.

The patient was nasotracheally intubated with bronchofibroscopy which confirmed the diagnosis. After multidisciplinary discussion it was decided to selectively intubate the right bronchus and place bilateral pleural drains. Surgery was deemed not feasible. Admission to ICU was denied and it was decided to provide conservative treatment at PACU. Selective intubation was maintained, with weekly bronchofibroscopy, to evaluate progress and ventilate the contralateral lung.

After 7 days the lesion was no longer observed. Intubation was maintained for another week to allow consolidation. After 19 days the patient was extubated. Initially, she experienced respiratory difficulty due to pulmonary secretions and disuse myopathy. Nonetheless, after 11 days of respiratory kinesiotherapy and BiPAP support, she was discharged home with nocturnal non-invasive ventilation and cough assist.

Discussion: A patient with severe comorbidities was admitted for a minor procedure and developed a major anesthesia related airway injury. Our hospital's differentiated PACU allowed us to provide specialized care. We theorize that ICU environment eviction may have benefited this patient by decreasing the risk of respiratory infection. During treatment, the patient exhibited various abnormal respiratory patterns, which we learned to interpret as part of the underlying syndrome and to allow some deviation from what would be considered normal.

References:

1. JA Clin Rep 4, 32 (2018)
2. Respir Physiol Neurobiol 1;189(2):280-7 (2013)

Learning points:

Even minor procedures may be associated with major complications. Differentiated PACUs may allow for the treatment of perioperative complications outside of the ICU.

13AP01-13
Disseminated intravascular coagulation induced by junctional tachycardia and hypotension during ureterocutaneostomy: a case report

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Background: Junctional tachycardia (JT) is a rare form of narrow QRS complex tachycardia in adults, secondary to enhanced automaticity or triggered activity. We reported an elderly patient with JT poorly responsive to drug therapy, severe hypotension and hemorrhage during surgery, eventually lead to concomittant hemorrhage and disseminated intravascular coagulopathy (DIC).
Case report: A 74-year-old female with previous abdominal surgery associated urinary obstruction and chronic kidney disease had a sudden onset of JT without exhibition of P wave ranging from 130 to 140 beats/min and hypotension (SBP 50-80 mmHg) during ureterocutaneoustomy under general anesthesia. Unresponsive to beta blocker and vasopressor, JT and hypotension was sustained except extremely temporary restoration of sinus rhythm (99 bpm) and increase in blood pressure (SBP 100 mmHg) with administration of adenosine. In addition, hemorrhage due to adhesion of previous surgical site was overlapped and consequently, lead to DIC and death.
Discussion: Classically benign in the young adult, proper diagnosis and management of JT during surgery is challenging because of poor responsiveness to drug therapy in the elderly without suspected cardiac disease.
Reference:
Frederick T Han. Incessant Palpitations and Narrow Complex Tachycardia. Card Electrophysiol Clin 2016: 8 :61-5.
Learning points: This case highlights the need for accurate interpretation and comprehensive understanding of best management of patients with spontaneously occurred arrhythmia during surgery. We know that obtaining informed consent from patients is a requirement. However, since the patient in the case has already died, the reason for exemption from patient consent received from the Research Ethics Committee is attached. Unfortunately, this notice has not been translated into English.

13AP02-01
Preoperative anaemia among elderly undergoing major abdominal surgery (PANAMA) is associated with higher postoperative morbidity and complications

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Background: Preoperative anaemia is associated with poor postoperative outcomes and is a modifiable risk factor that can be managed perioperatively. This study aims to determine the association of anaemia severity with presence of morbidity at the 5th postoperative day using postoperative morbidity survey (POMS) score. The secondary aim is to determine association of anaemia with trend of complications within 30 postoperative days as defined by POMS, Clavien Dindo Classification (CDC) system and Comprehensive Complication Index, perioperative transfusion requirements, length of hospital stay, 6-month mortality, 6-month readmission rates, and Days alive and out of Hospital (DaOH) at 30 days, 3 months and 6 months.
Methods: Ethics approval was obtained from SingHealth Centralised Institutional Review Board. This prospective, observational study was conducted in the preoperative anaesthesia clinic (PAC) of a tertiary hospital in Singapore over a 12-month period. The study protocol has been previously published.
Results & Discussion: 499 patients were recruited, of which 3 did not meet inclusion criteria. Of the 469 patients analysed, 176 (37.5%) were anaemic. The baseline Hb was 11.3g/dL for anaemic group and 13.8g/dL for non-anaemic group. Iron deficiency is the most common cause. Majority had mild anaemia (61.4%) while 4 patients were severely anaemic (2.3%).
The anaemic group is associated with older age, higher age-adjusted CCI score ($p<0.001$), higher incidence of diabetes mellitus ($p<0.001$) and had a higher proportion of patients with ASA status 3/4 ($p<0.001$). Anaemic group had a higher proportion of patients present with any POMS complications up to postoperative day 14/15 ($p<0.05$).
The total number of complications as well as morbidity was significantly higher in the anaemic group than non-anaemic group (both $p<0.001$). Perioperative transfusion requirement was also significantly higher. The anaemic group had a significantly longer length of stay ($p=0.013$), lesser DaOH at 30 days, 3 months and 6 months ($p<0.001$), and twice the proportion of readmission within 6 months ($p<0.002$). This was not translated into higher mortality within 30 days or 6 months.
Conclusion: There is a higher incidence of anaemia in elderly patients going for abdominal surgery than for general non-cardiac surgery. Preoperative anaemia, even to a mild degree, increases morbidity and surgical complications, as well as length of stay and shorter DaOH.

13AP02-02
Use of a new modified preoperative risk-stratification tool for virtual versus in-person preanaesthesia-evaluation discrimination in adult patients undergoing elective non-ambulatory surgery: preliminary study

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Background and Goal of Study: Preoperative risk factor identification and optimisation are widely accepted as the gold standard of care for elective surgery and are essential for reducing morbidity and mortality. Based on the successful implementation of telemedicine and its feasibility in the preoperative context, we aimed to develop, implement and assess a new risk-stratification tool for discrimination between virtual and in-person preanaesthesia evaluation.
Materials and Methods: We adapted the UCLA risk stratification scale to our setting and anaesthesiologists' risk score consensus was achieved. They trained anaesthesia nurses for correct tool man-

agement: nurses were asked to review clinical criteria to create a tier of eligible patients for virtual versus in-person preanaesthesia evaluation based on surgical risk scores (type of surgery (range from 1-5)) and patient risk scores (comorbidities (range 1-5)). Scores ≥ 7 were planned for face to face (by anaesthesiologist) and scores ‹ 7 for virtual (nurse) attendance. Additionally, preoperative testing (EKG, chest x-ray, laboratory testing, etc.) was decided according to guidelines. Nurse stratification took place under faculty supervision. Preliminary data are presented as absolute numbers ± SD or percentages.

		SURGICAL RISK SCORE				
		1	2	3	4	5
PATIENT RISK SCORE	1	Low risk	Low risk	Low risk	Virtual visit	Virtual visit
	2	Low risk	Low risk	Virtual visit	Virtual visit	**Face to face visit**
	3	Low risk	Virtual visit	Virtual visit	**Face to face visit**	**Face to face visit**
	4	Virtual visit	Virtual visit	**Face to face visit**	**Face to face visit**	**Face to face visit**
	5	Virtual visit	**Face to face visit**	**Face to face visit**	**Face to face visit**	**Face to face visit**

Results and Discussion: We report our experience of the first 504 adult patients during one month scheduled for elective non-ambulatory surgery (all surgical specialties were included). 326 patients (64.68%) and 178 (35.32%) were planned for in-person versus virtual attendance respectively. Mean nurse stratification time/patient was 9.6 ± 5.1 min. Most doubts asked by the nurses were related to new surgeries, specific morbidities and/or medications and preoperative testing needs.
Conclusion(s): The use of this new preoperative risk-stratification tool by trained anaesthesia nurses was feasible and easy to perform; it allowed us objectively to discriminate between virtual vs in-person attendance according to surgery and patient risk score. It should be adapted to each specific setting and be always performed under anaesthesiologist's supervision.

13AP02-03
Association of postoperative recovery with disability-free survival after elective major abdominal surgery

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Background and Goal of Study: In recent years, patient-reported outcome measures arising directly from the patient have gained more attention. The quality of recovery-15 (QoR-15) measured immediate postoperative period and the 12-item World Health Organization Disability Assessment Schedule (WHODAS) 2.0 assessed after discharge have used as patient-reported outcome measure after surgery; however, the association between immediate postoperative recovery in hospital and mid-term disability-free survival (DFS) after discharge has been poorly documented.
Materials and Methods: We conducted a prospective observational study and enrolled 260 patients with cancer aged ≥ 65-year-old undergoing elective major abdominal surgery (general, urologic, and gynaecologic surgery) with a cancer diagnosis. Patients completed the QoR-15 scale the day before, at 2 day, 4 day, and 7 day after surgery. The DFS was assessed before and three months after surgery. The poor recovery was defined as the QoR-15 score < 90. The DFS was defined as alive with the 12-item WHODAS <16%. The association of postoperative poor recovery with DFS was assessed by the Fisher's exact test. The odds ratios of poor recovery on POD 2 to DFS was investigated by a multiple logistic regression analysis with adjusting prominent factors (age, preoperative frailty, preoperative DFS, surgical duration, and intraoperative blood loss volume).
Results and Discussion: Of 260 eligible, 230 patients completed follow-up at 3 months. On POD 2, 27.3% (63/230) had poor recovery and the number of patients who had DFS at 3 months after surgery was higher in patients without poor recovery on POD 2 (79.6%) than in patients with poor recovery on POD 2 (65.1%) (P=0.02). The adjusted odds ratio of poor recovery on POD 2 to DFS at 3 months after surgery was 0.48 (95% confidence interval 0.23-0.99).
Conclusion(s): Patients with poor recovery on POD 2 were more likely to be non-DFS at 3 months after abdominal surgery.

13AP02-04
Preoperative prevalence of chronic kidney disease in a cohort of noncardiac surgery in Brazil

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Background and Goal of Study: Chronic Kidney Disease (CKD) (Glomerular Filtration Rate -GFR- < 60ml/min/1.73m² or albuminuria) affects 10% of the population worldwide and in Brazil.(1) Preoperative CKD is associated with Acute Kidney Injury and postoperative worsening of CKD. Therefore, identifying patients before surgery may improve perioperative care. The Kidney Disease Improving Global Outcomes (KDIGO) defines CKD in five categories for GFR in ml/min/1.73m² (G1 - Normal or high, ≥ 90; G2 - Mildly decreased, 60-89; G3a - Mildly to moderately decreased, 45-59; G3b - Moderately to severely decreased, 30-44; G4 - Severely decreased, 15-29; G5 - Kidney failure, <15). We describe the prevalence of preoperative CKD and assess its association with postoperative in-hospital mortality.
Materials and Methods: Between 2015 and 2019, 62,223 patients underwent 106,587 surgeries in a tertiary hospital in Brazil. We analysed a retrospective cohort of 36,747 noncardiac surgeries. We developed a logistic regression model to assess the association of CKD with postoperative in-hospital mortality, controlled by age, surgery severity, the urgency of the procedure and ASA-PS.
Results and Discussion: A preoperative GFR measure was available in 25,303 (68.8%) patients. The mean age of the sample was 52.4 years (SD 17); 41.15% were male; 21.5% were ASA-PS I, 57% ASA-PS II, 18.7% ASA-PS III, 2.5% ASA-PS IV and 0.35% ASA-PS V; 80.5% had an elective procedure. Major surgeries accounted for 21.7% of the sample. Only 12.2% of patients had preoperative CKD (G3a 5.62%, G3b 3.06%, G4 1.6% and G5 1.95%). In-hospital postoperative mortality by CKD categories was 1.94% for G1, 2.88% for G2, 6.48% for G3a, 9.87% for G3b, 20.2% for G4, and 12.41% for G5. In a logistic regression model, preoperative CKD was independently

associated with increased in-hospital mortality (OR 1.75, CI 95% 1.5-2.05, p<0.001). When analysing by categories, only KDIGO G4 (OR 2.48, CI95% 1.91-3.22, p<0.001) and G5 (OR 1.54, CI95% 1.17-1.54, p= 0.002) were associated with increased mortality.

Conclusion(s): Preoperative prevalence of CKD in noncardiac surgical patients mirrors the general population. However, preoperative CKD is independently associated with increased in-hospital mortality. Further studies are necessary to understand how CKD increases mortality and what measures reduce patient risk in this context.

Reference:

1. Piccolli AP, et al. J Bras Nefrol Orgao Of Soc Bras E Lat-Am Nefrol. 2017;39(4):384–90.

13AP02-05
Machine-learning guided prediction of the need for intensified postoperative care in elderly patients

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Background and Goal of Study: Early detection of postoperative complications is crucial to reduce surgical morbidity and mortality [1]. Due to limited capacities and increasing economic pressure, an appropriate allocation of patients requiring a monitoring bed is necessary to ensure best individual patient care. We aimed to predict the need for intensified postoperative care (IPC) in a post-anaesthesia care unit (PACU) in patients ≥ 65 years using a machine learning algorithm.

Materials and Methods: We used premedication and administration data from non-cardiac surgeries in patients ≥ 65 years between May 2014 and March 2020 to build a prediction model using extreme gradient boosting. The primary outcome was IPC, defined as stay in a PACU > 4 hours. The dataset was divided into a training (n=22963), testing (n=7656) and validation cohort (n=7656). Model development included a Bayesian hyperparameter search through triple cross-validation. Model performance was presented using receiver operating characteristic (ROC) and precision-recall (PR) curves.

Results and Discussion: 38275 surgeries were included, of which 8046 experienced IPC (21.0%). The model included 684 variables and showed high accuracy (validation AUROC 0.89 [95% confidence interval (CI) 0.88 to 0.90], AUPR 0.74 [95% CI 0.73 to 0.75]). The most important characteristic was number of ordered packed red blood cells, which contributed 23.2% to the prediction of IPC. The ten main contributing characteristics of IPC are shown in the importance plot (Figure 1).

Conclusion(s): The developed machine learning model is able to predict the need for IPC of patients ≥ 65 years based on individual preoperative data with high accuracy. Most of the identified characteristics are related to the underlying disease or planned surgical procedure, and are therefore not amenable to preoperative modifications. However, the algorithm may be used as a decision support to improve clinical workflows and to adjust clinical capacities.

Reference:

1. Goldhill, D.R., Preventing surgical deaths: critical care and intensive care outreach services in the postoperative period, British Journal of Anaesthesia, 2005, 95(1), p:88-94

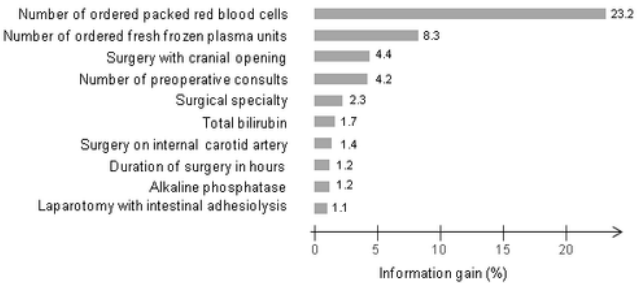

Figure 1. Determining factors of intensified postoperative care.

13AP02-06
Long-term mortality following acute abdominal surgery; result from the Swedish SMASH study (standardised perioperative management of patients operated with acute abdominal surgery in a high-risk and emergency setting)

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Background and Goal of Study: Individuals with severe abdominal pathology resulting in need of acute high-risk abdominal surgery are common in all emergency hospitals settings. The dominating surgical intervention is an emergency laparotomy. The typical patient is often critically ill and outcome associated with serious complications. The Swedish SMASH study investigates if a standardised management for patients undergoing emergency laparotomy can reduce complications.

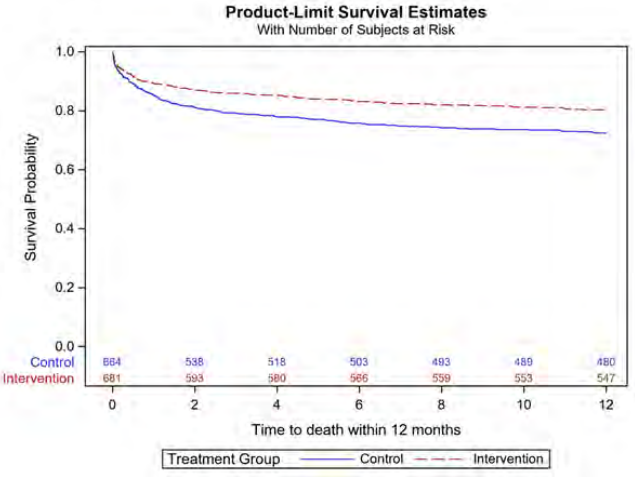
The study has earlier shown a decrease in complications including short-term mortality, need of intensive care, length of stay in hospital and surgical complications. This abstract presents the long-term mortality for patients in the SMASH-study.

Materials and Methods: This controlled prospective intervention study included all adult patients undergoing an emergency laparotomy over a period of 42 months (2018-2021). Perioperative management for the intervention patients was carried out using an activated standardised clinical protocol including standardisation regarding antibiotics, communication, time to first incision, competence in theatre, level of recovery care and the use and early warning score. The Long term- mortality was analysed at 90 and 365 days after surgery.

The outcomes were then compared with a retrospective control group operated on in the same hospital, the years prior to the intervention.

Results and Discussion: A total of 1,344 patients were included. In the intervention group (n=681), 90-day mortality of 14.1% was seen and, in the control group (n=663), the corresponding figure was 20.8% (P=0.0016). The mortality seen after 365 days was 19.7% for the intervention group and 27.7% for controls (P=0.0005). Adjusted analyses showed a significant reduction in long-term mortality following acute high-risk abdominal surgery. We can observe a tendency to continuously reduced mortality several months after surgery (see figure).

Conclusion: The SMASH study suggests that standardised management may improve the postoperative mortality after emergency laparotomy for a long time after surgery.



13AP02-07
Implementation and evaluation of TelePACE - a telemedicine service for preoperative screening and counselling in a tertiary institution in Singapore

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Background: Telemedicine's role in perioperative medicine is evolving. In Tan Tock Seng Hospital, Singapore, all patients scheduled elective surgery are seen in the PACE clinic (Pre-admission Counselling and Evaluation). During the COVID-19 pandemic, we piloted TelePACE, a videoconferencing (VC) service that provides nurse-led preoperative screening and counselling while maintaining physical distancing.
Objective: We share our experience in TelePACE, which is conducted via the VC platform Zoom®. We reviewed the rejection rate and reasons to assess patients' perception and barriers. We evaluated patient satisfaction and day-of-surgery cancellation rate to assess TelePACE's utility and efficacy.
Methods: We reviewed TelePACE data between October 2021 to May 2022.
The conduct of TelePACE screening is similar to in-person PACE screening. Medical records and investigations are reviewed, preoperative screening is done and anaesthesia information is explained. On the day of surgery, the anaesthetist will examine the patient and complete the assessment.
Patients who undergo TelePACE are given an online survey in which they are asked to feedback on delivery of information, patient experience and satisfaction.
We also reviewed the day-of-surgery cancellation rate to assess the efficacy of TelePACE in providing adequate preoperative preparation.
Results and Discussion: Between October 2021 to May 2022, 281 patients underwent TelePACE. A major obstacle is patients' perception: 55% of those who declined stated that they preferred a conventional clinic, while 24% quoted unfamiliarity with VC. A high rejection rate limits the service's efficiency. We are working towards upstream patient education by providing VC information and technical support at surgical clinics using pamphlets to increase patients' confidence in VC.
The average patient satisfaction score was 9.352 (scale of 10); 99.2% experienced clear information delivery, 96.8% had a positive experience.
Our day-of-surgery cancellation rate for this period for TelePACE patients was <1%, none a direct result of VC, supporting the evidence that preoperative telemedicine is reliable.
Conclusion: TelePACE screening is effective and should be continued beyond the pandemic. VC has its limitations due to the needs of preoperative assessment, and patient selection is vital for success. Improving patient education and technical support are crucial steps ahead for better efficiency, patient acceptance and satisfaction.

13AP02-08
Incidence and severity of postoperative hypotension in patients treated on general wards after non-cardiac surgery: a prospective observational study

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Background and Goal of Study: Intraoperative hypotension is common in patients having non-cardiac surgery and it is associated with organ injury and death. However, hypotension is not restricted to the intraoperative period, but also occurs after surgery.[1] The incidence and severity of postoperative hypotension remains largely unknown.
The aim of this study was to quantify the incidence, duration, and severity of postoperative hypotension during the remaining day of surgery and the first night and day after surgery in patients treated on general wards after non-cardiac surgery.
Materials and Methods: We performed a prospective observational study in patients treated on general wards after non-cardiac surgery with general anaesthesia. Blood pressure was measured using an automated oscillometric blood pressure monitoring device (OnTrak, Spacelabs Healthcare, Snoqualmie, USA) during the remaining day of surgery and the first night and day after surgery. To quantify hypotension we calculated the incidence of postoperative hypotension – defined as at least one mean arterial pressure (MAP) below 65 mmHg. In patients with postoperative hypotension, we calculated the median (25^{th} percentile, 75^{th} percentile) number as well as the median duration of episodes with a MAP below 65 mmHg, the median absolute maximum decline below a MAP of 65 mmHg, the median area under a MAP of 65 mmHg, and the median time-weighted average MAP less than 65 mmHg.
Results and Discussion: 253 patients with a mean (range) age of 70 (43 – 91) years were included in the final analysis. Patients were predominantly classified as ASA II (140 [55%]) or III (98 [39%]). 102 of 252 patients (40%) had postoperative hypotension defined as at least one MAP below 65 mmHg. In these patients, the median number of episodes with a MAP below 65 mmHg was 2 (1, 3) – with a median duration of 90 (30, 210) minutes. The median absolute maxi-

mum decline below a MAP of 65 mmHg was 6 (2, 10) mmHg, the median area under a MAP of 65 mmHg was 345 (72, 1082) mmHg x min, and the median time-weighted average MAP less than 65 mmHg was 0.21 (0.05, 0.68) mmHg.

Conclusion: Postoperative hypotension is common and profound in patients treated on general wards after non-cardiac surgery.

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13AP02-09
Impact of preoperative uni- or multimodal prehabilitation on postoperative morbidity: a systematic review and meta-analysis

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Background and Goal of Study: Postoperative complications occur in up to 43% of cases, resulting in increased morbidity and economic burden (1). Prehabilitation (prehab) could increase patients' pre-operative health and improve postoperative outcomes. However, reported results of prehab are contradictory (2,3).

The objectives of this systematic review are to evaluate the effects of prehab on postoperative outcomes in patients undergoing elective surgery.

Materials and Methods: We performed a systematic review and meta-analysis of randomized controlled trials published between January 2006 and January 2021 comparing prehab programs lasting ≥ 14 days to "standard of care" (SOC) and measuring postoperative complications. Database searches were conducted in four databases: PubMed, CINAHL, EMBASE, PsycINFO.

The primary outcome was the effect of uni and multi-modal prehab on 30-day complications, secondary outcomes were length of stay (LOS) and pain.

Results and Discussion: Twenty-four studies (including 1984 patients randomized in a 1:1 ratio) met the inclusion criteria. The average methodological study quality was moderate. There was no difference between prehab and SOC groups for postoperative complications (OR 0.98; 95%CI [0.82; 1.17]; p=0.09; I^2=36%) (*Figure 1*), total hospital LOS (MD -0.13 days; 95%CI [-0.56; 0.28]; p=0.53; I^2=21%), or postoperative pain.

The Intensive Care Unit (ICU) LOS was significantly shorter in the prehab group (MD -0.57 days; 95%CI [-1.10; -0.04]; p=0.03; I^2=46%) (*Figure 2*). Separate comparison of uni- and multi-modal prehab showed no difference in complications or hospital LOS.

Conclusion(s): Prehab reduces ICU LOS compared with SOC in elective surgery patients but has no effect on overall complications or total LOS, regardless of modality. Prehab programs should be more homogeneous and targeted to those patients most likely to benefit.

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13AP02-10
Intraoperative ketamine for prevention of postoperative neurocognitive disorders after major orthopedic surgery in elderly patients: a prospective multicenter randomized blinded placebo-controlled trial – the POCK study

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Background and Goal of Study: Preventive anesthetic impact on the high rates of postoperative cognitive disorders in elderly patients is debated (1,2,3). The Prevention of postOperative Cognitive dysfunction by Ketamine (POCK) study aimed to assess the effect of ketamine on delayed neurocognitive recovery post-surgery.

Materials and Methods: This is a multicenter, randomized, quadruple-blind, prospective study. Patients ≥60 years undergoing major orthopedic surgery were randomly assigned in a 1:1 ratio to receive preoperative ketamine (0.5mg/kg) or placebo in random blocks of size 2 and 4 stratified according to study site, preoperative cognitive status and age.

The primary outcome was the proportion of delayed cognitive recovery defined as a decline of one or more standard deviations in neuropsychological assessment according to the DSM-5 on postoperative day 7.

Secondary outcomes included the incidence of postoperative neurocognitive disorders and the incidence of delirium, anxiety, and depression three months after surgery. Statistical analyses were performed on an intention-to-treat basis using a logistic regression for binary outcomes.

Results and Discussion: Among 301 patients included, 292 (97%) completed the trial. Delayed neurocognitive recovery occurred in 50 (38.8%) patients in the ketamine group and 54 (40.9%) patients in the placebo group (OR [95% CI] 0.92 [0.56;1.51], p=0.73).

The incidence of postoperative neurocognitive disorders 3 months after surgery did not differ significantly between the two groups nor did the incidence of delirium, anxiety, apathy, and fatigue 7 days and 3 months after surgery. Depression was less frequent in the ketamine group three months after surgery (OR [95%CI] 0.34 [0.13-0.86]).

Conclusion(s): A single bolus of intravenous ketamine does not prevent delayed neurocognitive recovery but may reduce postoperative depression in elderly patients scheduled for major orthopedic surgery.

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13AP02-11
Can self-reported functional capacity predict perioperative outcomes in patients undergoing noncardiac surgery? A systematic review and meta-analysis

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Background and Goal of Study: Assessment of functional capacity is pivotal for patients' risk stratification and subsequent perioperative management. Self-reported functional capacity is less labor-intensive compared to exercise testing. However, its predictability on postoperative outcomes has not been established.
This study aims to clarify the predictability of self-reported functional capacity in the context of perioperative risk assessment.
Materials and Methods: In this systematic review and meta-analysis, we searched EMBASE and MEDLINE from the database inception to August 31, 2022. We included original research articles describing the association between self-reported functional capacity and perioperative outcomes in adults undergoing noncardiac surgery. For comparability, we only collected studies where functional capacity was expressed in metabolic equivalents (METs).
The primary outcome was postoperative major adverse cardiovascular events (MACE) including mortality.
The secondary outcome was any serious postoperative complications.
We estimated the odds ratio (OR) of the outcomes in patients with poor functional capacity (<4 METs) compared to good functional capacity (= 4METs or higher).
Results and Discussion: The literature search identified 4057 articles. After screening and full-text review, 8 studies (4 prospective and 4 retrospective cohorts) involving 12,823 individuals were included in the systematic review and meta-analysis. Evaluation methods of functional capacity were questionnaires (N=4), subjectively assessed METs (N=2), and specific questions (N=2).
The incidence of postoperative MACE was significantly higher in patients with a poor functional capacity [12.8% vs 3.1%, OR 2.19, 95% CI 2.08-3.21] with moderate heterogeneity (I2=31%) across studies. Patients with poor functional capacity also had postoperative serious complications more frequently [15.1% vs 5.6%, OR 1.95 95% CI 1.35-2.80] whereas heterogeneity was high (I2=74%). These findings support the current stratification strategy provided in the guidelines for patient perioperative assessment.
Conclusion: Self-reported functional capacity of less than 4 METs was associated with postoperative complications including cardiovascular events and other serious outcomes. The result needs to be interpreted with caution due to diverse measures to assess subjective functional capacity.

13AP02-12
Availability of preoperative assessment services in the West of Scotland: a survey

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Background and Goal of Study: The Centre for Perioperative Care (CPOC) provides guidance on the assessment and optimisation of adult patients being considered for surgery[1]. This may help reduce the risk of complications and optimise operating capacity; important given the ongoing backlog in elective surgery. We surveyed practice in the West of Scotland region, assessing alignment with CPOC guidelines.
Materials and Methods: In November 2022, a survey based on CPOC guidelines was emailed to the trainee research network (WoSTRAQ) representative at every acute adult hospital in the West of Scotland. The survey was to be completed alongside the lead perioperative consultant anaesthetist for each site. It was designed to assess the availability of pre-optimisation, comorbidity management, health surveillance and emergency pre-assessment.
Results and Discussion: Thirteen sites were surveyed with a 100% response rate. All sites recorded pre-assessment information electronically. No sites were able to access primary care notes but 5 could access GP summaries.
All 13 sites had means to optimise comorbidities with 12 following specific guidelines. There was less support available to optimise other factors: 7 sites provided no psychological support, 2 provided no nutritional support, and 2 had no functional capacity support. Four had no specific support for older patients. Most support available for any of the factors described was restricted to verbal or written advice.
Ten sites had no provision for assessing emergency patients. In sites that did, 2 had a ward outreach service, 2 had 'hot clinics', and 1 would use capacity in elective clinics when available. Surveillance for patients with long waits since first assessment was variable: 6 underwent full reassessment; 3 phone reassessment, and 3 relied on patient provided updates.
Conclusion(s): Our survey suggests CPOC guidelines for preoperative assessment and optimisation are not consistently met in West of Scotland hospitals. We will undertake a prospective snapshot audit of pre-operative assessment in elective adult surgery in March 2023. This will help further define any variation in services and identify areas for improvement.
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Acknowledgements: WoSTRAQ group collaborators

13AP03-02
Impact of peri operative factors on Postoperative Mechanical Ventilation (POMV) of patients undergoing hyperthermic intraperitoneal chemotherapy (HIPEC): a retrospective analysis

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Background and Goal of Study: Cytoreductive surgery (CRS) and Heated Intra-peritoneal Chemotherapy (HIPEC) has improved survival rates in patients with peritoneal carcinomatosis. The aim of this study is to analyse the peri-operative factors associated with prolong postoperative ventilation over a ten year period at our tertiary care centre in India.

Materials and Methods: 102 patients who underwent CRS and HIPEC in ten years (2011-2021) at Tata Medical Center, Kolkata were analysed for the primary outcome of extubation on table (n=59) vs elective postoperative ventilation (n=43) and secondary outcome of Clavien-Dindo (CD) classification and length of ICU stay. Statistical analysis was carried out using SPSS version 17.0.

Results and Discussion: Higher peritoneal carcinoma index (PCI) ($P < 0.05$), longer duration of surgery ($P < 0.05$), higher intra-operative fluid administration ($P=0.002$), higher requirement of blood products including PRBC and FFP ($P< 0.05$), requirement of diaphragmatic resection and ICD insertion ($P < 0.05$), were associated with failure of on table extubation.

These factors were also associated with longer ICU stay. Though age, urine output, number of anastomosis, intra-operative total fluid requirement, higher delta temperature and CD classification does not have statistically significant effect on elective postoperative mechanical ventilation. On table extubation was more prevalent in gastrointestinal malignancies compared to the gynaecological ones.

Conclusion(s): Higher PCI, longer duration of surgery, higher intra- operative blood and blood product requirement, diaphragmatic resection, ICD insertion were associated with failure of on table extubation as well as prolong ICU stay.

13AP03-04
Effect of preoperative warming on intraoperative hypothermia and postoperative functional recovery in total hip arthroplasty: a randomized clinical trial

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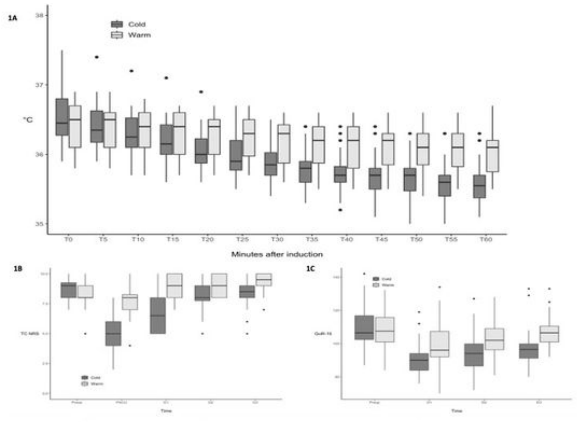
Background and Goal of Study: Intraoperative hypothermia (IH) increases postoperative morbidity and impairs postoperative recovery. Anterior-approached total hip arthroplasty (ATHA) can be associated with significant IH, partly because of the exposed body surface area in the operative field. This trial was conducted to assess the interest of preparative air-forced warming on IH and postoperative functional recovery.

Materials and Methods: Between February 5th, 2022, and October 23rd, 2022, 40 patients scheduled for ATHA were enrolled for this randomized, prospective, controlled trial. Patients were randomly divided into two groups of 20 patients each and received general anaesthesia. Group W received 30 minutes 43°C air-forced warming prior to anaesthesia induction. Group C did not receive any pre-induction warming. A blind observer noted the evolution of body temperature, measured by an oesophageal probe at the induction time and at fixed time points, i.e., every 5 minutes during the first hour. Impact on patient perceived thermal comfort and functional recovery (QoR-15) were assessed in the post-anaesthesia care unit (PACU), and 24, 48 and 72 hours after surgery. Intraoperative bleeding was also noted. Data were analyzed using Mann-Whitney or generalized linear mixed model tests as appropriate.

Results and Discussion: Intraoperative body temperature loss (Figure 1A) was faster and greater in group C than in group W, with a significant main effect for group ($p = 0.022$) and interaction between group and time ($p < 0.001$). The postoperative QoR-15 (Figure 1B) and TC (Figure 1C) evolutions were significantly better in the group W than in the group C, with a significant main effect for interaction between group and time ($p < 0.001$ and $p < 0.001$ for QoR-15 and TC, respectively) and less intraoperative bleeding [mL; median (IQR): Group W 445 (425 - 470) and Group C 615 (517.5 - 695) mL, $p < 0.001$].



Evolution of body temperature (°C) (**1A**) over the time points of interest (T0 = induction of general anesthesia; T5, T10, T15, T20, T25, T30, T35, T40, T45, T50, T55, T60: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60 minutes after induction of general anesthesia, respectively) in group W and in group C. Evolution of thermal comfort (**1B**) and French validated Quality of Recovery-15 items (**1C**) over the time points of interest (D–1= 1 one day before surgery; PACU = 30 minutes after post-anesthesia care unit admission; D1 = 24 hours after surgery; D2 = 48 hours after surgery; D3 = 72 hours after surgery) in group W and in group C.

Conclusion(s): In ATHA, 30-minutes preoperative warming reduces intraoperative body temperature drop during the first hour of surgery, and enhances postoperative recovery and patients' comfort during the first postoperative 3 days, with less intraoperative bleeding.

13AP03-05
The impact of local anaesthetics on NETosis of PMNs isolated by gelafundin-sedimentation

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Background and Goal of Study: Commonly used isolation methods for neutrophils (PMNs) influence the cell functions (1). The aim of the present study was to investigate the impact of local anaesthetics (LAs) on the extracellular trap formation (NETosis) of gently isolated PMNs.

Materials and Methods: PMNs were isolated from whole blood from healthy human subjects (vote: 12-101-0192) through 1*g* sedimentation with 10% gelafundin. 14 PMN-samples were incubated with different concentrations of bupivacaine (0.0-3.0mM), levobupivacaine (0.0-3.0mM) or lidocaine (0.0-13.0mM). Subsequently, NETosis was examined via live cell imaging for up to 22 h. Two parameters, first, the times for half-maximal NETosis (ET_{50}NETosis) at certain LA concentrations and second, the concentration to reach the half-maximal reduction of ET_{50}NETosis for each LA (EC_{50}NETosis) were measured. For that goal LAs were categorized into two groups of concentration (low < EC_{50}NETosis ≤ high) and statistical analysis was performed using Kolmogorov-Smirnov test of Gauss-distribution, followed by Mann-Whitney-U testing.

Results and Discussion: The ET_{50}NETosis showed a dose-dependent reduction from the low to the high groups of concentration, being significant for bupivacaine and lidocaine, but not for levobupivacaine (figure 1). The median of ET_{50}NETosis of PMNs treated with LAs ranged from 353.9-1096.2min (bupivacaine), 812.2-1013.7min (levobupivacaine) and 429.1-746.13min (lidocaine).

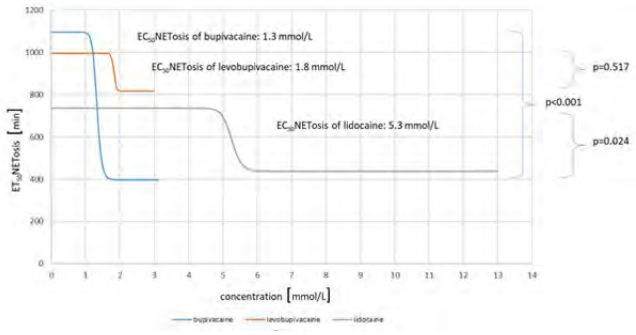

Figure 1: Effects of LAs on the half-maximal NETosis (ET_{50}NETosis)

In comparison to previous examinations (2), where PMNs were isolated with hypotonic lysis, EC_{50}NETosis-values are in the same range for lidocaine and bupivacaine, in contrast ET_{50}NETosis without LAs reached a distinct lower median (320.4min) with hypotonic lysis, results not shown.

Conclusion: We observed a negative sigmoidal correlation between ET_{50}NETosis and LA concentrations and a longer time until NETosis with the gelafundin-sedimentation isolation technique avoiding any centrifugation steps**.**

References:

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13AP03-06
Incidental durotomy during open spine surgery in adults and risk factors: an observational retrospective study

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Background and Goal of Study: Incidental durotomy (ID) is a common intraoperative complication of spine surgery (SS). It can lead to persistent cerebrospinal fluid leakage, which may cause serious complications. As a result, it contributes to higher healthcare costs and poor patient outcomes. Our hypothesis is that the incidence of ID in our center es high[1].

Materials and Methods: Retrospective descriptive observational single institution study was performed between January 2019 and December 2020. All adult patients who underwent SS were included. 500 patients were enrolled. ID was defined as unintended tearing of the dura during SS with cerebrovascular cerebrospinal fluid (CSF) extravasation. Demographic, surgery and postoperative data were collected.

We evaluated potential risk factors, including age, sex, BMI, ASA physical status classification, surgical indication, location of the surgery, type of surgical approach, diabetes mellitus, past surgical history in the operated area and length of stay in postoperative anesthetic critical unit (PACU).

The purpose of this study was to describe the ID incidence in our hospital and to clarify the independent risk factors that can cause ID during SS.

Results and Discussion: Student's t-test was performed for continuous variables and Chi-square for categorical variables. 37 ID cases were identified in 500 patients (7.4%). The analysis showed a statistically significant relation of ID to posterior approach (p=0.026), surgical site infection (p=0.004) and lumbosacral approach (p=0.004). Patients undergoing emergency surgery tended to be a positive predictor for ID (p=0.039). There was no statistically significant relation between ID and the rest of the variables.

Conclusion: The incidence of ID in our hospital is lower than expected and similar to the literature[1,2]. It appears to be related to the surgical approach and location of the surgery. ID implied a longer stay in PACU in hours (22.2 vs 9.9) and a higher incidence among patients with surgical site infection (24.1% vs 6.4%), which leads to a higher consumption of healthcare resources.

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13AP03-07
Incidence and clinical relevance of perioperative elevation of N-Terminal Pro-Brain natriuretic peptide in patients undergoing lung resection

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Background and Goal of Study: Postoperative (POP) natriuretic peptides elevation has been associated with adverse cardiovascular complications and even increased mortality in patients undergoing non-cardiac surgery. B-type natriuretic peptide (BNP) and its inactive cleavage product, N-terminal fragment (NT-proBNP), are produced by ventricular myocytes in response to ventricular wall stretching, myocardial ischaemia and endocrine modulation.
Our study aimed to evaluate the incidence and magnitude of perioperative NT-proBNP elevation and its relationship with the occurrence of major cardiovascular events in patients undergoing lung resection.

Materials and Methods: Prospective multicentre, observational cohort study at three University Hospitals including 187 patients, aged ≥45 years old and scheduled for elective thoracic surgery. Patients with severe heart failure, ventricular ejection fraction <30%, sepsis or undergoing urgent procedures were excluded. All patients provided written informed consent. NT-proBNP was measured preoperatively and at POP days 1 and 2. Elevation was defined as ≥300 ng/L NT-proBNP. We collected demographic variables and comorbidities, intraoperative data included complications, type of surgery and surgical approach, and 30-day cardiovascular complications and mortality. The bivariate relationship between each factor and NT-proBNP elevation was analyzed using a Student's t-test or the Mann-Whitney U test, and Chi-square or Fisher exact test for qualitative variables.

Results and Discussion: In our cohort 34 (18.2%, 95%CI:12.9%-24.5%) showed a preoperative NT-proBNP value ≥300 ng/L. In contrast to previous studies, more than half (57.2%, 95%CI:49.8%-64.4%) of our patients showed POP NT-proBNP elevation, which was more frequent in patients undergoing thoracoscopy (61%) than open procedures (30.6%) (p=0.01). Four patients (3.7%) with NT-proBNP elevation presented new-onset postoperative atrial fibrillation vs one patient (1.2%) without NT-proBNP elevation (p=0.3). No association was found between NT-proBNP elevation and 30-day mortality.

Conclusions: Our findings suggest that NT-proBNP elevations after lung resection may be related with surgical approach and not with 30-day mortality. Preoperative NT-proBNP levels would be useful to identify patients at increased risk of cardiovascular complications. Nevertheless, large studies are still needed for better understanding the incidence of NT-pro-BNP elevation in thoracic surgery.

13AP03-08
An immune signature of Surgical Site Infections (SSI), a retrospective study with a novel machine learning pipeline for biomarker identification

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Background: Surgical Site Infections are some of the most devastating, costly, and common surgical complications after surgery. The ability to accurately predict SSI is critical as it will guide high-quality surgical decision-making, including optimizing preoperative interventions and timing of surgery. However, existing risk prediction tools for the prediction of SSI perform poorly. In a prospective study of 43 patients, our group previously identified strong immune correlates of SSI in blood samples collected after surgery.
Here, we performed a retrospective study in 96 patients undergoing abdominal surgery to identify pre-operative immune responses predictive of SSI from the analysis of peripheral blood samples collected before surgery.

Materials and Methods: Blood samples collected before surgery were analyzed using a combined single-cell (mass cytometry) and plasma proteomic (SomaScan) approach. Samples were selected from a larger cohort using a frequency-matching procedure to minimize the effect of confounders on identified immunological biomarkers. The analysis combines two omics datasets, a plasma proteomic dataset and a mass cytometry dataset containing four omics sublayers. STABL, a novel machine learning analysis for omics data, is applied to obtain a unique set of predictive features.

Results: STABL identifies a model of SSI with good predictive performance (AUC = 0.74), improving current clinical scales performance. Notably, patients at risk for SSI showed increased MyD88 signaling in response to LPS in myeloid cell subsets such as granulocytes. This resonates with the proteomic dataset features, including increased levels of pro-inflammatory cytokines IL-1b and CCL3 or the stress response protein HSPH1. While IL-1b and HSPH1 represent classic mediators of acute response to inflammation and are released, among others, by activated neutrophils, CCL3 mediates initial recruitment of neutrophils to sites of inflammation.

Conclusion: These new findings emphasize the potential of STABL to discover predictive biomarkers that link multiple omics data layers with high biological plausibility and provide an avenue for efficient diagnostic and therapeutic development. Informative features of the SSI classification are readily interpretable biologically and the model points at coordinated bulk and single-cell proteomic features that are consistent with previously unrecognized innate immune system mechanisms, conducive to infection after surgery.

13AP03-09
The Neutrophil-Leukocyte Ratio (NLR) as a marker of 6-month mortality in emergency non-cardiac surgery

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Background and Goal of Study: Neutrophil-Leukocyte Ratio (NLR) has been associated with cardiovascular disease and overall mortality, yet its role in emergency surgery is not elucidated. Our goal is to evaluate NLR as a predictor of mortality in patients admitted for emergency surgery.
Materials and Methods: After ethics committee approval, we conducted a retrospective analysis between December 2021 to April 2022 of patients who underwent emergency surgery at the Hospital Clínico de la Universidad de Chile. Age, comorbidities, and preoperative blood count information were obtained. Using the national registry database, patients deceased within 6 months were identified.
A subgroup analysis was performed in patients over and under 65 years. Results were described as median with a 95% confidence interval (CI) and compared using the Mann-Whitney test with $\alpha=0.05$.
The predictive capacity of NLR for mortality was described using Receiver Operating Characteristic (ROC) curves. A final analysis was performed using multivariate logistic regression and Kaplan-Meier curves.

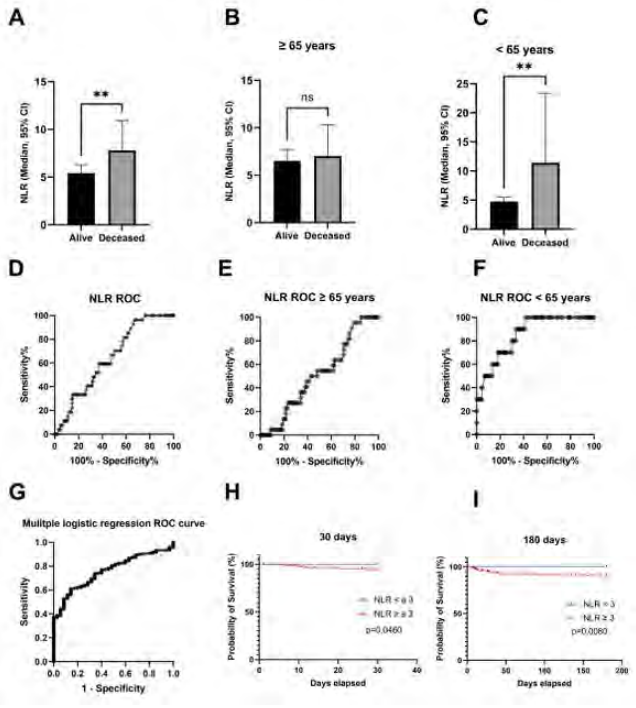

Figure 1.

Results and Discussion: We identified 351 patients who underwent emergency surgery. 33 (10.3%) patients died at six months. We observed a significant difference between the median NLR (5.4, 95% CI 4.8 – 6.3) in survivors and deceased (7.8, 95% CI 5.0-10.9) (p=0.0142.)(Fig 1 A). This was not observed in the subgroup over 65 years (p-Value=0.8595) but was maintained under 65 years (p-Value<0.001) (Fig 1 B-C). ROC curves of the NLR showed an AUC of 0.64 (p-Value=0.0147). When analyzed by age, NLR does not behave as a good predictor in people over 65 years (AUC 0.51, p-Value=0.8573) but improves its utility in people under 65 years of age (AUC 0.8537, p-Value= 0.0002) (Fig 1 D-F).
A mortality logistic regression model with NLR and age as a cofactor shows an AUC of 0.7593 (p-Value<0.0001) (Fig 1G). Kaplan-Meier curves show differences in 30 days and six-month mortality (Threshold NLR of 3, Fig 1 H-I).
Conclusion(s): NLR predicts mortality in surgical emergency patients, although further study on Age-related performance is needed.
Acknowledgments: ANID Grant SA22I0146 supported this work.

13AP03-10
Infection markers in perioperative medicine

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Background and Goal of Study: The prediction of infection remains difficult and long-lasting (microbial cultures) in perioperative and intensive medicine. Intensive care infection score (ICIS), derived from five blood-count parameters, characterize the immune response in routine blood samples.
In diagnostics of infection we routinely use evaluation of clinical status of the patient, biomarkers of infection like white blood cell count (WBC), C-reactive protein (CRP), procalcitonin (PCT), ICIS levels and microbial cultures. ICIS acquire values 0-20.
The cut–off ICIS level is 5. ICIS value 7-12 confirm diagnosis of sepsis. The important difference between patients with sepsis and SIRS has be seen in 48 hours from the first symptoms.
Materials and Methods: The goal was to verify, that ICIS as a biomarker differentiates infection from SIRS after surgery. ICIS contains five items:
1. Signal fluorescence intensity (SFL)was used to separate cells according to the DNA/RNA content and determine the immaturity of the examined cells.
2. Difference of the amount of hemoglobine in mature/immature erytrocytes (Delta He).
3. Count of mature neutrophiles (NEA).
4. Count of plasmocytes (HFLCA).
5. The count of immature granulocytes (IGA).
We have enrolled 291 cardiac surgery patients in this prospective study. The cohort was divided into infected and non-infected patient groups for evaluation.
Results and Discussion: Elevated level of ICIS had been proved in patients with positive microbial cultures in contrast to patients with postoperative SIRS (elevated CRP and negative microbial screening) after surgery.
Except after the surgery CRP, PCT and ICIS values are in correlation (p=0,001). We confirmed the cut – off ICIS level 5.CRP is not predictive for infection after the surgery.
Conclusion(s): ICIS help us differentiate between infection and SIRS in critically ill patients. In contrast to CRP and PCT, the ICIS score can be obtained routinely without extra blood sampling and with lower costs, yielding results very fast. ICIS helps to avoid antibiotics overuse.

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13AP03-11
Analysis of infectious complications in fusion prostate biopsies by magnetic resonance imaging and ultrasound: can we improve?

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Background: Prostate biopsy using magnetic resonance imaging and ultrasound (fusion prostate biopsy) is a highly accurate and efficient diagnostic procedure for prostate cancer in which adequate preparation of the patient is necessary for its correct performance, as well as for the prevention of subsequent complications, infection and sepsis being the most feared complications.
This study analyzes the infectious complications that patients in our hospital have presented and relates them to variables based on the characteristics of the patients. Results were compared with others published in different centers, with the aim of being able to establish criteria to reduce infections derived from this procedure.
Materials and Methods: Retrospective descriptive analysis of 121 patients who underwent transperineal prostate fusion biopsy (May 2018 to August 2022). Study variables: age, previous biopsies, PIRADS score of the main lesion to be biopsied in magnetic resonance imaging, ASA classification, anesthesia, samples taken, previous urine culture, complications, classification of complications (Dindo-Clavien scale).
Results: Of the 121 patients,the average age was 66.36 (+/- 6.238SD), 117 patients with previous biopsies (96.7%). PIRAD3 24 (19.8%); 70 (57.9%) PIRADS4 and 26 (21.5%) PIRADS 5.ASA I classification 4.2%, ASA II 77.3%, ASA III 18.5%. General anesthesia with a laryngeal mask was used in 74 patients (61.2%), spinal anesthesia in 33 patients (27.3%), and sedation with local anesthesia in 14 patients (11.6%). The average number of samples taken was 28.63 (+/-4.420SD), being 16 the minimum number of cylinders collected and 40 the maximum. Urine culture was taken before the biopsy in 113 cases,being positive in 1 patient. In relation to complications, none of the patients in the sample analyzed suffered microbiologically confirmed clinical urine infection after the test,so they did not require neither home treatment or admission in the critical care unit at any time. On the contrary, a total of 5 patients (Dindo-Clavien 1-2) presented acute urinary retention after the biopsy, 4 of whom underwent general anesthesia and 1 under spinal anesthesia.
Conclusion: Compared with other series described,the infection rate found is similar or lower, and may be related either to a smaller sample size or to the application of an adequate selection of patients and optimal management of antibiotic prophylaxis. Transperineal fusion prostate biopsy of MRI and ultrasound is a safe procedure for the diagnosis of prostate cancer.

13AP03-12
Kinetics of urinary biomarkers after living donor kidney transplantation and their predictive value on early and long term graft function

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Background and Goal of Study: Early assessment of graft function post transplantation is imperative since interventions might prevent further deterioration. Urinary biomarkers, like kidney injury molecule-1 (KIM-1), heart-type fatty acid binding protein (H-FABP), N-acetyl-β-D-glucosaminidase (NAG) and neutrophil gelatinase-associated lipocalin (NGAL), may be helpful in detecting and/or predicting inferior graft function.
The aim of this study is to analyse the dynamics and performance of biomarkers levels post-transplantation in predicting graft function in recipients of living donor kidneys (LDK).
Materials and Methods: Biomarkers were measured at standardized time points in urine of 57 recipients participating in the VAPOR-1 trial. Urinary samples were taken at various timepoints till day 9 post transplantation. Dynamics and predictive functions were tested using linear mixed modelling and regression analyses.
Results and Discussion: Univariate prediction models showed that KIM-1 at day 1 and 6 post transplantation were significant positive predictors for glomerular filtration rate (GFR) at month 6, 12 and 24 (day 1: B=0.288, P=0.038; B=0.382, P=0.005; B=0.291, P=0.039 respectively and day 6: B=0.345, P=0.017; B=0.299, P=0.041; B=0.296, P=0.046 respectively). H-FABP measured in the first urine upon reperfusion was a significant negative predictor for GFR at month 6 (B=-0.284, P=0.039). NAG and NGAL at day 1 were significant negative predictors for GFR 1 month (B=-0.383, P=0.005 and B=-0.371, P=0.007 respectively). However, no significant prediction remained after multiple testing correction.
Conclusion(s): We observed distinct dynamics of biomarkers in the post transplantation period. Urinary biomarkers were predictive for graft outcomes, which demonstrates the importance of timing and biomarker selection for indirect measurement of graft function in LDK recipients.

13AP04-01
Simplified risk assessment and preoperative management to prevent postoperative delirium: a retrospective study

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Background and Goal of Study: Postoperative delirium (POD) is a concern especially for elderly patients, because it is associated with postoperative mortality, complications, and cognitive decline. Several risk factors have been shown to increase the incidence of POD and several strategies have been established to prevent POD. Development of simple screening for risk of postoperative delirium

are expected in perioperative management. However, there is presently no gold standard. In this study, we retrospectively evaluated our risk assessment and perioperative management to prevent POD for patients undergoing major hepato-biliary-pancreatic surgeries.

Materials and Methods: With IRB approval, we conducted a retrospective analysis of data of adult patients undergoing major hepato-biliary-pancreatic surgeries in our hospital from February 2020 to June 2022. Patients underwent our simplified risk assessment of POD several days before surgery.

The assessment included several factors (dementia, past histories of delirium, brain stroke, brain injury, and heavy alcohol consumption) and we considered patients to be at high-risk of POD when they had at least one of these factors.

The high-risk patients were preoperatively counseled by psychiatrists and adjusted for psychiatric and/or hypnotic medications, and for heavy alcohol consumption if needed. POD was defined by confusion assessment method for the intensive care unit (CAM-ICU), 3-minute diagnostic interview for delirium using the confusion assessment method (3D-CAM) and/or symptoms. We evaluated the incidence of POD, sensitivity and specificity of the assessment, and other perioperative factors with POD.

Results and Discussion: Of the 171 patients evaluated, 31 patients (18.1%) were assessed to be at high-risk of POD and 52 patients (30.4%) experienced POD. The sensitivity of the assessment was 25.0 % and the specificity was 84.9%. The incidence of POD was associated with age, comorbidity index, surgical time, intraoperative bleeding, and postoperative complications.

Conclusion(s): High specificity of our simplified preoperative assessment to predict POD showed that patients at risk for POD properly received preoperative management to prevent POD. However, POD can occur also for patients assessed as low-risk, and attention is needed especially when they undergo extensive surgical stress and postoperative complications.

13AP04-02
Unexplained myocardial injury after non-cardiac surgery

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Background and Goal of Study: Postoperative myocardial injury (PMI) is associated with mortality after non-cardiac surgery. The underlying aetiology of PMI is multifactorial and usually subdivided into ischaemic (type 1 and 2), other cardiac and extra-cardiac disease. Often, the aetiology is unexplained.[1,2]

It is unknown whether patients with unexplained PMI may benefit from further cardiac evaluation. The aim of this study was to quantify the different causes of PMI and possibility for optimisation.

Materials and Methods: Retrospective study including patients ≥ 60 years of age, admitted for non-cardiac surgery at the University Medical Center Utrecht between January 2017 and December 2018. Routine troponin monitoring was applied within the first 72 hours after surgery. PMI was defined as troponin I ≥18ng/L (99th percentile).

Patients were categorised into four groups, based on the most likely aetiology of PMI and possibility for optimisation:

1. Known cardiac disease, already optimised before surgery;
2. Extra-cardiac disease (e.g. sepsis, pulmonary embolism, intracranial haemorrhage);
3. Perioperative hemodynamic instability (hypotension, tachycardia, anaemia, hypoxia);
4. Unexplained (none of the previously mentioned conditions).

Results and Discussion: Of 3885 surgical patients, 823 (21%) had PMI. In 185 of these 823 patients (22%), PMI was attributed to known cardiac disease, and in 204 (25%) patients PMI was likely secondary to extracardiac events. In 280 patients (34%) PMI was likely caused by perioperative hemodynamic factors (type 2 ischaemia). In 154 patients (19%) there was no apparent cause for PMI. Peak troponin levels were highest in the extra-cardiac group (median [IQR]: 143 ng/l [60-469]). Postoperative myocardial infarction was diagnosed in 31 patients (4%).

Conclusion(s): In most patients PMI was explained by known cardiac disease, extra-cardiac causes or perioperative hemodynamic instability. Only 19% of patients had unexplained PMI, and may benefit from further cardiac evaluation. Future studies should focus on diagnostic and treatment strategies in these patients specifically.

	Total n=823	Cardiac n=185	Extra-cardiac n=204	Hemodynamic n=280	Unknown n=154
No cardiac comorbidity	422 (51%)	0 (0%)	122 (60%)	189 (68%)	111 (72%)
Cardiac comorbidities					
Ischaemic disease	223 (27%)	116 (63%)	40 (20%)	44 (16%)	23 (15%)
Heart failure	69 (8%)	44 (24%)	13 (6%)	9 (3%)	3 (2%)
Arrhythmia	171 (21%)	66 (36%)	43 (21%)	44 (16%)	18 (12%)
Valvular disease	158 (19%)	104 (56%)	22 (11%)	20 (7%)	12 (8%)
Other disease (e.g. LVH)	69 (8%)	38 (21%)	14 (7%)	9 (3%)	8 (5%)
More than one cardiac comorbidity	203 (25%)	123 (67%)	34 (17%)	29 (10%)	17 (11%)
Peak level postoperative troponin (median, IQR)	82 (35-234)	78 (35-198)	143 (60-469)	72 (30-153)	74 (32-173)
Myocardial infarction within 7 days after surgery	31 (4%)	10 (5%)	3(2%)	11(4%)	7(5%)

Table 1. Numbers are presented as n(%) unless otherwise specified. Cardiac group: patients with known cardiac comorbidity and follow-up by their cardiologist at least 1year prior to surgery. Extra-cardiac group: patients with e.g. sepsis, pulmonary embolism, intracranial haemorrhage, rapid atrial fibrillation, kidney failure. Hemodynamic group: patients with perioperative hypotension (mean arterial pressure <65mmHg for at least 10 minutes), tachycardia (heart rate >100/minute for at least 10 minutes), anaemia (haemoglobin < 6.0mmol/L), or hypoxia (at least one measurement of saturation ≤88%). Unknown: none of before mentioned conditions.

Abbreviations: PMI: postoperative myocardial injury. LVH: left ventricular hypertrophy. IQR: interquartile range.

Table 1. Classification of most likely causes of PMI

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1. NEJM 2015;373:2258–69.
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13AP04-03
Service evaluation of blood pressure monitoring alarm presets in adult patients undergoing anaesthesia

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Background and Goal of Study: The arterial blood pressure (ABP) alarm limits of anaesthetic monitors are often left unadjusted, rather than taking into account comorbid disease and preoperative blood pressure. We conducted a study to elucidate the frequency with which anaesthetists adjusted ABP alarm limits and what informed their decision.

Materials and Methods: This study was approved as a service evaluation and conducted at Leeds General Infirmary. Trauma and orthopaedic cases were studied.

A member of the study team visited the theatre and recorded the default and (if used) customised systolic (SAP) and diastolic pressure (DAP) alarm limits.

Results and Discussion: Data were collected from 50 patients (66% male), median (range) 54.5 (18-89) years. Custom ABP limits (Group C) were set in 16 (32%) of cases. Custom ABP limits were systematically lower than default values (Figure 1). There were no significant differences between patients in Groups C and D. 69% of patients in Group C were male vs. 65% in Group D. The median(range) age was 57.5 (22-79) in Group C and 51.5 (18-89) in Group D ($p=0.77$). 25% of patients in Group C and 21% in Group D had a history of hypertension ($p=0.54$). 31% of patients in Group C were ASA grade III or IV compared with 44% in Group D ($p>0.99$).

Anaesthetists were more aware of SAP alarm limit values; 98% provided these vs. just 20% for DAP. This is surprising given the importance of diastolic pressure in determining mean arterial pressure (MAP) and organ perfusion. The median (range) MAP for the custom limits was 56.7 (51.7-56.7) mmHg, whereas the MAP for the default limits was calculated as 63.3 (56.7-63.3) mmHg, which is above the suggested MAP necessary to mitigate against damage during non-cardiac surgery[1].

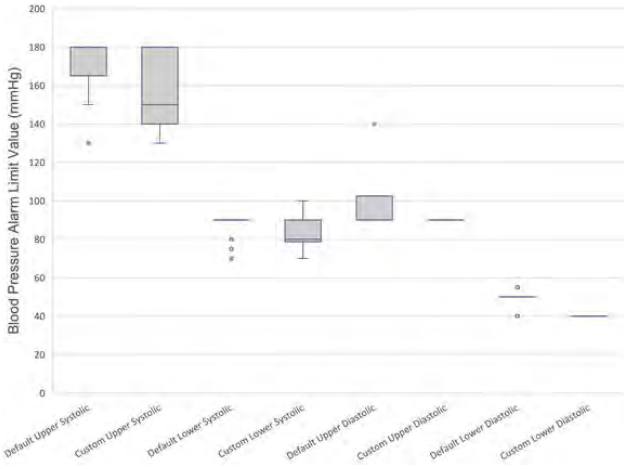

Figure 1:

Conclusion: ABP alarm limits were inconsistently set, particularly for DAP. Since diastolic hypotension is potentially hazardous, our next step is a piece of quality improvement work to support the consistent use of DAP alarm limits.

Reference:

1. Sessler, D.I. *et al.* Perioperative Quality Initiative Consensus Statement on intraoperative blood pressure, risk and outcomes for elective surgery. *Brit J Anaes 2019;* **122**; 563–74.

13AP04-04
Backcross of shrews or discovering genetic factors to prevent postoperative nausea and vomiting: a preliminary study

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Background and Goal of Study: Genetic variations may be involved in the incidence of postoperative nausea and vomiting (PONV). However, the genetic mechanisms by which PONV is suppressed have not been fully elucidated. Musk shrews (Suncus murinus) have been used for emetic research and they have been bred as experimental animals in East Asia. We performed backcross of an inbred strain of shrews that show a low response to emetic stimuli in order to produce a novel congenic strain.

The aim of this study was to verify a decrement of vomiting behaviours after surgical insult under inhalation anaesthesia in a new strain of shrews.

Materials and Methods: Inbred shrews (Jic:SUN-Ler/Kwl strain) with traits of resistance to emetic stimuli were prepared. Ler strain shrews were mated with background Jic:SUN-Her/Kwl strain shrews. The first generation of filial shrews received pharmacological emetic stimulation (0.25 mg/kg veratrine) and a littermate with traits of resistance to veratrine was mated again with the background strain of shrew. Congenic shrews were produced by repeated backcrossing of the Ler strain to the background strain for 10 generations. At 6 - 9 weeks of age, female shrews were anesthetized with 5% isoflurane and received laparotomy: 1-cm vertical incision on the lower abdomen followed by vigorous manipulation of the small intestine. After anaesthetic emergence, we counted the number of emetic episodes characterized by rhythmic abdominal contractions that were either associated with oral expulsion of solid or liquid material (*i.e.,* vomiting) or not associated with the passage of material (*i.e.,* retching).

Results and Discussion: We acquired four female congenic shrews at 30 months after the first backcross. The numbers of emetic episodes were counted in the four congenic shrews and six control (Her) shrews. Figure 1 shows the numbers of emetic episodes.

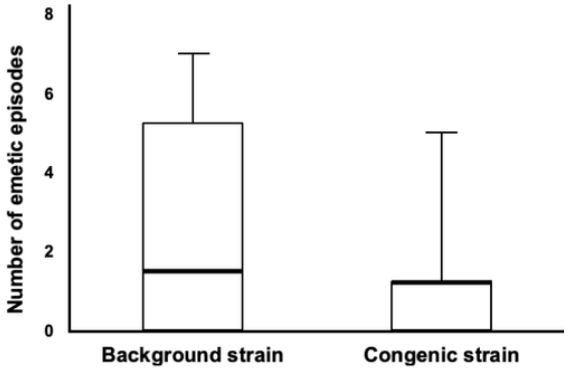

Figure 1. Emetic behaviours of the shrews. The number of emetic episodes in the congenic strain tended to be smaller than that in the background strain ($p = 0.4$, Mann-Whitney test). The box represents the median and 25th - 75th percentiles. Error bars represent the maximum.

Conclusion(s): The genetic trait of resistance to PONV may be transferred by backcrossing 10 times. We will compare genetic variations in the two strains at the genome-wide level in the near future.

13AP04-05
Guideline for a non-pharmacological delirium prevention programme within a perioperative setting

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Background and Goal of Study: Delirium is an acute cerebral dysfunction and is characterised by a disorder of attention, perception and/or consciousness. An acute start and a fluctuating progression are typical (1). Post-operative delirium (POD) is an adverse post-operative complication that can occur in patients of all ages (2). POD is associated with complications such as prolonged hospitalisation, increased mortality, monetary costs, and long-term adverse effects (3). The overall incidence of POD is at 24%, however, it varies by age and is strongly influenced by specific risk factors (2,4). Preventive measures have the potential of reducing the incidence of POD by 35%. The identification of risk factors and early implementation of preventive interventions play a fundamental role in avoiding POD and preventing complications (2,5).
Aim: To raise awareness of interprofessional anaesthesia teams and to identify POD in perioperative management at an early stage by implementing the "Poketcard Delir" guideline. The consistent implementation of non-pharmacological procedures supports anaesthesia teams in managing existing institutional delirium concepts and promotes the reduction of PODs.
Materials and Methods: At an interprofessional workshop in 2019, non-pharmacological methods for the prevention of the development of POD in a perioperative setting were discussed and consolidated. Current literature and expert opinions were summarised in a multi-staged process based on the existing "ASPECT" framework (2,6). Prior to publication, the guideline was reviewed and submitted by members of both the Swiss Society for Anaesthesiology and Perioperative Medicine and nurse anaesthetists of the SIGA-FSIA.
Results and Discussion: The recommended guideline "Poketcard Delir" contains evidence-based- and practice-relevant measures for the assessment of various risk factors of POD, including recommendations for the prevention of POD.
Conclusion(s): The now available national literature-based guideline "Poketcard Delir" raises awareness and highlights appropriate non-pharmacological approaches for preventing possible delirium in a perioperative setting. In combination with institutional delirium concepts, it is an important addition in reducing the occurrence of POD.
References:
1. American Psychiatric Association, 2013.
2. Aldecoa et al., 2017.
3. Dasgupta&Brymer, 2016.
4. Ho et al., 2021.
5. Savaskan&Hasemann, 2017.
6. Bosshart, Ries&Haubner, 2016.

13AP04-06
Preoperative impaired executive functions but not memory are associated with postoperative delirium in cardiac surgery: a secondary analysis of a prospective observational study

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Background and Goal of Study: Postoperative delirium (POD) is a frequent complication after cardiac surgery. Cognitive impairment is a leading predisposing factor for POD. However, performing a complete preoperative neuropsychological testing is challenging. The aim of this analysis is to determine whether targeting a specific cognitive domain would predict POD and ease preoperative screening.
Materials and Methods: This is a secondary analysis of a research project (NCT03706989). A battery of preoperative neurocognitive tests was performed in 220 adult patients undergoing elective cardiac surgery. We extracted tests assessing either memory or executive functions (Fig.1) to calculate two domain-specific Z-scores. CAM-ICU, CAM and a chart review were used for POD screening. Comparisons between groups were analyzed using a Mann Whitney-U test for continuous variables and a Chi-square test for categorical variables. A binary regression analysis was used to evaluate the influence of domain-specific Z-scores on the occurrence of POD.

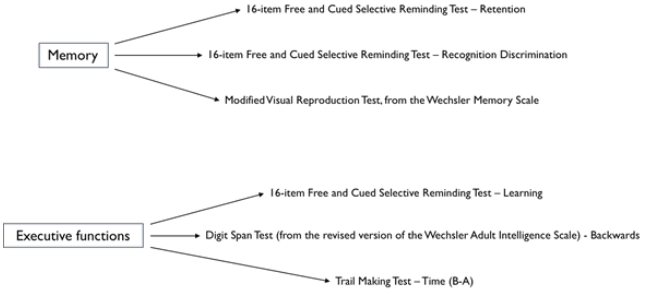

Figure 1. Memory and executive functions tests.

Results and Discussion: POD incidence was 29.5%. Patients' characteristics are shown in Table 1. POD(+) patients were significantly older and had higher EuroSCORE II scores. Both Z-score "memory" (Z-score M) and Z-score "executive functions" (Z-score EF) were lower in delirious patients. However, in multivariate analysis, only a low Z-score EF increased the risk of POD (adj.OR [95% CI]=0.63 [0.42-0.95]) and not Z-score M (adj.OR [95% CI]=0.74 [0.48-1.15]).

	POD (-) (n=155)	POD (+) (n=65)	*P*
Age, years	67 (59-74)	74 (64-79)	< 0.001
EuroSCORE II, %	1.5 (0.9-2.5)	2.4 (1.3-4.0)	< 0.001
Z-score memory	0.18 ± 0.77	-0.41 ± 1.31	< 0.001
Z-score executive functions	0.18 ± 0.86	-0.46 ± 1.15	< 0.001
Surgical time, min	226 ± 57	238 ± 60	0.17
Cardiopulmonary bypass time, min	99 ± 33	112 ± 40	0.02

Table 1.

Conclusion: In contrast to memory tests, poor performances on tests of executive functions are associated with the occurrence of POD in cardiac surgery. Focusing preoperative evaluation on executive functions might ease cognitive assessment of patients in routine practice.
Reference:
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13AP04-07
Predictive analytics of intraoperative hypotension in patients undergoing elective surgery: a prospective ultrasound study

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Background and Goal of Study: Prevention of an undesired hypotensive event has a key role in providing patient safety (1). Every minute of hypotension in the operating room can increase 1-year mortality (2). Induction of general anesthesia is often associated with hypotension (3). Although intraoperative hypotension (IOH) has no universal definition, it can have a serious impact on postoperative complications (4,5). Therefore, accurate prediction of IOH is essential to improving patient outcomes. Recent data suggests that pre-induction volume status can have effect on postinduction hypotension (6), which is also consistent with results of our previous study. The role of inferior vena cava (IVC) in hemodynamic monitoring is treated with caution due to a number of limitations (7), while data on the use of subclavian vein (SCV) in perioperative setting is scarce. Our study sought to investigate the diagnostic accuracy of IVC and SCV in prediction of IOH.

Materials and Methods: Patients (n=50) undergoing abdominal surgery were included in the study. Pre-anesthesia ultrasound evaluation of IVC and SCV was performed with portable Logic e ultrasound. Significant IOH was defined as a decrease of more than 30% in MAP from the baseline level, or any absolute value of MAP less than 65 mmHg. Collapsibility index (CI) was calculated using a mathematical formula. Multivariate linear regression was used to assess the predictive ability. ROC curve analysis was done for IVC-CI and SCV-CI to calculate sensitivity and specificity.

Results and Discussion: IOH was observed in 23 patients (46%). Patients who developed IOH had a higher ICV-CI and SCV-CI ($P = 0.002$). The IVC-CI (cutoff- 38%) showed sensitivity 91% and specificity 82 %, while SCV-CI (cutoff – 34%) had sensitivity of 94% and specificity of 84%. After adjusting for confounders, IVC-CI was not a predictor of IOH ($P = 0.115$), whereas SCV-CI was a significant predictor of IOH ($P < 0.001$).

Conclusion(s): To conclude, this study has demonstrated that SCV-CI is a significant predictor of IOH and has a superior diagnostic accuracy over IVC-CI. Further studies are needed to confirm our findings, before it can be recommended for clinical use as a surrogate.

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Zhang J, et al.. doi: 10.1097/ALN.
Kaptein et al. , CKD, 1548-5595.

13AP04-08
Effect of heart rate control with ivabradine on myocardial injury after non-cardiac surgery: a single centre, randomized controlled, double-blind feasibility pilot trial (PROTECTIN Pilot - NCT04436016)

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Background and Goal of Study: Perioperative myocardial injury (PMI) after non-cardiac surgery (NCS) is associated with post-operative mortality. Heart rate (HR) is an independent risk factor for PMI. Ivabradine (IVA) is a negative chronotropic agent. In this pilot study we tested the feasibility of a complex perioperative HR-targeted intervention (adherence to the protocol). Primary outcomes were appropriate dosage rate and blinding success rate. Secondary objectives were to assess the feasibility of recruitment, enrolment and resources.

Materials and Methods: This was a single centre, randomized, placebo-controlled, double-blind, parallel group, feasibility pilot trial conducted at Geneva University Hospitals from October 2020 to January 2022. We included patients over 75 years old or over 45 years old with cardio-vascular risk factors planned for intermediate or high-risk NCS. Patients were randomized to receive IVA or placebo twice daily, from the morning of surgery until post-operative day two, with an individualized regimen adapted to HR: HR≤70 bpm (Pill A: placebo), HR 71-85 bpm (Pill B: IVA 2.5mg or placebo), HR 86-100 bpm (Pill C: IVA 5mg or placebo) and HR≥ 101 (Pill D: IVA 7.5mg or placebo).

Results and Discussion: We screened 1136 patients, identified 549 eligible and approach 246 patients. 93 patients agreed to participate (38% of approached) and 78 were randomised (recruitment rate of 1.3 patients/week). 439 of 444 study drug administrations were correctly performed according to the patient's HR (98% appropriate dosage rate). The blinding success rate was 100%. Pill A was administered in 41% of pre-operative visits and between 16% and 36% of post-operative visits. The median duration of study visits varied between 15 min [IQR,10-15min] (30-day follow-up) and 45 min [IQR,40-60min] (evening of surgery). There were 13 protocol deviations mainly due to compliance issues linked to difficulties with oral intake post-operatively. The number of bradycardia was similar in both groups (8 in the placebo and 9 in the ivabradine group). Overall, 10.3% patients had a troponin elevation from baseline ≥14 ng/L independent of randomisation group.

Conclusion: Future RCTs testing individualized IVA dosage adapted to HR are feasible. Sample size and inclusion criteria should be adapted to the small proportion of patients with troponin elevation and the fact that about 30% of drugs administrated may be inactive. Significant human resources are also required.

13AP04-10
High blood pressure on hospital admission in patients scheduled for elective surgical procedures: risk factors, intraoperative low blood pressure and postoperative morbidity

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Background and Goal of Study: Data on the prevalence of high blood pressure (HBP) on hospital admission (HA) in patients scheduled for elective surgery and its impact on postoperative outcomes is scarce. The authors aim to evaluate the prevalence of HBP, to identify risk factors and postoperative outcomes.
Materials and Methods: An observational longitudinal study, in a tertiary hospital in Portugal, included adult inpatients undergoing elective, non-cardiac, non-obstretric surgery between october-december 2019. Data collected prior to admission to surgical wards included: sociodemographic characteristics, known hypertension, antihypertensive medications, risk factors (smoking, alcohol consumption, dyslipedimia, diabetes, obstructive sleep apnea syndrome), surgical intervention, systolic and diastolic blood pressure, heart rate and body mass index. HBP was present if systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg. Outcomes data were collected on intraoperative period, at the time of hospital discharge and one year after.
Results and Discussion: Of 402 patients, 57% were male and the median age was 60 years old. HBP values were present in 40% of the patients on HA, 49% had a previous diagnose of HBP and despite ongoing treatment, approximately half of them presented HBP (48%, n=95). Age (OR = 1.02; 95% CI 1-1.04), dyslipidemia (OR = 1.61; 95% CI 1.07-2.42), alcohol consumption (OR = 1.73;95% CI 1.15-2.59) and diabetes (OR = 1.73; 95% CI 1.02-2-94) were predictors to preoperative HBP. Post-operative mortality after 1 year was 2% (8 patients; 1 in-hospital), 3 patients presented HBP on HA (intraoperative hypotension observed in 5 patients). Regarding 1 year's outcome, 10% (20 HBP diagnosis) presented poor outcome: 18 (43%) patients with HBP on HA and intraoperative hypotension in 29 (69%).
Conclusion(s): A significant proportion (40%) of patients admitted at pre-surgical setting presented HBP values. Despite ongoing HBP treatment, approximately half presented HBP values at HA. This study identified modifiable HBP predictors such as the non-optimization of hypertension treatment. All patients who died during 1 year´s follow-up had HBP and presented intraoperative hypotension. About half of the patients with poor outcomes presented HBP on HA and the majority had intraoperative hypotension. HBP prehabilitation programas are important to optimize the intraoperative period and adverse outcomes.

13AP04-11
Association of MACE and mortality with the guideline-adherent use of preoperative TTE - a comparison of the current and old guidelines for preoperative cardiac testing

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Background and Goal of Study: Cardiac risk evaluation prior to noncardiac surgery is fundamental to tailor perioperative management to patient's estimated risk. In August 2022, the "European Society of Cardiology" (ESC) published updated guidelines for preoperative cardiac evaluation.
The aims of this study were:
1. To compare the recommendations of the old and new guidelines regarding preoperative echocardiography (TTE),
2. To analyze whether the patient's outcome is affected by guideline-adherent use.
Materials and Methods: Secondary analysis of a multicenter, international, prospective cohort study (ethics: 5859R); Primary endpoints were level of recommendation for preoperative TTE, mortality and major adverse cardiac events (MACE) after one month.
Exposures were overuse (conduction despite level III recommendation) and underuse (non-conduction despite level I recommendation) of TTE according to the old and current guidelines, respectively. The association of guideline-adherent use of TTE with mortality and MACE was analyzed using multivariate logistic regression with forced entry of predefined covariates.
Results and Discussion: Out of 15.899 patients, 15.529 were analyzed (61% male, mean age 72±8 years). Table 1 shows the comparison and distribution of recommendation for preoperative TTE of both guidelines. The regression analysis showed that neither overuse nor underuse of TTE according to the old guidelines was associated with mortality [OR_{over}: 1.1; 95% CI (0.8-1.5); OR_{under}: 1.1; 95%CI: (0.7-1.7)], nor with MACE [OR_{over}: 1.2; 95%CI (0.8-1.6); OR_{under}: 1.0; 95%CI: 0.7-1.6)].
Based on the current guidelines, the OR for overuse and mortality was 0.8 [95%CI: (0.5-1.3)], and for underuse and mortality 1.1 [95%CI : 0.8-1.5]. The OR for overuse and MACE was 0.9 [95%CI: 0.6-1.4] and 1.1 [95%CI: 0.8-1.6] for underuse and MACE.

	2022 level III	2022 level IIb	2022 level I
2014 level III	8344	4322	751
2014 level IIb	45	0	140
2014 level I	0	905	1022

Table 1 Crosstab comparing recommendation grades according to 2014 and 2022 guidelines.

Conclusion(s): Based on a broad multicenter cohort, the number of level I recommendations has not changed significantly in the current guidelines, whereas the number of level IIb recommendations has increased. Neither under- nor overuse of preoperative TTE according to both guidelines was independently associated with postoperative MACE or 1-year mortality.

13AP04-12
Staff-directed breathing exercises in the postextubation period reduce postoperative atelectasis in patients undergoing major abdominal surgery: a randomised controlled trial

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Background and Goal of Study: Atelectasis occurs in most anaesthetized patients and may persist after surgery, potentially contributing to the development of postoperative pulmonary complications. Breathing exercises may re-expand collapsed lung tissue and reverse atelectasis. However, breathing exercises are commonly initiated on the first postoperative day, which has a significant lag compared with the time of developing atelectasis. The postextubation period has been largely ignored in previous studies. We aimed to evaluate the effect of staff-directed breathing exercises after extubation on postoperative atelectasis in patients undergoing major abdominal surgery.

Materials and Methods: In this assessor-blinded, randomised controlled study, patients aged ≥50 years with ASA Ⅰ-Ⅲ, scheduled for elective open upper abdominal surgery were randomised to perform breathing exercises after extubation under the supervision of the anaesthesia team (intervention group) or receive usual care (control group) during the postanaesthesia care unit (PACU). Standard anaesthetic management was applied in both groups.

The primary outcome was atelectasis detected on computed tomography or chest radiograph within the first 7 postoperative days. Secondary outcomes included lung ultrasound scores (LUS) and the arterial partial pressure of oxygen (PaO_2) at PACU discharge.

Results and Discussion: Baseline characteristics were similar between groups. Atelectasis within the first 7 postoperative days occurred in 24% (17/71) of patients in the intervention group compared with 42% (29/69) in the control group (difference, -18% [95%CI, -33% to -2%]; risk ratio, 0.57 [95%CI, 0.35 to 0.94]; P=0.023).

Compared with the control group, the intervention group had significantly lower LUS (median, 2 vs 8; difference, -5 [95%CI, -6 to -3]; P<0.001) and higher PaO_2 (median, 74 vs 70 mmHg; estimated median difference, 5 mmHg [95% CI, 0 to 9]; P=0.038) at PACU discharge, indicating better lung aeration and oxygenation.

Our results suggest that the postextubation period may be the critical timing for reversing atelectasis and breathing exercises during this period significantly reduce postoperative atelectasis.

Conclusion(s): Among patients undergoing open upper abdominal surgery, staff-directed breathing exercises in the postextubation period decreased the incidence of postoperative atelectasis. We recommend the addition of postextubation breathing exercises to the current standard of care.

13AP04-13
The impact of routine anaesthesia visits on postoperative pain until one year after surgery in Dutch medium to high-risk surgical patients; a secondary analysis of the TRACE study

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Background and Goal of Study: TRACE studied the impact of routine standardised postoperative anaesthesia visits in the ward on clinical, quality of recovery, and quality of life outcome measures until one year after surgery[1,2].

Postoperative pain, one of the outcome measures, was evaluated in medium to high-risk patients undergoing non-cardiac surgery.

Materials and Methods: TRACE was a prospective, multicentre, stepped-wedge cluster randomised interventional study in nine hospitals in the Netherlands. Pain scores (numeric rating scale – NRS in rest and during movement) were collected during ward visits (postoperative day (POD) 1 and 3), and by questionnaire (pre-operatively, POD 7, 30, and 365). Pain scores were compared between study groups using multilevel linear regression models.

Results and Discussion: Secondary analyses in 5190 patients (control 2490, intervention 2700) are ongoing. Analyses include the severity and course of pain across nine types of surgery until one year, and the association of severity of pain with 30-day complications, hospital length of stay, recovery from surgery, ability to perform activities of daily living, and quality of life.

Preliminary results showed overall low average pain scores (NRS for control and intervention group at baseline, postoperative days 1, 3, 7, 30 and 365 consecutively: 2.3 vs 2.3, 2.3 vs 2.2, 2.1 vs 2.1, 3.0 vs 2.9, 2.1 vs 2.0, 1.6 vs 1.5), reaching a maximum at POD 7. Patients undergoing orthopaedic, thoracic, and transplant and renal surgery showed the highest pain scores. Pain scores were not significantly different between groups at any timepoint.

The overall low scores could be the result of mandatory embedded practice of anaesthesia pain services in hospitals in the Netherlands. For the explanation of the higher pain scores at POD 7 further analyses are currently performed.

Conclusion(s): In a Dutch cohort of non-cardiac surgical patients overall postoperative pain scores until one year after surgery are low, with a maximum at POD 7. Postoperative anaesthesia visits did not significantly reduce pain scores. Further analyses are currently in progress.

References:

Smit-Fun VM, *et al. Trials* 2018;19
Buhre WF, *et al.* Ann Surg. 2021 May 24

13AP05-01
The impact of the COVID-19 pandemic on mortality rates for the Swedish general surgical population. An observational study

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Background and Aim: The global COVID-19 pandemic has had a massive impact on health care. Perioperative care has been affected with decreased surgical capacity due to forced relocation of resources. The decision to conduct surgical procedures has also been limited by the increased risk of complications among SARS-CoV-2 positive patients as demonstrated by the COVIDSurg Collaborative.[1]

This study aimed to describe potential differences in postoperative mortality rates due to the COVID-19 pandemic.

Methods: The study included all adult patients (≥18 years) who underwent any surgical procedure in Sweden during two inclusion periods; 6 March 2019-31 Dec 2019 (pre-pandemic) and the corresponding dates for 2020 (pandemic). This group was treated as one cohort, including admission period as an independent exposure variable.

Primary outcome measures were mortalities at 30 days and one year. Logistic regression models were created with adjustment for age, gender, ASA-score, hospital type, acute/elective surgery and BMI.

Results and Discussion: 441 858 patients were available for analysis, 247 457 from the pre-pandemic and 194 401 from the pandemic period. Baseline characteristics did not differ between the two periods. Crude mortality rates were somewhat higher during the pandemic, 1.61% vs. 1.24% (95% CI 0.31-0.45, $p<0.001$) for 30 days and 5.50% vs. 4.79% (95% CI 0.58-0.84, $p<0.001$) for one year. In multivariable analyses, surgery during the pandemic was associated with a lower risk of mortality with aOR 0.27 for 30 day (95% CI 0.17-0.37, $p<0.001$) and aOR 0.18 for one year (95% CI 0.12-0.23, $p<0.001$), respectively.

The risk-decreasing effect of surgery in contrast to increased crude mortality rates during the pandemic period was an unexpected finding. Despite adjustment for important baseline characteristics, unaccounted confounding is probable. The COVIDSurg recommendations[1] for patients undergoing surgery with perioperative SARS-CoV-2 infection may have also led to a selection of patients at lower risk that is not encompassed by the ASA-score.

Conclusion: Surgery during the pandemic was independently associated with a lower risk of death. Further detailed analyses are required to understand the reasons for this apparently beneficial outcome.

Reference:

1. COVIDSurg Collaborative. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. *Lancet*. 2020 Jul 4;396(10243):27-38.

13AP05-02
Post-pandemic recovery of surgical productivity in Japan

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Background and Goal of Study: The COVID-19 pandemic has shifted healthcare resources to its countermeasures. As a result, the productivity of surgery suffered a negative impact from the COVID-19 pandemic in 2020 (Ref). However, it is totally unknown whether the negative impact in 2020 has any lasting influence on surgical productivity. The goal of this study is to determine the long-term surgical productivity changes before and during the pandemic using Malmquist index (MI).

Materials and Methods: We collected data from all the surgical procedures performed at Teikyo University Hospital from April 1 through September 30 in 2016-22. MI represents the dynamic productivity change of a decision-making unit (DMU) between two time periods. MI can be used to divide the productivity change into two components: efficiency change (EC) and technical change (TC).

We used a non-radial and non-oriented Malmquist model under constant return-to-scale assumptions. A DMU was defined as a surgical specialty department. The inputs were the number of medical doctors who assisted the surgery, as well as the duration of the surgery from skin incision to closure. The output was the surgical fee. We defined the annual changes in 2016-19 as "pre-pandemic," while the annual changes in 2019-22 as "post-pandemic." All surgical departments in the sample were assigned MI, EC, and TC values. The natural logarithms of MIs, ECs, and TCs were compared between pre-pandemic and post-pandemic periods, and those of each period against 0 using t-tests.

Results and Discussion: We analyzed 18,805 surgical procedures performed in 2016-22. There was no statistically significant difference in annual productivity, efficiency, and technical changes between pre-pandemic and post-pandemic periods (Table).

	Pre-pandemic (2016-19)	**Post-pandemic** (2019-22)
Productivity change (%)	-1.1 ± 2.9	-1.3± 3.2
Efficiency change (%)	+6.2 ± 3.3	-0.2 ± 3.8
Technical change (%)	-7.4 ± 2.1*	-1.1 ± 3.0

*The values are expressed as mean ± SE. * indicates that the value is significantly different from 0 (p = 0.0005).*

Table: Annual percent changes of productivity, efficiency, and technique.

Conclusion: We demonstrated that the surgical productivity had fully recovered to the pre-pandemic level by 2022 in Japan.

Reference:

Nakata Y, et al. ***Inquiry*** 2022 Jan-Dec;59: 469580221128737.

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13AP05-03
Pre-operative assessment after the COVID-19 pandemic - are we doing this too late in the patient care pathway?

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Background and Goal of Audit: Pre-operative assessment should be performed in all patients receiving elective surgery. Timely assessment is required for optimisation of health conditions and behaviours. This may reduce the risk of late cancellation or postoperative complications. Royal College of Anaesthetist guidelines recommend initial assessment occurs as close as possible to point of booking for surgery - ideally at least 2 weeks before surgery [1].
We audited the timing of initial pre-operative assessment at our hospital against these national guidelines.
Materials and Methods: This was a retrospective audit of all elective surgery at the Royal Alexandra Hospital (Paisley, Scotland) in May 2022. A patient list and date of surgery was obtained from the theatre management system. Basic demographic information, date of booking for surgery and initial pre-operative assessment was sought in the patient medical records. All data were anonymised and stored securely. Data are presented as median values (Q1-Q3).
Results and Discussion: A total of 222 patients received elective surgery from 1st to 31st May (157 female, 66 male). Median age at time of surgery was 63 years (46-73). Initial pre-operative assessment was performed in 215 patients (96%). When performed, it was less than 2 weeks before surgery in 124 patients (58%). Timing of initial pre-operative assessment in the patient care pathway - when applicable - is detailed below.

Speciality	Number of patients	Days from booking to surgery	Days from booking to initial pre-assessment	Days from initial pre-assessment to surgery
Gynaecology	64	75 (29-113)	39 (14-65)	10 (2-61)
General	54	38 (16-114)	20 (12-45)	8 (4-27)
Urology	50	77 (41-131)	45 (29-90)	8 (5-42)
Breast	35	19 (13-28)	7 (2-12)	9 (6-20)
ENT	19	212 (141-351)	162 (52-292)	8 (6-112)
All specialities	222	57 (20-120)	28 (12-68)	8 (5-35)

Conclusion: The majority of patients underwent initial pre-operative assessment, but a considerable number were assessed less than 2 weeks before surgery despite adequate time since booking. National guidelines were not consistently met, suggesting services were inadequately resourced to handle the COVID-19 backlog. We are implementing changes so that initial assessment occurs early in the care pathway for all elective patients. The audit will be repeated in due course.
Reference:
1. Royal College of Anaesthetists. Guidelines for the provision of anaesthesia services for the perioperative care of elective and urgent care patients 2022. https://rcoa.ac.uk/gpas/chapter-2

13AP05-04
Professional liability in sedation for gastrointestinal endoscopic procedures in Spain: 32 years of national audit

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Background and Goal of Study: Sedation is essential during gastrointestinal endoscopies (GE), as it provides the best quality, comfort and safety for patients. The ideal provider for sedation is the anaesthesiologist but, in Spain, as in other European countries, other professionals are allowed to perform profound sedations. From the legal point of view, throughout Europe, the supervision and administration of sedation tends to be restricted to the specialty of Anaesthesiology, although there is no clear consensus.
Our goals were to analyse the Spanish jurisprudence related to sedation for GE and to collect the complications of these procedures leading to litigation. The main causes of allocation of professional responsibility were examined.
Materials and Methods: A national audit of Spanish legislation and jurisprudential analysis (1990-2022) related to professional responsibility in sedation during GE in adults was performed. The search for veredicts was carried out, via Internet, through a Spanish official judicial portal.
Results and Discussion: 13 verdicts were found, 12 in the contentious-administrative (CA) court and 1 in the penal court. The main complications were death (3), permanent neurological injury (4), oesophageal perforation (1), colonic perforation (1), other non-permanent damage (3) and post-procedure traffic accident (1).
Professional responsibility was recognized in 6/13 judgements, all in the CA court. In most of these judgements (4/6) a non-anaesthesiologist was in charge of sedation. Informed consent and protocol compliance were the main determining causes of responsibility.
From the legal point of view, international, national, regional and deontological regulations are taken into account in Spain regarding the professional responsibility of the sedation provider in GE. The exact role of the different stakeholders is not 100% clear and there is no legal consensus.
Conclusion(s): The sedation healthcare provider needs a deep knowledge and a specific training focused on patient safety, in order to avoid complications and legal responsibility. A specific informed consent for sedation has been shown as a key factor.
References:
1. Hinkelbein J, et al. Eur J Anaesthesiol. 2018;35:6-24.
2. Mellin-Olsen J, et al. T. Eur J Anaesthesiol 2010;27:592–7.
3. Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine, Oviedo, 4.IV.1997.

13AP05-06
Peri-operative fasting – a drop in the ocean? An audit to review current practice within a multi-surgical specialty district general hospital

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Background: There is a growing body of evidence that traditional 6-4-2 fasting rules are outdated and can lead to harm[1]. These were developed from work done seven decades ago to prevent against the equally rare and feared anaesthetic complication of pulmonary aspiration[2].
The consensus for clear fluid fasting for children has been updated to allow clear fluids up to 1 hour prior to general anaesthetic[3] and this practice is growing within the adult population.
Our aim was to investigate views on fasting from key stakeholders and quantify current practice.
Methods: A survey was distributed to staff involved in perioperative care within the surgical directorate. We sought to establish familiarity with current guidelines and how comfortable staff felt with patients sipping on different fluids. This was rated on a scale (1=not comfortable to 5=very comfortable) with the option of free text to expand on this. The data was collated and presented locally.
Results: There were 43 replies; 21 anaesthetists, 15 surgeons, 6 nurses and 1 FY1. 56% were aware of current guidelines. The majority (72%) were comfortable allowing sips of water until sent for with reducing support for what was perceived as more particulate matter; diluting juice (40%), fruit juice (33%) and tea/coffee with milk (16%). Within the free text recurring themes of cancellation by the anaesthetist for not being fasted and risk of pulmonary aspiration were raised. Fasting times for elective patients were calculated from perioperative records across two separate weeks which showed a mean fasting time of 6 hours and 59 minutes with a range of 1 hour to 18 hours.
Conclusion: This demonstrates that similar to national data, our patients are being over fasted with the current fasting rules. The majority of respondents would be happy to adopt a more liberal clear fluid policy and are keen to update current practice.
Consequently, we have begun to implement a Sip to Send policy within the surgical directorate with the aim of improving our fasting times and reducing patient discomfort and harm from dehydration. We plan to re-audit this in the future.
References:
1. M. Thomas, T. Engelhardt Think drink! Current fasting guidelines are outdated. BJA, Volume 118, Issue 3, March 2017, 291–293
2. Mendelson CL. The aspiration of stomach contents into the lungs during obstetric anesthesia. American Journal Obstetric Gynecology 1946; 52: 191–205
3. APA consensus statement on updated fluid fasting guidelines APAGBI

13AP05-07
Intelligent operating room: a dream is becoming a reality

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Background and Goal of Study: The Perioperative medicine has many facets. Optimizing the general organization from the earliest stages would mean having a better and more accurate management of the resources available. With this study we want to highlight how it is feasible to use AI (artificial intelligence) models capable of tracing the patient along his entire perioperative care path, with the aim of leading to a more targeted organization of the OR (Operating Room), ultimately creating an integrated technological-organizational model[1].
Materials and Methods: An innovative tracking system is used. The architecture provides for an internal localization of BLE (Bluetooth low energy) tags through a Raspberry Pi v4. Once informed consent is obtained from the patient, a Tag is applied to him. Once worn, the Tag is hooked to the internal system and patients are assigned a progressive number.
In addition, the use of a tablet in the Ricovery Room (RR) allows you to monitor in real time the movements in and out of the patient. This architecture therefore allows you to create a solid database, which with the use of AI allows you to accurately predict the perioperative times, in particular those of occupation of the OR and therefore to create an adequate scheduling system early on, optimizing resources.
Results and Discussion: The analysis of the first data is promising. First of all, it is possible to monitor the patient in all the perioperative phases. It immediately emerged that the times recorded in these phases are much more precise and in real time than those present in the computerized system of the SB (operating block).
The time difference expressed in mean % varies from 6.90% (19,3 min) for patients present in the SB, to 11.10% (17,1min) for the stay in the OR and even 27.80% (24,5 min) in RR. The AI can easily predict the timing of the intervention based on some variables including: the operator's skills, the complexity of the surgery, the patient's ASA score and the type of anesthesia performed.
Conclusion(s): It is therefore possible, right from the start, to optimize the organization times of the OR and, more generally, of the OS, thus improving scheduling. Ultimately, it is essential to create a database that is able to implement the technological-organizational system already.
Reference:
1. Dagli MM, Rajesh A, Asaad M, Butler CE. The Use of Artificial Intelligence and Machine Learning in Surgery: A Comprehensive Literature Review. Am Surg.

13AP05-08
Historical patient measurements used for elective surgical referrals - do we need to do better?

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Background and Goal of Study: Controlling hypertension and anaesthetic planning for obese patients prior to surgery avoids unnecessary postponement. Patients referred by their general practitioner (GP) for elective surgery should have a height, weight and blood pressure (BP) recorded within the past 12 months to aid in pre-operative management. Unfortunately, referrals often include historical measurements.

The aim of this audit was to firstly identify the time period elapsed between the GP clinical assessment of height, weight and BP and subsequent surgical referral.

Our secondary aim was to ascertain if there was any disparity between the measurements documented on the referral and measurements taken at the pre-operative assessment clinic.

Materials and Methods: This was a retrospective audit involving 131 patients undergoing elective surgery between June and July 2022. Patients were selected based on having a complete data set of height, weight and BP measurements recorded on the initial referral and at pre-operative assessment.

Results and Discussion: The average length of time between referral for surgery and the last recorded measurement of height, weight and BP was 6.5 years, 4.7 years and 2.1 years respectively. 47% of patients did not have a recent BP and 66% did not have a recent weight recorded in the year preceding referral.

The average difference between height on referral and at pre-operative assessment was 2.4cm (–9cm to +47cm), between weight on referral and at pre-operative assessment was 5.9kg (–20kg to +65kg), between systolic BP on referral and at pre-operative assessment was 15mmHg (–31mmHg to +73mmHg).

It is evident that patients referred for elective surgery often do not have recent measurements of height, weight or BP recorded. Although regular recording of height is of less importance after 18 years of age.

Conclusion: All patients in this cohort had their elective operation. However, patients with uncontrolled hypertension and/or obesity discovered at pre-operative assessment have the potential for being more complex in their anaesthetic and surgical management, which can cause unnecessary delays to surgery.

Going forward, we look to collaborate with our primary care colleagues to recognise areas where these patient details could be collected prior to referral. There will also be a focus on updating the referral platform, to prompt for recent patient information prior to referral submission.

13AP05-09
Cost-effectiveness of a perioperative quality improvement care bundle for high-risk surgical patients in Brazil

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Background: High surgical risk patients are responsible for most postoperative complications and deaths. Improving perioperative care has the potential to reduce preventable deaths. We designed a 48-hour postoperative care pathway for high-risk surgical patients (‚high-risk surgical bundle') who did not meet criteria for elective intensive care admission. The pathway includes risk identification and communication; specific checklist for discharge from the post-anesthesia care unit; immediate nursing admission to the ward; intensified monitoring of vital signs; troponin measurement and immediate access to medical support if needed.

We compared the cost-effectiveness of high-risk patients undergoing major abdominal surgery allocated to the new High-Risk Surgical bundle with patients of the same profile undergoing usual care.

Methods: A retrospective cohort evaluated data from 130 high-risk postoperative patients undergoing the new High-Risk Surgical Bundle (intervention group). The activity and time-based costing method was used to assess cost at the individual level per patient based on care flow mapping. Mean costs of high-risk surgical patients undergoing usual postoperative care were also descriptively compared for 188 patients.

One-year survival was assessed with Kaplan-Meier survival curves. We tested a Cox proportional hazards model, with group as exposure, adjusted for risk class based on the Ex-care model, to analyze the hazard ratio for the primary outcome.

Results and Discussion: The average cost per patient in the intervention group was $2,316.01, 46% higher than in the usual care group, with emphasis on medication consumption, which was 249% higher in the intervention group. Comparison of median costs using the Mann-Whitney-Wilcoxon Test (intervention X usual care) did not show statistical significance p= 0.3766. The Kaplan-Meier curve for one-year mortality showed that the groups were significantly different, p=0.002.

According to the model, the new care strategy resulted in an increment of 0.12 LYG (Life Year Gained) at an incremental cost of $150.12. The projected ICER for one year of life gained was $1,217.66; this proves the cost-effectiveness of the new high-risk surgical bundle.

Conclusion: We demonstrated that adopting a new care bundle to high-risk surgical patients is cost-effective even in a middle-low income country. This work may contribute to new strategies that improve the postoperative outcomes of high-risk surgical patients.

13AP05-10
Cancellation of orthopaedic procedures – incidence and causes

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Background and Goal of Study: Beyond the obvious negative impact on patients, both physically and psychologically, cancellation of orthopaedic surgeries has financial and logistical implications for the institution. Knowing the reality of our hospital through identification and correction of these faults, is a major step to prioritize areas of improvement and increase its efficiency. Despite the lack of literature about this thematic it seems that this issue is extended to other hospitals.

The main objectives of this audit were to evaluate and describe the incidence and reasons for cancellation of orthopaedic surgeries both emergent and elective, at our central operating room (OR).

Secondary outcomes included timing of cancellation, perioperative mortality rate, length of hospital stay - total and after surgery and pre-anaesthetic evaluation at the ward.

Material and Methods: Cancellation records of all surgeries scheduled between January 1, 2021, and December 31, 2021, were retrospectively reviewed. Data were collected through consultation of OR listings and clinical records.

Results and Discussion: Of all 2132 patients scheduled for urgent or elective surgery, 137 (6.4%) were cancelled. The most common reason was lack of anaesthetic / surgical conditions (51%), mainly due to infectious processes such as upper respiratory or urinary tract infection and cardiac causes. Lack of OR time (16%) and lack of ward vacancies (12%) were other substantial causes.

Most of these cancellations occurred on the day before surgery (63%) and the remaining 37% on the surgery day. An important percentage of total cancelled surgeries (10%) still occur at the OR.

Conclusion: In this study, 6.4% of patients had their surgical procedure cancelled at least once. Our data suggest that most cancellations occur because of lack of anaesthetic / surgical conditions or structural processes, many of them potentially preventable. It appears that by targeting these processes and developing strategies to correct them, it should be possible to eliminate many of these cancelations thereby improving economic efficiency and possibly patient outcomes.

Suggestions were made, like timely anaesthetic evaluation in consult, when possible, minimisation of surgeries overbooking by taking medical staff, patient and facility factors including ward vacancies available into account and reduction of room turnover time. Future research and strategic measures to overcome these reasons should take priority.

13AP05-11
Perioperative acute respiratory failure linked to COVID-19 history in elective cardiac surgery patients - a prospective cohort observational study

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Background and Goal of Study: In the last 2 years about 10% of the world population has been infected with Sars-CoV 2 virus, creating a great burden on the medical system. Patients with recent COVID–19 infection have a great risk for pulmonary complications and mortality in the perioperative setting (1).

The aim of this study is to assess the impact of COVID–19 history more than 3 month on the perioperative incidence of pulmonary complications (acute respiratory failure and pneumonia) in the elective cardiac surgery patients.

Materials and Methods: We conducted a prospective observational study for four months in a cardiac intensive care unit (ICU). 68 consecutive patients who were hospitalized in the ICU after elective on pump cardiac surgery were included. The patients were followed from the ICU admission until discharge from the hospital. The history of COVID–19 infection and vaccination status were recorded.

Results and Discussion: From the 68 patients with a mean age of 61.78 ± 11.43 years, 34 (50%) had a history of COVID -19 and 61.8% were vaccinated. 97,05% of the patients had a mild form of COVID-19. The mean ASA score was 3.44 (±0.520) and the mean EUROSCORE I 5.19 (±2.541).

The most frequent surgery was the coronary bypass (CABG) – 35.3%, with a median of pump duration of 104.60 (±41.88) minutes. 35.3% of the patients had acute respiratory failure and 5.9% had pneumonia. The multivariate mixed effects logistic regression model found that the history of COVID-19 disease [odds ratio (OR) 3.54, 95% confidence interval (CI), 1.06-11.85) was associated with postoperative acute respiratory failure, but not with the occurrence of pneumonia.

The patients who had COVID-19 in 2020 (37.5%) or 2021 (37.5%) are more prone to have acute respiratory failure than those who had it in 2022 (12.5%).

Conclusion(s): The history of COVID – 19, even mild, is associated with acute respiratory failure post cardiac surgery, but not with the occurrence of pneumonia. The main limitation of this study is its size, but the intention is to extend it.

Reference:

1. COVIDSurg Collaborative, GlobalSurg Collaborative. Timing of surgery following SARS-CoV-2 infection: an international prospective cohort study. *Anaesthesia* 2021; 76: 748– 58.

13AP05-12
30-Day outcome in patients undergoing postponed elective surgery during the COVID-19 pandemic (TRACE II)

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Background and Goal of Study: The COVID-19 pandemic has had a tremendous impact on the capacity of elective surgery worldwide. The TRACE II study aims to study the effect(s) of delayed surgery on preoperative health status, postsurgical complications and quality of life (QoL) in patients with postponed elective surgery**.**
Materials and Methods: From September 2020 onwards, this observational, multicentre, prospective cohort study was performed in seven Dutch hospitals (1) and results were compared with the control group of the original TRACE study (2).
We used independent samples t-tests and Mann-Whitney U tests to test for differences in continuous baseline characteristics and Pearson's $\chi 2$ test and Fisher's exact test to check for differences in distribution of categorical variables between the two cohorts.
The primary outcome, 30-day incidence of major complications, was compared between the cohorts using logistic mixed-effects regression analysis.
Results and Discussion: A total of 1479 patients were included in TRACE II and compared to 2490 control patients from TRACE. At baseline more patients in the TRACE II study had an ASA score of III or higher and a lower METS score. The mean quality of life, quantified as EQ-5D-5L utility score at baseline, was lower in TRACE II compared to TRACE. Surgery severity grade was also lower in TRACE II. The delay of surgery ranged from 1 day till 744 days.
Within 30 days after surgery, we observed 58 (2.3%) patients with major complications in TRACE and 54 (3.7%) in TRACE II (aOR for TRACE II: 1.29, 95% CI: 0.87 – 1.93, p = 0.208). The mean quality of life at 30 days was 0.77 (SD 0.21) for patients in the TRACE cohort, compared to 0.73 (SD 0.23) in the TRACE II cohort (p = 0.028).
Conclusions: Our findings suggest that patients undergoing delayed elective surgery have more serious comorbidities, however, major postoperative complications did not occur more frequently compared to the TRACE control cohort.
Furthermore, quality of life seems to be lower before and after surgery in patients undergoing delayed elective surgery.
References:
1. Werger AC et al. BMJ Open 2022;12: e060354.
2. Buhre WFFA et al. Ann Surg. 2021 May 24.
Acknowledgements: We would like to thank all the investigators in the participating centres for their support in conducting the TRACE and the TRACE II study.

13AP06-01
Does the choice of neuromuscular blocking agent in rapid sequence induction influence mortality risk? A retrospective propensity score-matched cohort study

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Background and Goal of Study: Clinical trials have demonstrated that rapid sequence inductions (RSI) with rocuronium (0.9 -1.2mg/kg) are not statistically different from those with succinylcholine in terms of excellent and acceptable intubation conditions [1].
Due to the numerous adverse effects and contraindications of succinylcholine and the increased availability of sugammadex, rocuronium is increasingly favoured [2].
To date, however, both types of neuromuscular blocking agents (NMBA) are used in clinical practice. The aim of this study was to investigate the influence of choice of NMBA on in-hospital mortality.
Materials and Methods: After ethical approval, surgeries performed between 2014 and 2022 in adults receiving RSI were analysed. We excluded caesarean sections and surgeries, where both NMBAs were used. All available preoperative and clinical data were included. To reduce inhomogeneity, we performed 1:1 propensity score matching with a caliper of 0.001. Mann-Whitney-U test and Fisher's exact test for count data were used.
Results and Discussion: A total of 4,724 surgeries with RSI took place during the study period of which 3,793 (80.3%) received neuromuscular blockade with rocuronium and 931 (19.7%) with succinylcholine. After 1:1 propensity score matching, 568 patients given rocuronium were matched to 568 reference patients with succinylcholine. No significant difference in mortality between the rocuronium [n=22 (3.9%)] and succinylcholine group [n=15 (2.6%; p=0.24)] was found.

	Not matched	Matched				Not matched
Characteristic	**Rocuronium, N = 3,225[1]**	**Rocuronium, N = 568[1]**	**Succinylcholine, N = 568[1]**	**effect size**	**p-value[2]**	**Succinylcholine, N = 363[1]**
Age (years)	65 (52 - 76)	52 (34 - 67)	51 (34 - 66)	0.019	0.5	36 (29 - 47)
Sex (female)	1,475 (45.7)	264 (46.5)	261 (46.0)	0.005	>0.9	219 (60.3)
Premedication data available	1,400 (43.4)	197 (34.7)	202 (35.6)	0.03	0.8	135 (37.2)
Emergency	1,356 (42.0)	301 (53.0)	300 (52.8)	0.002	>0.9	189 (52.1)
Duration of surgery (min)	116 (75 - 175)	92 (61 - 135)	62 (39 - 99)	0.271	<0.001	40 (22 - 68)

[1]n (%); median (Interquartile Range); [2]Pearson's Chi-squared test; Wilcoxon rank sum test

Conclusion(s): The choice of NMBA does not influence perioperative mortality in a tertiary care hospital, where RSI performed with rocuronium and succinylcholine are both common practice.
References:
1. Tran, D.T.T., et al., *Rocuronium vs. succinylcholine for rapid sequence intubation: a Cochrane systematic review.* Anaesthesia, 2017. **72**(6): p. 765-777.
2. Bash, L.D., et al., *Neuromuscular Blockade and Reversal Agent Practice Variability in the US Inpatient Surgical Settings.* Adv Ther, 2021. **38**(9): p. 4736-4755.

13AP06-02
The experiment for anti-tumor effect of lidocaine and the impact of intravesicle lidocaine administration in bladder cancer: developing clinical model based on the translational research

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Background and Goal of Study: Lidocaine, which is known for a famous local anesthetic, has recently been reported to have anti-tumor effects in several studies, showing the possibility of being helpful in the treatment of cancer patients. However, the exact oncological molecular mechanism of lidocaine has not yet been fully investigated. Moreover, the increased blood concentration of lidocaine via intravenous administration can cause fatal side effects. However, if lidocaine is injected directly into a bladder cavity for the transurethral resection of bladder tumor, it can be used safely in the bladder cancer surgery. Therefore, we aimed to confirm the anti-tumor effect of lidocaine on bladder cancer cells, and establish a protocol can be used as one of the adjuvant therapies in bladder cancer surgery by providing evidence for the efficacy and safety of intravesical lidocaine based on our research.
Materials and Methods: We evaluated effects of lidocaine on human-derived bladder cancer cell lines (253 J cell) and rat-derived bladder cancer cell lines (NBT-II cell) by assessments of cell viability, cell cycle analysis, cell migration, Western blot analysis, and flow cytometry. Subsequently, autophagy influx and real-time polymerase chain reaction were conducted to find out the transduction system of signals related to the apoptosis of bladder cancer cells. In addition, the impact of intravesical lidocaine on the growth and metastasis of bladder cancer was investigated by in vivo imaging system via the 253 J cells xenograft in nude mice.
Results and Discussion: The NBT-II cell viability assays demonstrated that lidocaine had an anti-proliferative effect to the bladder cancer cells by cell cycle arrest, suppressing cell migration, and p-extracellular signal-regulated kinase signalling. It was also confirmed that bladder cancer cell growth inhibition by lidocaine acting as an autophagy inducer, and tumor growth was also attenuated in lidocaine administered into bladder groups.
Conclusion(s): The anti-tumor effect of lidocaine appears to be associated with mechanisms, including inhibition of proliferation, induction of apoptosis, and autophagy. And the clinical dose of lidocaine demonstrated anti-tumor effects on 253 J cell-derived bladder cancer in nude mice. Accordingly, we may expect that the clinical benefit of the intravesical lidocaine administration as an alternative adjuvant therapy in patients with a transurethral resection of bladder tumor.

13AP06-03
Efficacy of melatonin premedication in reducing perioperative anxiety during hysteroscopy under spinal anesthesia

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Background and Goal of Study: Hysteroscopy is a frequent surgical procedure performed for diagnostic or therapeutic benign endocavitary uterine pathologies. Although it is most often conducted on an outpatient basis, it continues to be a source of perioperative anxiety for patients.
Melatonin has shown an anxiolytic effect when administered preoperatively in different types of surgery.
The aim of the study was to evaluate the anxiolytic efficacy of melatonin when administered as premedication during hysteroscopy procedures.
Materials and Methods: A prospective randomized double-blind study was performed over a period of 04 months at a tertiary maternity center. It included ASA I and II physical status patients scheduled for diagnostic or therapeutic hysteroscopy under spinal anesthesia. Patients were randomized to receive two tablets of either a placebo in group P or melatonin in group M (a total dose of 04mg); 120 minutes before surgery. Spinal anesthesia was performed below L3 with 10 mg of hyperbaric bupivacaine and 2.5 μg of sufentanil for a sensitive block at T10.
The primary outcome of the study was the degree of pre and post operative anxiety measured by a simple verbal anxiety scale (VAS: 10-9 awful; 8-7 horrible; 6-5 distressing; 4-3 uncomfortable; 2-1 annoying; 0 no anxiety).
The secondary outcomes were intraoperative hemodynamic status and patient satisfaction measured by a two-dimensional scale (0 not satisfied; 1 satisfied). A p value<0.05 was considered statistically significant.
Results and Discussion: Our study included 51 patients in each group. There was no significant difference in socio-demographic and surgical characteristics in the two groups. Preoperatively, the mean VAS score was 3.2 ± 1.1 and 5.6 ± 1.4 respectively in groups M and P ($p<0.001$). In the post operative period, VAS scores were 1.6 ± 0.8 in group M and 3.9 ± 1.8 in group P ($p<0.001$).
The mean time of installation of spinal anesthesia was 3 ± 0.8 minutes in the melatonin group and 4.8 ± 0.8 minutes in the placebo group ($p<0.01$). A hemodynamic stability status was observed in both groups ($p=0.2$). Patient satisfaction was noted in 98% of the patients in the group M and in 64% of the patients in the group P ($p<0.001$).
Conclusion(s): Exogenous melatonin is harmless and has several analgesic, anti-inflammatory and sedative properties. In our study, melatonin reduced perioperative anxiety and improved the satisfaction of patients proposed for hysteroscopy scheduled under spinal anesthesia.

13AP06-04
Effects of music therapy on anxiety and physical parameters in central venous catheter placement: a systemic review and meta-analysis

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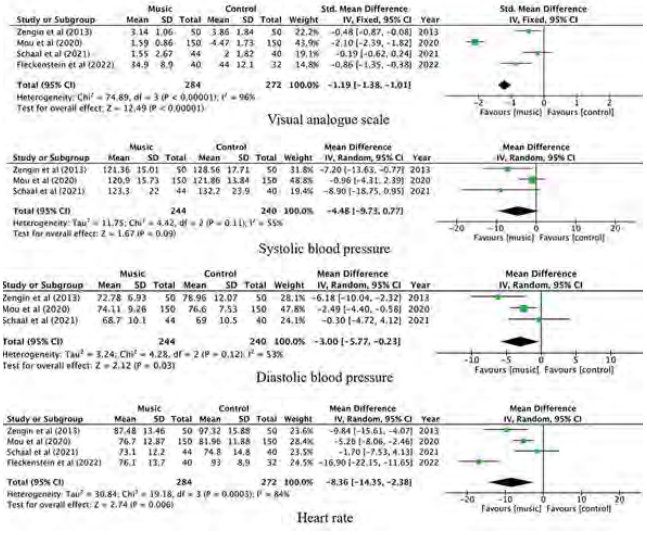
Background and Goal of Study: During central venous catheter (CVC) implantation, patients often suffer from intensive anxiety and pain, which may lead to instability of hemodynamics. There are already several original articles revealing controversial outcomes about the efficacy of the music therapy during CVC placement. This systematic review and meta-analysis surveys the existing literature for the use of music in CVC placement to further determine if music therapy can provide improvement in patients' anxiety levels and stabilize the hemodynamic status of the patients.
Materials and Methods: Literature search was performed by 3 different reviewers using Pubmed and Cochrane Central Register of Controlled Trials, using the search strings of "Music (Music intervention) and catheter". We included all the randomized clinical trials investigating the effects of music therapy in adult patients during placement of central venous catheter, peripherally inserted central catheter and subcutaneous port. Primary outcome was the visual analogue scale (VAS) to measure the anxiety level of patient, and secondary outcomes included the systolic blood pressure, diastolic blood pressure, and heart rate during the procedure. We used Review Manager 5.4.1 for data extraction and analysis.
Results and Discussion: There are 4 studies, 284 patients involved in the study. The studies used VAS to measure anxiety, which significantly decreased in music therapy group [standard mean difference (SMD): -1.19, 95% Confidence interval(CI): -1.38,-1.01]. Considering secondary outcomes, the heart rate was significantly lower in the music therapy group (SMD: -8.36, 95% CI: -14.35, -2.38) as well as the diastolic blood pressure (SMD: -3; 95% CI: -5.77, -0.23); the systolic blood pressure is insignificantly lower in the intervention group (SMD: --4.48, 95% CI: -9.73, 0.77). The heterogeneity of all results is moderate to high. The absence of blinding of the patients may contribute to risk of bias.



Conclusion: The music therapy can decrease the anxiety level of the patient and lead to stabler heart rate and diastolic blood pressure during implantation of central venous catheter.

13AP06-05
Effectiveness of virtual reality distraction compared to tablet distraction for reducing pain associated with peripheral venous cannulation

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Background and Goal of Study: We investigated the feasibility and benefits of implementing a tablet compared to VR-glasses for distraction during peripheral venous cannulation in a Dutch peripheral hospital (Wilhelmina Hospital Assen). By diverting attention away from a painful stimulus pain perception is reduced. The use of VR glasses for minimizing pain associated with peripheral venous cannulation in a pediatric population is established. The aim of this non-inferiority study was to compare the NRS scores during peripheral venous cannulation using tablet or VR glasses, since a tablet is more feasible and less expensive then VR glasses.
Materials and Methods: Patients were eligible if peripheral venous cannulation was indicated and surgery was scheduled. Inclusion was from July 5, 2021 until October 18, 2021. The exclusion criteria were: Children under 4; patients who did not receive intravenous access; language barrier; a history of epilepsy, psychosis, or claustrophobia; blindness or deafness; cognitive impairment; and refusal. A total of 658 patients were randomized into a VR distraction or tablet distraction group. Numeric pain rating scale (NRS) was used prior and after, to address pain during venous cannulation. Additionally, questionnaires for patients and staff were used to address satisfaction of both distraction technics.
Results and Discussion: There was no significant difference in NRS scores between VR glasses (2,6 SD +/- 2,3) or tablet (2,9 SD +/- 2,2) P= 0,12 (p<0,05). Of patients using VR glasses as distraction, 80,5% of were satisfied, versus 58,5% using a tablet. Staff member satisfaction with the VR-glasses was 74,0% versus 48,6% in the tablet group. Both the VR glasses and tablet were easy applicable in a high turnover setting.
Conclusion(s): Although there was a higher satisfaction with VR glasses, this study shows that a tablet gives comparable pain distraction during venous cannulation.

13AP06-06
Prevalence of preoperative anaemia and postoperative outcomes in 15 166 surgical patients from a public hospital in Brazil: a single observational study

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Background and Goal of Study: Preoperative anaemia is associated with poor postoperative outcomes, but few studies have reported the prevalence of this condition in patients submitted to surgery in low-middle income scenarios. We aimed to identify the prevalence of anaemia and its relationship with 30-day postoperative death at a university public hospital in Brazil.
Materials and Methods: This cohort study included patients who underwent surgery between 2015 and 2019 at Hospital de Clínicas de Porto Alegre.

Primary outcome was 30 day-death after surgery. Anaemia was defined as haemoglobin <12 g/dL for females and <13 g/dL for males. Poisson regression models were constructed to examine the associations between preoperative anaemia and outcomes.

Results and Discussion: We included 15 166 patients. The mean age was 56 [SD 17] yr, and 7819 (51.6%) were female. Preoperative anaemia was present in 6387 (42.1%) patients, 2881 (19.1%) had mild anaemia, 2837 (18.7%) had moderate anaemia, and 669 (4.4%) had severe anaemia. After adjustment for potential confounding factors, patients with moderate (RR 1.73 95%CI 1.43-2.10) and severe anaemia (RR 2.43 95%CI 1.92-2.07) had increased mortality. Anemia also significantly increased the risk of transfusion (RR of 11.83 95%CI 10.09-13.85 for severe and RR of 5.44 95%CI 4.72-6.27 for moderate anaemia.

Conclusion(s): Four of every ten patients were anaemic in our cohort. These patients have an increased risk of transfusion and death. Interventions are essential to improve the quality of care and optimize the surgical patient's journey from anaemic patients.

	Unadjusted association		Multivariable analysis	
	RR (95% CI)	p value	RR (95% CI)	p value
Anaemia Category				
Mild	1.69 (1.36-2.09)	< 0.01	1.38 (1.12-1.71)	< 0.01
Moderate	3.18 (2.66-3.80)	< 0.01	1.73 (1.43-2.10)	< 0.01
Severe	6.62 (5.36-8.17)	< 0.01	2.43 (1.92-2.07)	< 0.01
Schooling				
Years of schooling (< 9 years)	Reference		Reference	
Years of schooling (9 years)	0.85 (0.7-1.04)	0.12	0.96 (0.80-1.16)	0.68
Years of schooling (12 years)	0.72 (0.58-0.88)	< 0.01	1.05 (0.88-1.26)	0.56
Years of schooling (>12 years)	0.83 (0.6-1.16)	0.27	1.11 (0.83-1.47)	0.48
Male	1.09 (0.94-1.26)	0.23	0.94 (0.82-1.09)	0.44
Age	1.04 (1.04-1.05)	< 0.01	1.02 (1.02-1.03)	< 0.01
Ethnicity - White	0.97 (0.78-1.22)	0.82	1.09 (0.88-1.36)	0.43
Emergency/Urgency	3.69 (3.16-4.3)	< 0.01	2.21 (1.81-2.69)	< 0.01
Grade of Surgery				
Minor	Reference		Reference	
Intermediate	1.20 (0.91-1.58)	0.20	0.85 (0.64-1.12)	0.25
Major	3.80 (2.96-4.88)	< 0.01	1.60 (1.23-2.09)	< 0.01
ASA				
Class I or II	Reference		Reference	
Class III	6.98 (5.42-8.97)	< 0.01	4.30 (3.17-5.83)	< 0.01
Class IV or V	41.75 (32.72-53.28)	< 0.01	15.94 (11.51-22.06)	< 0.01
Medical specialties				
General surgery	Reference		Reference	
Urology	0.35 (0.24-0.5)	< 0.01	0.77 (0.55-1.09)	0.14
Ortopedics	0.25 (0.17-0.35)	< 0.01	0.59 (0.40-0.85)	0.01
Neurosurgery	1.55 (1.24-1.94)	< 0.01	1.02 (0.80-1.30)	0.88
Ginecology	0.08 (0.03-0.21)	< 0.01	0.23 (0.07-0.74)	0.01
Coloproctology	1.2 (0.78-1.84)	0.40	0.91 (0.60-1.36)	0.63
Vascular surgery	1.48 (1.2-1.83)	< 0.01	0.94 (0.76-1.17)	0.58
Thoracic surgery	0.74 (0.49-1.11)	0.15	1.08 (0.72-1.62)	0.72
Cardiovascular	0.77 (0.6-0.99)	0.04	0.58 (0.43-0.79)	< 0.01
Others	0.15 (0.08-0.29)	< 0.01	0.45 (0.21-0.99)	0.05

95% CI: 95% Wald Confidence Interval for relative risk

Table. Association between preoperative anemia and in-hospital mortality within 30 days of surgery. Poisson regression model with RRs are adjusted for age, ethnicity, sex, ASA grade, degree and nature of surgery, surgical procedurw category, CI, confidence interval.

95% CI: 95% Wald Confidence Interval for relative risk

13AP06-07
Effectiveness of melatonin as premedication for cataract surgery under peribulbar block

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Background and Goal of Study: Cataract is a ubiquitous pathology. Surgical treatment is increasingly practiced under sedation and locoregional anesthesia on an outpatient basis. In this context, intraoperative sedation-analgesia is not without risks. Melatonin enhances sedation when administered preoperatively.

The aim of this study was to evaluate the efficacy of a premedication with melatonin on sedation-analgesia for elective cataract surgery under peribulbar block.

Materials and Methods: This is a prospective randomized double-blind study including patients (ASA I to III) scheduled for elective cataract surgery by phacoemulsification under peribulbar block. Sixty minutes before surgery, patients received 05 pills of either a placebo (group P) or Melatonin (10 mg) (group M). Peribulbar block was performed after sedation with intravenous Midazolam (0.02mg/kg) and Alfentanil (03μg/kg).

Intraoperatively, a supplemental sedation-analgesia was given to achieve a Ramsey score between 2-4 and a simple verbal scale(EVS)< 2 (0: no pain, 1: mild, 2: moderate, 3: severe and 4: extremely severe pain).

We noted total consumption of Midazolam and alfentanil, sedation level (Ramsey score and bispectral index), analgesia (EVS), patient anxiety (APAIS score), perioperative intraocular tone and patients and surgeons satisfactions (Five points Likert Scale).

The primary outcome was the total consumption of Midazolam and Alfentanyl.

The secondary outcome was perioperative intraocular tone. A $p<0.05$ value was considered statistically significant.

Results and Discussion: Our study included 56 patients. During the procedure, the median consumption of Midazolam in group M was 1.5 [1.3-1.7] mg and 2.3 [1.47-2.57] mg in group P (p=0,003). The median consumption of Alfentanyl was 240 [195-287] μg and 380 [247.5-442.5] μg respectively in group M and P (p=0,001). The median EVS and the mean value of BIS were significantly lower in group M (p<0.001). The median APAIS Score was 8 in both groups (p=0.259). During the procedure, intraocular tone was significantly lower in group M (p<0.01). Patients and surgeons satisfaction scale were higher in group M (respectively 3 and 4 (p=0.001)).

Conclusion(s): Oral premedication with melatonin for elective cataract surgery under peribulbar block enhanced sedation and analgesia, reduced intraocular tone and improved the operating conditions. Other studies should be conducted to demonstrate its perioperative anxiolysis.

13AP06-08
Derivation and validation of a national multicenter mortality risk stratification model – the Brazilian Extended Care (BE-Care) model

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Background: Surgical risk stratification models are useful for decision-making regarding prioritization of care, resource allocation and facilitating dialogue between professionals and family members. Ideally, they should be simple, accurate, reproducible and externally validated. However, most of these tools were built in high-income countries and did not have their accuracy tested in our scenario. To fill this gap, we aimed to build a robust and feasible national preoperative risk assessment tool based on data from patients operated in Brazil.
Methods: Retrospective multicenter cohort study including consecutive surgeries from January, 2017 to December, 2018 at ten Brazilians hospitals. Data were obtained through queries from electronic medical records. The Ex-Care model, a validated tool including four predictors, was used as reference. A multivariable logistic regression model predicting 30-day in-hospital mortality was developed. Sequential variables adjustments were fitted on the derivation sample and new coefficients were obtained, based on Ex-Care original predictors (age, ASA-PS, surgical severity and nature) to keep with the principles of a parsimonious model. An independent sample was used for validation. Model accuracy was tested using discrimination (area under the receiver operating characteristic curve (AUROC)) and calibration (Brier test and calibration plot) measures.
Results and Discussion: 105501 patients were considered for analysis. 73850 comprised the derivation cohort, with a mortality rate of 2.16%. The BE-Care model presented excellent discrimination, AUROC 0.931 (CI 95%, 0.925-0.936), and calibration (Brier score of 0.017). The good performance was confirmed by the validation cohort, composed of 31651 patients with mortality of 2.17%, AUROC 0.933 (CI 95%, 0.926-0.941) and Brier score of 0.017. Among the selected predictors, surgical nature and ASA-PS class had the greatest impact on death (OR 4.23 and 4.00, respectively).
Conclusion: Using a multicentric sample, the BE-Care model showed excellent accuracy in stratifying the surgical risk of patients operated in Brazil. Using this tool, quality improvement strategies can be planned to improve surgical population outcomes in resource constrained settings.
Reference:
Gutierrez CS, Passos SC, Castro SMJ, et al. Few and feasible preoperative variables can identify high-risk surgical patients: derivation and validation of the Ex-Care risk model. Br J Anaesth. 2020;126(2):525–523.

13AP06-09
CLOCKS 2 observational study: does the phase shift observed after surgery and anesthesia differ for morning vs. afternoon procedures?

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Background and Goal of Study: Surgery and general anesthesia are known disturbances of the circadian timing system and post-operative sleep. Earlier research from our study group showed a phase advance of sleep-wake timing on the night before and two nights after surgery, which was associated with a lower post-operative sleep quality.
However, the timing of the disturbance of the circadian timing system may be of importance and we hypothesized that surgery and general anesthesia in the afternoon would result in a larger phase advance.
Materials and Methods: We performed a single centre prospective cohort study in adult (18 years or over) patients scheduled for elective surgery with at least 30 minutes of general anesthesia. We used the Munich Chronotype Questionnaire and Pittsburgh Sleep Quality index (PSQI) to determine baseline chronotype, sleep parameters (e.g. on- and offset timing, duration) and sleep quality. A sleeping log was used for 3 nights before and 7 nights after surgery, and a second PSQI was filled out a week after surgery to determine sleep-wake timing and post-operative sleep quality respectively.
Results and Discussion: We included 94 patients for this preliminary analysis. We compared the shift between midpoint of sleep three nights before surgery with midpoint of sleep on the night after surgery. For patients operated in the afternoon, we found a phase advance of 53 min (SD 76 min), which was smaller than the phase advance of 20 min (SD 71 min) we found in patients operated on in the morning ($p = 0.049$).
However, multiple linear regression using morning-afternoon surgery, as well as pre-operative chronotype, age and duration of surgery as independent variables showed that only chronotype predicted phase shift significantly ($p < 0.001$), while morning vs. afternoon surgery did not ($p = 0.190$).
Both morning and afternoon surgery resulted in a lower post-operative sleep quality, but there was no significant difference in lowering of PSQI-score in both groups. Our results do not concur with studies in animals, showing differences in phase shifts depending on the timing of administration of anesthetics.
Conclusion(s): We did not find a significant smaller peri-operative phase advance in patients operated on in the afternoon when using multiple linear regression. However, there was a significant phase advance in sleep-wake timing in both groups, which was associated with a significant lowering of sleep quality.

13AP06-10
Anxiolytic preanaesthetic medication in Europe: a survey of current practice - preliminary results

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Background and Goals: Excessive preoperative anxiety is associated with increased postoperative complications, but there are no clear guidelines for preoperative anxiolysis. Preanaesthetic medication with midazolam has been a common practice for the last decades but recent European data are unknown.
We aim to evaluate the current practice of preoperative anxiety assessment and management in Europe and the role of midazolam in modern practice.
Methods: Cross-sectional online survey of European anaesthesiologists regarding current anxiolytic premedication practice starting 14th November 2022. Links were sent by email to ESAIC members. The survey included 9 sections with 38 multiple choice questions.
Results and Discussion: We received 288 responses from anaesthetists working in 51 countries; mean age of respondents was 45 ± 11 years, 63% were men, 85% anaesthesia specialists and working mostly in public hospitals. 76% of respondents report to evaluate anxiety subjectively and only 3% use a scale; 22% register anxiety data in the medical record; 71% use non-pharmacologic strategies to manage anxiety, the most frequent being the pre-operative visit. Only 3% of respondents never prescribe anxiolytic medication.
Among the prescribers, 68% report that midazolam is the preferred drug in the outpatient setting, 66% in the inpatient setting and 79% in the paediatric setting. Globally, 80% admit to use Midazolam at least occasionally.
The second most used drugs are other benzodiazepines in adults and dexmedetomidine in children. Most anaesthetists premedicate adult patients in the holding area through an intravenous route, or orally on the day of surgery; and paediatric patients orally in the ward.
Only 21% report being aware of anxiolytic premedication protocols in their department for ambulatory surgery, 34% for inpatient surgery and 47% for paediatric anaesthesia. Midazolam is the mot common protocol drug in all settings, and might be combined with other drugs.
Conclusions: Midazolam remains the most used anxiolytic preanaesthetic medication among European anaesthesiologists in all operative settings. 43% of respondents are unaware of protocols in their departments.
We recommend that anaesthesiology societies develop clear guidelines concerning evaluation, registry and management of preoperative anxiety, namely the use of quantitative anxiety scales, non-pharmacologic and pharmacologic strategies.
Acknowledgements: To ESAIC for disseminating this survey.

13AP06-11
AMAZONE Prevention of persistent pain after breast cancer treatment by online cognitive behavioural therapy – results of an interim analyses after 6 months

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Background: Persistent pain after breast cancer treatment (PPBCT) is highly prevalent. Strategies of intensified perioperative pain management failed to reduce the prevalence of PPBCT. Until now psychological distress (PD) has not been targeted before surgery.
The AMAZONE study is designed to examine the preventive effect of online cognitive behavioural therapy (eCBT) on the prevalence of PPBCT six months after surgery.
Methods: In a randomized controlled multicenter trial in six Dutch hospitals, patients scheduled for unilateral breast cancer surgery with PD [HADSa≥8, CARS≥5, SFI≥3, PCS≥18] were randomized to five sessions perioperative eCBT or education interventions (EDU). Patients with low PD received treatment as usual (TAU).
Primary endpoint is the prevalence of PPBCT (NRS ≥3/10) at 6 months. Secondary endpoints are pain intensity, -interference, and psychological distress. The sample size was calculated to be 138 patients with PD.
Results: From June 2021 to October 2022, 188 patients were included, 54 scoring high for PD and randomized to eCBT or EDU, 100 were TAU and 34 excluded. PD was mostly determined by anxiety and surgical fear (tab1). The majority of patients had low stage breast cancer and underwent breast conserving surgery.
Only three patients had to undergo axillary dissection. The mean postoperative pain-intensity was higher in EDU and eCBT (n.s.) (fig1).
The 6-month results on PPBCT prevalence, pain sensitivity, PD are not yet available and will be presented at the conference.

Group	Age [y] (med/min/max)	BMI [kg/m²] (med/min/max)	Smoking [n]	Surgical fear ≥ 3 [n]	CARS ≥ 5 [n]	PCS ≥ 18 [n]	HADSa ≥8 [n]
eCBT (n=27)	52.0 (32/76)	24.2 (20.4/36.7)	3 (11%)	13 (48%)	5 (19%)	9 (33%)	22 (82%)
EDU (n=27)	53.0 (35/70)	25.5 (18.4/34.1)	4 (15%)	12 (44%)	4 (15%)	6 (22%)	24 (89%)
TAU (n=100)	58.5 (30/77)	25.4 (18.7/38.9)	6 (6%)	-		-	-

Table 1: Epidemiological Data

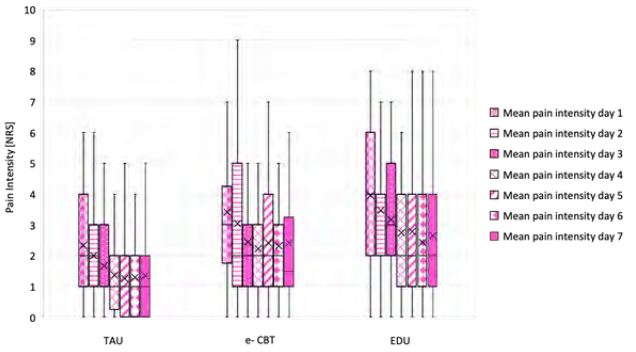

Figure 1: Mean postoperative pain-intensity day 1-7

Conclusion: With perioperative preventive eCBT targeting psychological distress, we expect to improve functioning and quality of life in breast cancer survivors by a reduction of PPBCT prevalence and severity.

Acknowledgements: AMAZONE is supported by ESAIC and Pink Ribbon/KWF

13AP06-12
A prospective, longitudinal cohort study of persistent postsurgical opioid use among patients treated at a Swiss hospital: a preliminary analysis

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Background and Goal of Study: A recent study of the Swiss national poison center found a significant increase in the rate of calls for opioid-related poisonings (1). The ongoing opioid epidemic in the United States has been associated with opioid dependence after surgery (2).

It is unclear if a similar association exists in Switzerland.

Our year-long study aims to detect and describe prolonged opioid use after major elective surgery in a Swiss cantonal hospital.

Materials and Methods: For this preliminary analysis, 312 patients undergoing major elective surgery were screened for enrollment from June 1 to September 30, 2022. 272 patients were eligible and agreed to participate. Baseline demographic and operative data were gathered from electronic medical records.

Postoperative interviews about opioid use were done by telephone 6 weeks after surgery. If patients were taking opioids, a 12-week follow-up was scheduled. The cantonal ethics committee approved this study (EKOS 22/042), consent was obtained from all patients. The analyses were conducted in Stata Version 15.

Results and Discussion: Of the 272 eligible patients, 5 withdrew at the first follow-up (n=267). The median age at surgery was 59 years (IQR 39-73). 56% were women, 71% had ≥1 major comorbidity (ASA ≥3), and 66% took concomitant medication. Surgery type was: major visceral (34%), hip arthroplasty (19%), caesarian section (18%), major hand (16%), spine (8%), and partial or complete prostatectomy (5%).

Anesthesia was performed as general (73%), regional (24%) or combination (3%). 8% had major postoperative complications. 13 patients took opioids before hospitalization, and 11 received a prescription at discharge (9 patients with a long-term prescription did not receive an additional one from the hospital).

At the 6-week follow-up, 14 patients were lost-to-follow-up. Of the 243 patients contacted, only 4 filled their opioid prescription. 2 patients received opioids from another source after discharge. At the 6-week follow-up, 4 patients were still taking opioids. At the 12-week follow-up only 2, both of whom were already taking opioids before surgery.

Conclusion: These preliminary results indicate no association between perioperative opioid usage and prolonged opioid use disorder. This study is ongoing. Long-term outcomes are needed to generalize our findings.

Reference:

1. Hooijman MF et al. The Lancet Regional Health – Europe 2022;00: 100437 (2) Larach DB et al. Anesthesiology 2022; 136:594–608

13AP07-01
From pre-to perioperative iron deficiency management for colorectal cancer patients undergoing robot-assisted surgery

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Background and Goal of Study: A pre-operative diagnosis of iron deficiency, which is highly prevalent in patients with colorectal cancer, predicts for decreased survival[1].Treatment with oral or intravenous (IV) iron can significantly improve post-operative and ongoing oncological outcomes[2].

Current guidelines for treatment of iron deficiency, shown in Figure 1, plan for treatment in the pre-operative period only. However, opportunities for pre-operative treatment are missed due to the short interval between diagnosis of iron deficiency and therapeutic robot-assisted surgical procedure for colorectal cancer. Untreated iron deficiency leads to suboptimal clinical status post-operatively causing delays to time-sensitive onward oncological treatment.

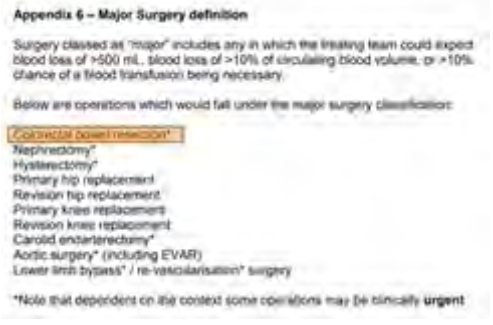
National guidance advocates for extending the possible treatment timeframe of iron deficiency to the immediate post-operative period[3]. A quality improvement (QI) project was therefore undertaken to bring local practice in line with national guidance, expanding the timeframe for treatment of iron deficiency from the pre-operative to the peri-operative period at Colchester Hospital.

Materials and Methods: Patients undergoing robot-assisted colorectal surgical procedures in the last 24 months were identified by searching the hospital database with relevant clinical codes. Patients undergoing procedures for non-malignant disease were excluded from the sample.

Electronic patient notes and pre-operative blood investigations were retrospectively analysed in order to identify those who were iron deficient. Iron deficiency was defined as haemoglobin (Hb) <130g/L and serum ferritin <30 mcg/L or serum ferritin 30-100mcg/L with transferrin saturation <20% as per local guidelines. Further examination of patient records revealed those who were given pre-operative treatment and those who were not.

Results and Discussion: 107 patients undergoing robot-assisted procedures for colorectal cancer were identified from September 2020 to March 2022. 42 of these patients (39.2%) had a pre-operative haemoglobin <130g/L. Of these, 18 did not have adequate investigations for iron deficiency completed.

24 of the 42 patients were diagnosed with iron deficiency and should have been treated pre-operatively as per local and national guidelines. 14 out of these 24 (58.3%) were given a pre-operative iron transfusion. 10 patients received no treatment for iron deficiency in the peri-operative period.


Appendix 6 – Major Surgery definition

Surgery classed as "major" includes any in which the treating team could expect blood loss of >500 mL, blood loss of >10% of circulating blood volume, or >10% chance of a blood transfusion being necessary.

Below are operations which would fall under the major surgery classification:

Colorectal bowel resection*
Nephrectomy*
Hysterectomy*
Primary hip replacement
Revision hip replacement
Primary knee replacement
Revision knee replacement
Carotid endarterectomy*
Aortic surgery* (including EVAR)
Lower limb bypass* / re-vascularisation* surgery

*Note that dependent on the context some operations may be clinically **urgent**

Figure 1: Current guidelines for treatment of iron deficiency in the pre-operative period

Figure 2: Proposed guidelines to extend period of treatment to peri-operative period. (POA: pre operative assessment, PAC: pre-assessment clinic)

This data has initiated a change in current peri-operative iron deficiency management guidelines. Proposed guidelines shown in Figure 2. Following implementation of new guidelines, prospective data will be collected as part of the second QI cycle to ensure these recommendations are smoothly implemented into local clinical practice.

Limitations of this quality improvement project include the retrospective data collection from patient records which were not designed for this purpose and therefore may be subject to researcher bias.

Conclusion(s): The data highlighted that in an 18-month period, 41.6% of iron-deficient patients undergoing robot-assisted surgery for colorectal cancer missed the opportunity to have a pre-operative intervention for iron deficiency. Therapeutic intervention would not only have improved future outcomes but may also have prevented delays in their onward oncological care.

By changing guidelines and local practice we hope to improve peri-operative and oncological outcomes for future patients.

References:

1. Muñoz, M. et al 2016. International consensus statement on the peri-operative management of anaemia and iron deficiency. *Anaesthesia*, 72(2), pp.233-247.

2. Muñoz, M., 2014. Perioperative anemia management in colorectal cancer patients: A pragmatic approach. *World Journal of Gastroenterology*, 20(8), p.1972.

3. Nice.org.uk. 2022. *Recommendations | Blood transfusion | Guidance | NICE*. [online] Available at: <https://www.nice.org.uk/guidance/ng24/chapter/Recommendations#intravenous-and-oral-iron-2> [Accessed 19 October 2022].

13AP07-02
Anaemia before discharge and 1-year survival in patients undergoing surgery for colorectal cancer: single-centre retrospective analysis

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Background and Goal of Study: Preoperative anaemia is common in colorrectal cancer patients. Besides, non-anaemic patients are likely to be anaemic postoperatively. Postoperative anaemia has been associated with red blood cell transfusion and increased length of stay. It has been hypothesized anaemia could impact oncological outcomes. Tumour cell hypoxia has been postulated as promoter of malignant progression and resistance to adjuvant therapy. The aim of our study was to analyse the effect of anaemia before discharge on 1-year survival

Materials and Methods: Single centre retrospective cohort study including patients undergoing colorectal cancer surgery between 2009 and 2017. Patients were grouped according to the presence or not of anaemia before discharge. Anaemia was defined as haemoglobin <12 g dl^{-1} for females and <13 g dl^{-1} for males.

Primary outcome was 1-year survival.

Secondary outcomes included 30-day postoperative complications, red blood cell transfusions and length of stay.

Overall survival was calculated with the Kaplan-Meier log rank method and Cox proportional hazard regression based on anaemia at discharge

Results and Discussion: 680 patients with a mean age of 70 (± 12.4) were included, of whom 559 (82.2%) were anaemic before discharge. Mean haemoglobin of the entire cohort was 12.6 (± 2) g dl^{1} before surgery, and 10.9 (± 1.6) g dl^{1} before discharge. There were no differences in postoperative complications between anaemic and non-anaemic patients (52.9 vs 47.1% p = 0.25). Patients with anaemia before discharge received more red blood cell transfusions during the intra- (9.7% vs 3.6% p <0.05) and postoperative (18.6% vs 7.3% p <0.05) periods. Length of stay was shorter in non-anaemic patients (7 [IQR 5-13] vs. 5 [IQR 4-7], p <0.05). There were no differences in overall 1-year survival (HR 1.21; 95% CI 0.82- 1.81; p = 0.332).

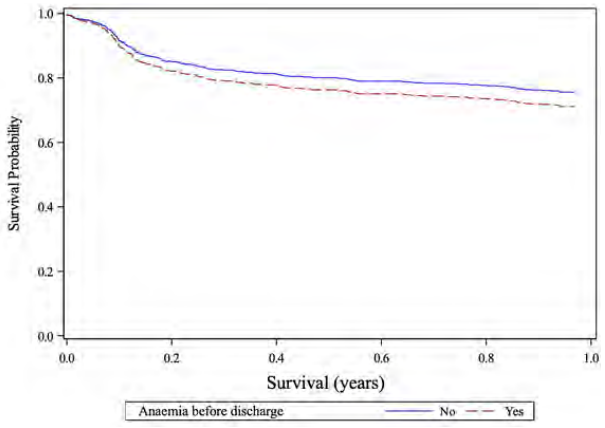

Figure. Direct adjusted survivor functions.

Conclusion: Anaemia after surgery for colorectal cancer was frequent in our cohort, although anaemia before discharge was not associated with decreased 1-year survival. Patients with anaemia before discharge received more red blood cell transfusion in the intra- and postoperative period and had an increased length of stay.

13AP07-03
Preoperative anaemia and 1-year survival in colorectal cancer patients: a single centre retrospective study

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[1]Hospital Universitario Donostia, Anaesthesia and Critical Care, San Sebastian, Spain, [2]Hospital Universitario Infanta Leonor, Anaesthesia and Critical Care, Madrid, Spain, [3]Universidad Complutense de Madrid, Medical School, Madrid, Spain

Background and Goal of Study: Anaemia is frequent in patients with colorrectal cancer. Preoperative anaemia is independently associated with postoperative morbidity and mortality, and with red blood cell transfusions. Besides, it has been associated with worse long-term outcomes in patients undergoing surgery for cancer. The aim of our study was to analyse the effect of preoperative anaemia on 1-year survival.
Materials and Methods: Single centre retrospective cohort study including patients undergoing colorectal cancer surgery between 2009 and 2017. Patients were grouped according to the presence or not of preoperative anaemia. Anaemia was defined as haemoglobin <12 g dl^{-1} for females and <13 g dl^{-1} for males.
Primary outcome was 1-year survival.
Secondary outcomes included 30-day postoperative complications, red blood cell transfusions and length of stay.
Overall survival was calculated with the Kaplan-Meier log rank method and Cox proportional hazard regression based on anaemia at discharge.

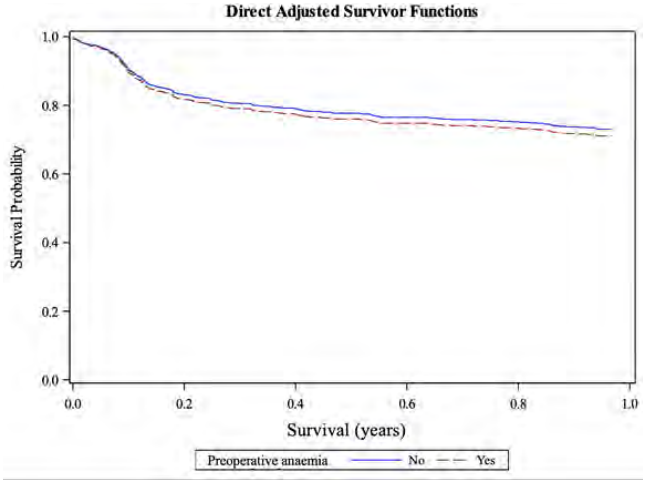

Figure. Direct adjusted survivor functions.

Results and Discussion: 739 patients with a mean age of 70 (± 12.6) were included, of whom 368 (49.8%) were anaemic. There were no differences in postoperative complications between anaemic and non-anaemic patients (52.7% vs 51.5%, p = 0.74). Anaemic patients received more red blood cell transfusions during the intra- (53 (16.4%) vs 7 (2.1%) p <0.05) and postoperative (78 (24.3%) vs 32 (10%) p <0.05) periods, and had an increased length of stay (7 [IQR 5-13] vs. 6 [IQR 5-11], p <0.05). There were no differences in overall 1-year survival (HR 1.09; 95% CI 0.83 - 1.43; p = 0.547).
Conclusion(s): in this single centre cohort of patients undergoing colorectal surgery preoperative anaemia was not associated to decreased 1-year survival, or 30-day postoperative complications. Preoperative anaemia was associated with red blood cell transfusion and increased length of stay.

13AP07-04
Managing general anesthesia in patients undergoing elective colorectal surgery: a substudy of The European Postoperative Outcomes Within Enhanced Recovery After Surgery Protocol (EUROPOWER) study

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Background and Goal of Study: Improvements in outcomes following colorectal surgery have been linked to Enhanced Recovery After Surgery treatment, as opposed to conventional care. However, uncertainties remain on how monitoring impacts postoperative outcomes.
This study sought to determine whether the use of anesthetic optimization techniques such as bispectral index (BIS), cardiac output (CO), temperature, and neuromuscular blockade was linked to a reduction in postoperative outcomes.
Materials and Methods: The European Postoperative Outcomes Within Enhanced Recovery After Surgery Protocol (EUROPOWER) Study recruited 2841 consecutive adults scheduled for elective colorectal surgery from 185 centers in 21 different European countries over the course of one month in 2020.
The primary study outcome was moderate to severe postoperative complications within 30 days after surgery. Patient characteristics and data related to CO, BIS, neuromuscular blockade and temperature monitoring were collected. To determine the characteristics that led to the use of monitoring, a multivariable logistic regression model was used.
Results and Discussion: Patients were monitored for CO, BIS, neuromuscular blockade, temperature, and neuromuscular blockade in 23%, 45%, 58%, and 64% of cases, respectively. The 2 factors associated with the CO monitoring were the presence of a metastatic solid tumor (OR [95% confidence interval (CI)]:10.24 [1.46-71.95], p=0.019), and preoperative albumin (OR [95% CI]:0.34 [0.14-0.85, p=0.02). Preoperative creatinine (OR [95% CI]:0.75 [0.61-0.92], p=0.005) was associated with BIS monitoring.
Comorbidities were tassociated with neuromuscular blockade monitoring (OR [95% CI]:5.25 [1.03-26.6] p=0.046). Duration of surgery (OR [95% CI]:1.00 [1.00-1.00] p=0.015) was associated with temperature monitoring. There was no correlation between the use of

individual monitoring or all monitoring combinations and a reduction in postoperative complications (OR [95% CI]:0.66 [0.36-1.22] p=0.186).

Conclusion(s): Monitoring is not carried out as recommended in patients having colorectal surgery in Europe; in this substudy, more monitoring was not linked to improved postoperative outcomes.

Reference:

Ripollés-Melchor J, Abad-Motos A, Cecconi M, et al. Association between use of enhanced recovery after surgery protocols and postoperative complications in colorectal surgery in Europe: The EuroPOWER international observational study. *J Clin Anesth*. 2022;80:110752.

13AP07-05
Clinical and economic impact of multimodal prehabilitation in adult patients undergoing major oncological digestive surgery

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Background and Goal of Study: Prehabilitation may reduce postoperative complication rates and severity, but its sustainability and impact on costs are still under discussion. The aim of our study was to assess the clinical and economic impact of multimodal prehabilitation (MP) programme in patients undergoing major digestive oncological surgery.

Materials and Methods: During the 3 years previous to the COVID-pandemic, we gradually implemented a MP programme in our setting. We included a total of 307 adult patients (199 male (64.8%)/108 female (35.2%), mean age 64 ± 5.1 years) scheduled for oncological surgery due to esophageal, hepatic or pancreatic cancer. MP consisting in anaemia correction, nutritional and psychological support and physical exercise recommendations was performed 4 weeks before surgery (8h-session/week). Variables recorded were: age, gender, in-hospital/ICU length of stay (LOS), in-hospital mortality, 30 days- hospital readmission, readmission mortality. Data are presented as absolute numbers, mean values and/or percentages.

Year	Patients	In-hospital LOS (days)	ICU-LOS (days)	In-hospital mortality	In-hospital mortality (%)	30 day-readmission	30 day-readmission (%)	Readmission mortality
2016	83	19.6	7.5	3	3.61	8	9.64	0
2017	106	14.2	5.4	2	1.89	9	8.49	0
2018	118	12.7	3.9	2	1.69	12	10.17	0

Results and Discussion: During the studied period, a 3.3 days reduction of the in-hospital LOS and a 3.6 days reduction of the ICU-LOS were achieved; this fact allowed us to increase the number of operations. In-hospital mortality was 1.92% lower and the readmission rate was very similar over time.

Taking into account the daily UCI and ward costs in our setting, a 3 days LOS-reduction for a sample size of 120 patients/year represented a saving of 490.695 €/year; staff costs (anaesthesiologist, nurse, nutritionist, psychologist, physiotherapist, rehabilitator, secretary staff) and MP materials and equipment costs (questionnaires, print information/diaries, pedometers, handgrips) were estimated in 45.710 €/year.

Conclusion(s): Multimodal prehabilitation may add value to the surgical process without incrementing global costs to the health system. A significant saving in health care costs was achieved by reducing complications and shorter hospital stay. MP seems to be a safe, efficient and cost-effective intervention that should be a *gold standard* for preoperative optimisation of high-risk patients scheduled for major (oncological) surgeries.

Further RCTs on these populations are needed to confirm our hypothesis.

13AP07-06
Efficacy of prehabilitation in oncologic rectal resections

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Background and Goal of Study: Prehabilitation provides preoperative interventions to promote physical and psychological health and improve nutritional status in order to enhance recovery after the surgery.

However, the main guidelines can't strongly recommend its implementation due to a lack of studies that demonstrate its efficacy[1].

The goal of the study is to analyze the efficacy of our prehabilitation program in patients scheduled to rectal resections.

Materials and Methods: After ethics committee approval, we designed a retrospective study of patients scheduled to laparoscopic oncological rectal resections after neoadjuvant therapy (5 weeks of chemotherapy + 1 week of radiation therapy).

We divided patients into 2 groups:

- Prehabilitation Group (2017-2021): When the patients finished neoadjuvant therapy they started a prehabilitation program 2 months before the surgery. It consisted in a non-supervised high intensity training to improve their physical condition, protein supplementation (20g/day) for increasing muscle mass and mindfulness sessions to provide emotional support.
- Historical Control Group (2011-2016): After neoadjuvant therapy patients waited 2 months until surgery without any specific treatment.

All patients were managed following the standard intraoperative protocol of our hospital.

We recorded demographic variables (gender, age, BMI, ASA status and Charlson index) and intraoperative data (duration of surgery and need of conversion to open surgery).

We analyzed length of stay (LOS) and incidence of postoperative complications measured with the Comprehensive Complication Index (CCI).

Statistical Analysis: Mann-Whitney U test for LOS and CCI

Results and Discussion: We included 43 patients in the Historical Group and 52 in the Prehabilitation Group. No differences found between groups in demographic or intraoperative data.

The median (range) LOS in the historical group was 13 (6-44) days while in the prehabilitation group was 8 (4-28) days ($p<0.05$).

The prehabilitation group also had a lower median CCI 8.7 (0-74.3) compared to the historical group 20.9 (0-44.9) $p<0.05$.

Conclusion(s): The prehabilitation program for oncological rectal resections in our hospital is effective.

Studies addressed to evaluate efficiency should be designed.

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1. Gustafsson UO et al. Guidelines for Perioperative Care in Elective Colorectal Surgery: Enhanced Recovery After Surgery (ERAS. World J Surg. 2019;43(3):659-95.

13AP07-07
Detection and treatment of perioperative iron deficiency anaemia in patients presenting for elective colorectal cancer resection: where are we now?

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Background and Goal of Study: Increasing elective surgery following the COVID-19 pandemic has necessitated improvement of efficiency and consistency of perioperative medicine. Recommendations and standards for management of iron deficiency anaemia, along with the morbidity and mortality associated with both this and autologous blood transfusion led us to target this as a key area for improvement.[1,2,3] Data from which future work can be benchmarked was required.
Materials and Methods: Retrospective analysis of 50 consecutive colorectal cancer resections from our colorectal malignancy database were selected and analysed. Electronic laboratory and primary care records were accessed for full blood count and ferritin results at the time of endoscopic diagnosis and time of surgery. We assessed whether oral iron had been prescribed.
Results and Discussion: 10 patients excluded as emergent resections prior to elective operative date. All patients had a full blood count at time of diagnosis. Ferritin was requested in 50% of cases. 12 patients were anaemic based on full blood count. A further 5 were iron deficient by ferritin level. A further 9 patients with ferritin 30-100μg/L may have benefitted from oral iron therapy. 9 patients had iron studies performed. 50% of anaemic patients were treated and no significant improvement in haemoglobin concentration seen. The mean time from diagnosis to operation was 68 days.
Conclusion: Improvements in the identification of anaemia have been made. All patients had a full blood count checked, improving on previous work. Ferritin may have picked up more iron deficient patients, but only 50% were assessed. Half of those identified as anaemic had treatment. Our next cycle of improvement will focus on compliance with ferritin requesting and prompt treatment of anaemia. Consideration to future work assessing impact of improvements in pre-operative anaemia on rates of perioperative complication
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2. Guideline for Management of Anaemia in the Perioperative Pathway. London: CPOC: 2022
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13AP07-08
Non-invasive, patient-near anaemia screening in elective orthopaedic pre-operative assessment - is it accurate, safe and cost effective?

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Background and Goal of Study: Anaemia is associated with poor orthopaedic outcomes, increased transfusion rates and delayed discharge. Venepuncture is shown to cause pain and stress responses, so we assessed a non-invasive co-oximeter as a screening tool for anaemia in the pre-operative
assessment setting, while also considering the financial implications of avoiding unnecessary invasive laboratory studies.
Materials and Methods: Prospective data was collected from 50 patients (28 females, 22 males, median age 63 years) at lower limb arthroplasty pre-assessment clinic. Non-invasive total haemoglobin (SpHb) was measured using the Masimo Radical-67 co-oximeter, alongside full blood count (FBC) venepuncture. SpHb results were compared with the FBC haemoglobin (FBCHb) results using the World Health Organisation definition for anaemia: male <130g/l and female <120g/l.
Results and Discussion: Forty-four (88%) patients had a normal haemoglobin on both FBC and SpHb testing. The mean variation between the two tests was +- 9.7g/L (SD 7.2). Three of the four FBC anaemic patients were missed by the non-invasive device. One patient had a large gap between the FBC Hb of 120 and SpHb of 153, which we cannot explain. Two patients were anaemic using non-invasive measurement, however FBC confirmed normal haemoglobin levels. Our data show that with an r-value of 0.6, the SpHb may result in false negative findings in females with an SpHb < 130 and males with an SpHb <140.
Conclusion(s): Our findings suggest that the co-oximeter can be used as a screening tool for anaemia, but we advise caution in females with an SpHB <130g/L and males <140g/L. While lab studies have a degree of error, they are the gold standard and indicated in these patients. FBC and UE tests are part of our anaemia screen, the latter is required for retrospective haematinics. The cost for these is £18.82 alongside clinic time, transport, and interpretation while patients often experience pain and stress during blood tests. The device and patient sensor (allowing 1000 readings) cost £910 and £1845, respectively. If 146 of the 1000 scans can be shown to have a satisfactory SpHb, then the device pays for itself. Our data suggest that around half our patients would have avoided venepuncture. In summary, non-invasive screening can provide early anaemia detection, while reducing costs, harm and stresses associated with unnecessary invasive venepuncture.

13AP07-09
Quality improvement project: management of anaemia in Musgrave Park Hospital Pre-Operative Assessment Clinic for patients undergoing orthopaedic surgery

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Background and Goal of Study: Peri-operative anaemia and allogenic blood transfusion are independent risk factors for poor post-operative outcomes. Risks associated with peri-operative anaemia include increased length of hospital stay, post-operative complications such as poor wound healing, and increased mortality. Risks associated with blood transfusion include effects on immunity, exposure to multiple donors and transfusion reactions. (1)
It was noted that there was variation in practice in the management of anaemia when identified at Musgrave Park Hospital Pre-Operative Assessment Clinic. This resulted in patients presenting for orthopaedic surgery with un-investigated, un-optimised anaemia. Patients were then undergoing potentially avoidable blood transfusion with consequent risk of related complications.
The primary aim of our project was to improve pre- and post-operative Haemoglobin and our secondary aim was to reduce the incidence of peri-operative blood transfusion.
Materials and Methods: We introduced a pre-operative pathway in our intervention group which was based on the 2017 AAGBI Consensus Guideline for managing peri-operative anaemia. We rapidly identified anaemic patients using a Point-of-care Haemoglobin device (Haemocue) to ensure early investigation and treatment of anaemia. Our comparison group of patients were managed pre-operatively in the usual manner.
Results and Discussion: We found that accuracy of the Haemocue was acceptable and it under-read compared to lab values, so 100% of anaemic patients in the intervention group had a same-day Haematinics screen sent. The pathway improved appropriate investigation of anaemic patients with Haematinics by 64%. It improved appropriate pre-operative treatment of anaemia based on Haematinics by 16%. It reduced the incidence of patients presenting with anaemia for primary or secondary arthroplasty by 6%. It reduced the incidence of patients becoming anaemic in the immediate post-operative period by 8%. It also reduced the incidence of peri-operative blood transfusion by 3%.
Conclusion(s): Pre-operative anaemia is common, and a strong predictor for peri-operative blood transfusion. Early diagnosis and treatment of anaemia improves post-operative outcomes and patient safety in the peri-operative period. (1)
Reference:
1. Guideline for the Management of Anaemia in the Perioperative Pathway. London: CPOC: 2022

13AP07-10
Association of preoperative factors and 30- day postoperative complications in adult patients undergoing elective colorectal surgery

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Background and Goal of Study: Preoperative diseases are frequent in patients with colorectal cancer. Besides, comorbility has been associated with worse long-term outcomes in patients undergoing surgery for cancer. The aim of our study was to analyse the effect of preoperative factors on postoperative complications in adult patients undergoing elective colorectal surgery.
Materials and Methods: Single centre retrospective cohort study including patients undergoing colorectal cancer surgery between 2009 and 2017. Primary outcome was to analyse the effect of preoperative factors (preoperative diseases, sex, age >70 years, and ASA clinical status) on included 30-day postoperative complications. Secundary outcome were the influenced of type of colorectal surgery in postoperative outcomes. Postoperative complications were calculated with Chi-Square and Fisher exact test, Odds ratio and logistic regression.
Results and Discussion: 747 patients with a mean age of 70 (± 12.6) were included, of whom 368 (49.8%) were anaemic. Age > 70 years (196 (54.60%) vs 243 (62.79%) $p<0.05$) and male (207 (57.50%) vs 263 (67.96%) $p<0.01$), odds ratio =1.89 ((Wald IC95%: (1.047, 3.408)) and preoperative obstructive pulmonary disease odds ratio=5.39 (Wald IC95%: (1.271, 22.852)) were associated with more postoperative complications $p<0.05$. However, there were no differences in 30-day postoperative complications between anaemic and non-anaemic patients (52.7% vs 51.5%, $p = 0.74$). Moreover, ASA clinical status and type of colorectal surgery was not associated with complications after surgery, $p>0.05$.
Conclusion(s): Age >70 years, males and preoperative obstructive pulmonary disease were associated with more 30-day postoperative complications. Preoperative anaemia, ASA clinical status and type of colorectal surgery were not associated with 30-day postoperative complications.

13AP07-11
The impact of treatment of anaemia with intravenous iron on haematological values and recovery for patients after colorectal cancer surgery. A prospective, randomized, double-blind placebo-controlled study

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Background and Goal of Study: Anaemia is common among patients with colorectal cancer (CC). Iron supplements, erythropoiesis stimulating medication and allogeneic blood transfusion are used for treatment.

However, a significant ratio of patients does not receive adequate treatment preoperatively. The goal of the study is to evaluate the effect of postoperative intravenous (iv) iron supplementation on haematological values, serum ferritin levels and clinical recovery in patients with ferrodeficitic anaemia who underwent CC surgical treatment.

Materials and Methods: The study was registered in the *clinicaltrials.gov* (NCT02999217). It included ASA I-III patients, aged 18-75 years with preoperative anaemia (haemoglobin (Hb) <130 g/l and ferritin (Fer)<100 mkg/l) and CC who had elective surgery. Patients were randomly assigned into two groups to receive postoperatively: iv iron (IV) – 1000 mg of iron isomaltoside solution (Monofer, Pharmacosmos, Orivas) or control (CTRL) – corresponding amount of saline. Data describing demographics, anaemia status before treatment, changes in Hb, hematocrit (Ht), mean corpuscular volume (MCV), mean Hb concentration (MCH) and Fer over time, complications and length of hospital stay were collected. Mann–Whitney U, $\chi 2$ and Student–t tests were used for statistical analysis, $p<0.05$ was considered statistically significant. Results are presented as mean (standard deviation).

Results and Discussion: The study included 34 patients. IV and CTRL groups were comparable with respect to sex, age and ASA class, as well as anaemia level and type. Fer concentrations, mkg/l in IV group versus CTRL were as follows: 438.5 (231.92) vs 145.36 (118.98) μg/l) 3 days after surgery, 534.31 (214.98) vs 140.08 (115.00) at discharge from hospital and 499.27 (138.28) vs 88.07 (51.54) 4 weeks after discharge, $p<0.001$ at all points. Hb level, g/l was higher in IV group 4 weeks after treatment: 126.70 (13.02) vs 116.45 (10.96), $p=0.039$. Groups were comparable in terms of Ht, MCV, MCH and complications ($p=0.101$). Length of hospital stay was 8.00 (1.73) vs 9.36 (2.34) days, IV group vs CTRL, respectively, $p=0.035$.

Conclusion(s): Postoperative i/v iron supplementation of colorectal cancer patients with preoperative ferrodeficitic anaemia results in statistically significantly higher levels of serum ferritin and Hb. The positive effect lasts for 4 weeks and leads to 1.4-day shorter hospital stay.

Acknowledgements: Pharmacosmos/Orivas for Monofer.

Patient Safety

14AP01-01
Impacts of fatigue on trainees' clinical performance and clinical errors

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Background and Goal of Study: Fatigue is known to impact on clinical performance. As we get more tired, vigilance becomes more variable, performing complex tasks and making decisions is more difficult, and arithmetic ability, attention and memory are all affected. (Kayser et al., 2022). The way we interact with colleagues and manage our emotions changes and we are less able to assess risk.
Materials and Methods: An online survey about the impacts of fatigue on trainees in anaesthesiology and intensive care in Europe was distributed through the delegates of the European Board of Anaesthesiology, National Anaesthesiologists Societies Committee and through the ESAIC trainee network over a seven-month period.). As well as questions on demographics, working schedules and the impacts of fatigue on their wellbeing, reported elsewhere, the trainees were asked whether they had made or had nearly made a clinical error because of fatigue. and asked to anonymously share details.
The free text answers to the question 'Have you ever made a clinical error or had a near miss because of fatigue?' were thoroughly read several times by two separate reviewers] to immerse themselves in the data. Each identified themes which were then discussed, and a coding frame agreed. Four main themes emerged.
Results and Discussion: Of 1200 respondents, 72 (6%) provided free text examples of errors or near misses. These included clinical decision-making errors, poor quality communication, difficulties with procedures, drug errors and prescribing errors. Examples included: *'Pneumothorax during central line insertion after sleepless night' and ,Gave a bolus of norepinephrine instead of insulin'*
Conclusion(s): Clinical errors and near misses are a common occurrence amongst trainees working night shifts. If the events described in this survey are typical of the experience of European trainees, tiredness may be having significant detrimental effects on patient care.
Other safety-critical industries are required to manage fatigue-related risk, by ensuring that employees have regular breaks and encouraging power naps at night. Patients safety may be improved if Anaesthesiology and Intensive Care adopt a similar approach.
Reference:
Kayser KC, Puig VA, Estepp JR. Predicting and mitigating fatigue effects due to sleep deprivation: A review. *Front Neurosci*. 2022;16:930280. Published 2022 Aug 5. doi:10.3389/fnins.2022.930280
Acknowledgements: The WWW Standing Committee of the EBA

14AP01-02
Pre-anesthetic assessment documentation practice: safety concern

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Background and Goal of Study: Pre anesthetic evaluation is the corner stone of peri op management of patient which would minimize morbidity & mortality. Documentation can improve overall patient outcome. It also has an irreplaceable role in medico-legal aspects. Documentation is one of the challenges of providing quality care service.
Materials and Methods: 50 pre operative assessment sheets. Observational retrospective study, collected from recovery and wards post operatively, using an empty sheet as template and that it should be (100% completed).
Results and Discussion: *(1*00%) done the patient sticker (demographic), past procedure, medication, systemic review and ASA grade were filled in all forms. proposed operation (94%), dentition (92%), Patient or guardian were consented in (88%). On the other hand, the lower percentages where in: (20%) BMI, Investigations and risks of damage to teeth, Fasting & cross matching were mentioned in less than 50% of responses. Only (50%) wrote plan & comments.
Conclusion(s): A written summary of the pre-anesthetic assessment, orders or arrangements should be explicitly and legibly documented in the patient's anesthetic record. Staff awareness of the short areas. Another cycle could be repeated in a couple of months (Reaudit).
Furthermore, posting posters or stickers to notify doctors of the importance of being fully compliant.
Lastly, Constructing electronic sheet as a replacement could be the ultimate solution.
Reference: Local Guidelines
Acknowledgements: Thanks to Dr Vikash, Audit department OLOL Hospital and my friend Dr. Monzer Okasha

14AP01-03
Management of antihypertensive treatment in the pre-anesthetic visit, medical orders and accomplishment

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Background and Goal of Study: The prevalence of hypertension is estimated at 55% in the general population. 88% of known hypertensive patients take pharmacological treatment and the most frequently used drugs are ACE2/RAA inhibitors, diuretics and calcium antagonists. [1,2]
The goal of this evaluation was to know the current state of the preoperative management of the different antihypertensive drugs in patients undergoing elective non-cardiac surgery in our center.
Materials and Methods: We did an analysis of all hypertensive patients undergoing scheduled surgery between October to December 2021, filling a preoperative questionary asking:

1. Whether or not they had received instructions on the management of antihypertensives in the pre-anesthetic visit, and;
2. If they had complied with the instructions, if they had received them.

Results and Discussion: We analyzed 101 patients aged 69±2 years (mean ± SD), 52% women, 47% ASA 3 and the rest ASA 2. 44% received combinations of the drugs studied, 52% received any of them in monotherapy, with ACE inhibitors being the most frequent group. 26% of patients reported having received a verbal explanation and a written order in the consultation. 52% of patients only received a verbal explanation and 10% only received a written order.

In 12% of patients no indication was given. 96% of the surveyed patients who received medical indications fulfilled them correctly.

Conclusion(s): 10% of the patients received medical orders only written and in most cases only a verbal indication was given. There is a high percentage of accomplishment of the pre-anesthetic medical orders by the patients.

References:

1. Reuter H, Jordan J. Status of hypertension in Europe. Curr Opin Cardiol. 2019 Jul;34(4):342-349.
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14AP01-04
Does repetitive simulation-based training enhance non-technical skills of medical undergraduates?

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Background and Goal of Study: Non-technical skills are inevitable to maintain best patient care and to enhance patient safety[1]. The need for early integration and implementation of NTS already during undergraduate medical education, has been emphasized. There is a gap of knowledge on how to convey effectively and hereby enhance NTS in under- or postgraduate medical training. Therefore, we investigated if repetitive simulation-based training enhanced NTS of medical undergraduates.

Materials and Methods: N = 937 1st, 2nd, 3rd and 4th year undergraduates were enrolled, who participated in mandatory emergency simulation trainings of the medical faculty Hamburg. Each training has a pre-set of training specific and standardized simulation scenarios. NTS of the students were assessed with the Anaesthesiology Students NTS (AS-NTS) taxonomy[2].

The differences of performance of the different cohorts of students were calculated with an analysis of variance (ANOVA) and with a follow-up post hoc test (Bonferroni correction) the significant differences were analyzed.

Results and Discussion: NTS of the undergraduates improved with every ascending year of medical school. NTS of 4th year undergraduates differed significantly compared to 1st year undergraduates´ NTS, $F(4, 937) = 5.612$, $p < .001$. As the trainings are specially designed to assess progress of NTS (with each proceeding training, the simulation scenarios require higher levels of TS and NTS), conceptualized comparison of the trainings and thus comparison of skills levels of different year medical undergraduates is possible. Although it has been emphasized that NTS do not enhance with clinical experience, we could demonstrate that undergraduates benefit from repetitive simulation trainings. Nonetheless, the effects of this NTS progress occurred only after three trainings.

Conclusion(s): NTS are essential skills to complement technical skills and hereby ensure patient safety. The early longitudinal integration of NTS trainings in undergraduate medical curricula (learning spiral) is an effective approach to enhance NTS of future doctors.

Reference:

Fletcher, Georgina, et al. "Anaesthetists' Non-Technical Skills (ANTS): evaluation of a behavioural marker system." *British journal of anaesthesia* 90.5 (2003): 580-588; Moll-Khosrawi, Parisa, et al. "Anaesthesiology students' Non-Technical skills: development and evaluation of a behavioural marker system for students (AS-NTS)." *BMC medical education*19.1 (2019): 1-11.

14AP01-07
Discontinuation of piped supply of Nitrous Oxide in a quaternary care hospital to enhance safety and efficiency

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Background and Goal of the Audit: Nitrous Oxide (N_2O) has a well-established place in anesthesia practice despite seeing a marked decline in its usage in recent years. In major hospitals, Medical Gas Pipeline System (MGPS) delivers pressurized gases; it is vulnerable to developing escapes of potentially hazardous waste, and is notoriously difficult for detection and curtailment of such leaks.

The MGPS in our hospital runs several kilometers of pipeline; we audited to evaluate its cost effectiveness for N_2O supply and usage.

Materials and Methods: After IRB approval, we retrospectively reviewed the anesthesia charts of all the patients anesthetized in our main operating rooms (ORs) over a month, and noted the utilization of N_2O along with the procedure, specialty, and patients' demographics. We extrapolated this data to the whole year, and compared with the average annual supply of N_2O over the preceding 3 years.

Results and Discussion: 3.1% patients (out of 950) received N_2O over 0.87% of total anaesthesia time (Figure 1). Only 2% of the supplied N_2O was actually consumed revealing a undetected 98% volume loss between the manifold and the patient end.

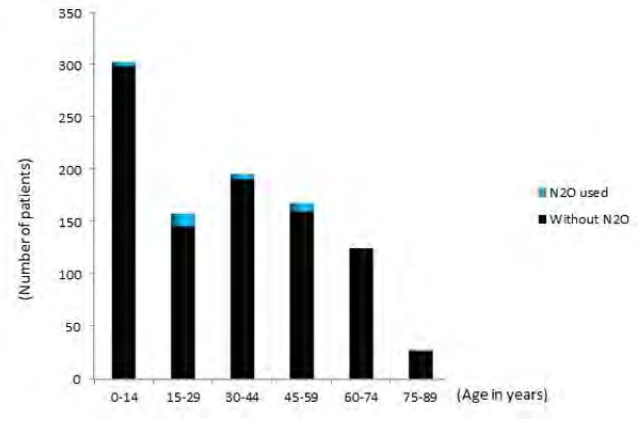

Figure 1.

Our audit established that the piped supply of N_2O was grossly under-utilized, was resulting in leakage of hazardous waste, and was financially inefficient. It also highlighted the cost, difficulties, and challenges of the maintenance task.
We estimated an annual saving of around $40,000 to be achieved by supplying this N_2O consumption (0.07 million liters) through 76 x E-type cylinders attached directly to the anaesthesia machines; this excluded the savings on the MGPS maintenance costs.
An administrative decision was taken to discontinue N_2O supply through MGPS, and switch to portable E type cylinders in the operating rooms according to the clinically needs.
Conclusion(s): Our audit proved to be an inexpensive tool, an alternative to the highly expensive engineering machinery, to determine the extent of the wastage of N_2O supplied through MGPS, and resulted in introducing a significant change of practice with enhanced efficiency and safety.

14AP01-08
Move to improve: avoiding medicacion errors (ME) in a new surgical area

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Background and Goal of Study: ME are a leading cause of morbimortality and avoidable harm in perioperative care. ME can occur at different stages of the medication use process and different contributory factors may be involved. The operating room (OR) is a sensitive environment where different factors can make it more vulnerable:
1. The same anesthesiologist prescribes, prepares, registers and administers the medication, without any other professional or technology verifying its suitability.
2. Management of multiple high-risk drugs, by different routes in a short period of time.
3. Instant decision-making, critical situations and a large volume of activity with a high number of care transitions.
4. Adverse environment: poor lighting, stress, noise, difficult access to the patient.
Materials and Methods: During 2022 we have faced the opening of a new Surgical Center. The Anesthesia Patient Safety Task force decided to create a multidisciplinary team including anesthesiologist, farmaceuticals and IT to go over the ME strategies, to detect the possible weak points, updated the preventable strategies and to elaborate new measures to prevent ME to occur taking advantage of new technologies available.
Results and Discussion:
The measures that have been introduced are:
- Prescription:development of a one-step computer prescription and administration program.
- Dispensing:incorporation of pixis machine, design of anesthesia trays with medication for general anesthesia and specific for ambulatory surgery.
- Storage:restructuring of anesthesia carts, change of presentation of look a like drugs.
- Preparation:presentations with a clamping system, increase the number of pharmacy-prepared infusions and pre-filled syringes.
- Management:doble check with barcode reading before administration.

We found the following barriers to implementation: work overload, individual attitudes and lack of safety culture.The time and the way to implement the recommendations coinciding with the opening of the new surgical center was especially relevant. Training programs were carried out for professionals and dissemination of the strategic measures adopted via email 4 months in advance.
Conclusion: The goal was to change attitudes and work habits to improve not only patient safety but anesthesiologist safety too. Individual efforts to decrease ME alone are not successful: changes in existing protocols and systems are necessary, as well as a safety culture and institutional support.

14AP01-09
Central venous catheterization protocol with ultrasound for non-experts

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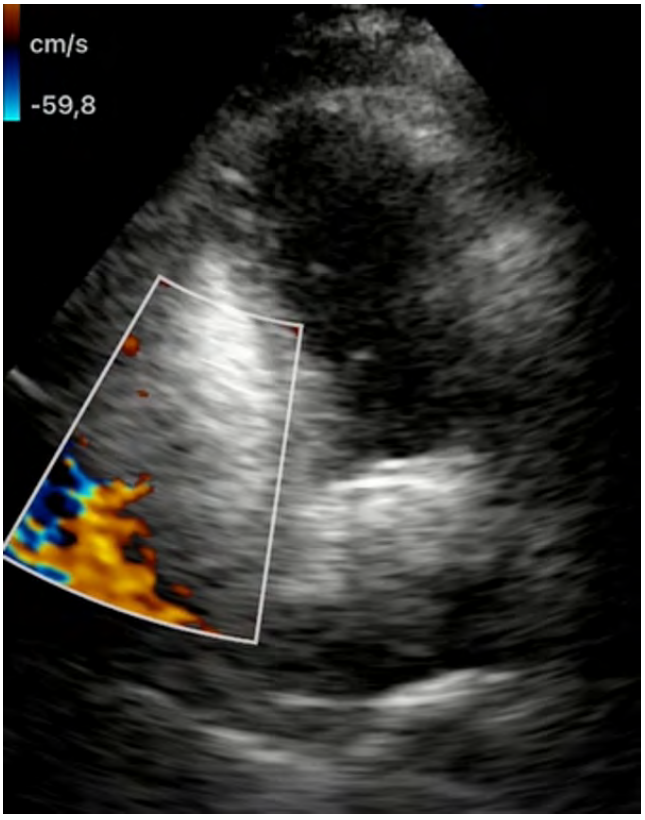
Background and Goal of Study: Central venous access is an essential element in all patients who require special intravenous treatments. Insertion, care and resolution of complications require previous and continuous training over time. Point-of-care ultrasound permits rapid patient evaluation, improved success rate and early detection of complications.
Clinical simulation provides training in a safe environment, promoting possibility of repetition-guided learning and accelerating the translation of learning to practice.
This systematic review aimed to provide knowledge for correct indication and safe procedure in central venous catheterization.
Materials and Methods: We conducted a literature search to review scientific evidence available in PubMed and Cochrane Library, using English and Spanish languages and 2015 - 2022 dates. The protocol is complemented by teaching experience of ECOCRITIC and SIMIA.
Results and Discussion: Learning and improving central venous access can be summarised in:
- Patient history: justification, allergies, personal background.
- Insertion site (ultrasound anatomical check, exclude anatomical variants - thrombosis) and type of catheter.
- Patient positioning and ultrasound preparation.
- Asepsis measures.
- Identify anatomy and location of the vein (longitudinal and transverse section of artery and vein, colour-pulsed Doppler).
- Real-time ultrasound-guided technique.
- Confirm needle-guidewire-catheter position inside the vein.
- Rule out complications: catheter malposition (no contralateral jugular turbulence sign, right atrial turbulence sign) (image) and iatrogenic pneumothorax (sliding B-mode and seashore M-mode) (1).
Conclusions: Training programmes aim to develop medical professionals able to provide a high level of care and safety. Standardisation and teaching of central venous insertion improves effectivity and safety in the process. It is necessary to create successful educational programmes and to get long-lasting educational results.



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14AP01-10
Knowledge and attitudes of healthcare professionals towards the use of Look Alike Sound Alike medication

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Background and Goal of Study: The need to avoid errors associated with medication is a growing concern, since they are major causes of avoidable harm. Preventing Look Alike Sound Alike (LASA) medication errors is an important part of that.
This study aims to assess the evolution of healthcare professionals (HCP) knowledge about LASA medication, its influencing factors and the adoption of preventive attitudes.
Materials and Methods: A cross-section study held in two different times in a tertiary hospital in Portugal, between 2015 (T0) and 2019 (T1), used a self- self-administered questionnaire to HCP such as nurses, physicians, pharmacy technicians and pharmacists, to determine their knowledge regarding LASA medication and their adoption of preventive attitudes. The same questionnaire was applied in T0 and T1. Taking into account the results obtained in T0, improvement measures were implemented to increase HCP knowledge and to increase safety in medication handling (institutional education, discussion of clinical scenarios, display of posters containing LASA information, improvement of electronic prescription).
Results and Discussion: Of 890 participants, 448 were obtained in T0 and 442 in T1. The median age was 37 years, with a median of 12 years of experience and a predominant sex was female (72.8%). From the total of HCP, 62.9% knew about LASA medication, with an increase in this knowledge ($p < 0.001$) in T1.
Factors associated with this increase included recognition of Tall Man Lettering (OR 4.74, 95% CI 3.12-7.19), learning through hierarchical superior (OR 4.70, 95% CI 2.17-10.15), by institutional (OR 2.50, 95% CI 1.40-4.46) or by academic education (OR 22.87, 95% CI 5.17- 101.13).
Factors with a positive impact on safe practices included, being in T1 group (OR 36.56, 95% CI 16.49-81.94), being a nurse (OR 6.51, 95% CI 3.14-13.52), working in a surgical department (OR 2.73, 95% CI 1.51-4.93), having knowledge of LASA (OR 8.19, 95% CI 4.80-13.97) and having at least one prescription error (OR 2.08, 95% CI 1.07-4.06).
Conclusion(s): Continuous training and improving HCP knowledge, specifically on how to adopt preventive attitudes can have a positive impact on patient safety. These illustrate the impact that continuous training has in the acquisition of knowledge and changes in behavior.

14AP01-12
The effect of implementation institutional protocol for massive bleeding on patient safety

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Background and Goal of Study: Massive transfusion protocol (MTP) was an initiative of the PBM program in Croatia.
To improve patient safety we try to implement national MTP as a protocol of UHC Zagreb institution. As MB accounts for a significant proportion of the annual global mortality and after it is recognized as a serious health problem, we improved our educational efforts and we tried to standardize our treatment of massively bleeding patients. After intense educational efforts, we tested the algorithm, and we analyzed the data for MB patients during 1.1.2021. till 31.12.2021.
Materials and Methods: During 2021, to ensure the successful implementation of MBP despite the heterogeneity of massive bleeding, we used a user-friendly pocket-sized protocol, with two sides. On the one side, there were algorithm for massive bleeding without a point of care coagulation (POC) device, and on the other side, there was an interventional algorithm for MB with a POC device.
We did a single-center retrospective analysis about the influence of MTP implementation on early mortality (24 h) and mid-term mortality (30 days) in surgical and intensive care massive bleeding patients. We found 46 massive bleeding cases from whom 9 (18,5%) died in the first 30 days, and no single patient died in the first 24 h.

Results and Discussion: MB has been related to higher morbidity and mortality, reaching even more than 50% in some studies, depending on the type of bleeding and its treatment. Low overall mortality and no patients with mortality in the first 24 h means we are aggressive with resuscitation and the algorithm is useful.
With quick and safe treatment mainly led by anaesthesiologists on duty in ED, we achieved a significant reduction in mortality following MTP implementation, especially using a point-of-care monitoring device. It should be recommended to all institutions managing injured and bleeding patients.
Conclusion(s): Patient safety is a healthcare discipline that is crucial for providing quality healthcare and reduction in patient morbidity and mortality.
We still do not know the perfect dosing, rates, and timing of hemostatic therapy, blood, and blood products, but for sure early resuscitation with coagulation factors, tranexamic acid, and avoiding dilution of patients using POC device strongly influence patient safety, lowering morbidity and mortality.

14AP01-13
The four temptations of the multidose vial to err is human: to sin too

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Background: Medication-related adverse events (MRE) are a common cause of patient morbidity and mortality.
We have analyzed all the multidose-vial (MV) related critical incidents (CI) reported in a 10-year period in the Spanish System of Safety Notifications in Anesthesiology and Resuscitation (SENSAR). The aim of this study is to reflect on the reasons why clinicians continue to use these containers, despite their known potential danger to the patient.
Material and Methods: In 2021, all MRE reported to SENSAR database from 2008 to 2017 were analyzed. Among them, we identified those specifically related to the use of MV.
Results and Discussion: In the period analyzed, 7,072 CI were reported, out of which 1,970 corresponded to MRE. Data classification does not include a "MV category"; in turn, no statistical figure has been obtained.
However, detailed analysis of each MRE revealed four main reasons for its dangerous popularity:
1. Avoiding waste: drugs packaged in higher doses than needed for a single patient (insulin or droperidol).
2. Dividing doses: expensive or prescription-controlled drugs (botulinum toxin, opioids or sugammadex).
3. Amplifying the accessibility: drugs with low availability (COVID19 or monkeypox vaccines).
4. Optimizing the turnaround time to attend a higher number of patients (remifentanil or iodinated contrasts).
While the potential for time and cost savings is evident, the use of MV is risky, with an ever-present danger of contamination from infection, iatrogenic cross-contamination or dosing error. Guidelines have stated that the safest practice is not to use MV.
These contributing factors and measures to be implemented can be highlighted:
Patient: vulnerable. Co-responsibility for safety.
Individual: experience, rush, knowledge. Situational awareness.
Task: single vial per patient. Standardize.
Human team: awareness and communication. Training.
Workplace: unit dose. Guarantee stock.
Organization: care pressure. Safety culture promotion.
In conclusion, understanding the operational behaviors of professionals, designing legislation and creating a true alliance where the interests of healthcare organizations, industry and patients can coexist, is imperative to stop MRE.
Learning points:
- MRE are frequent.
- There are four main reasons why clinicians continue to use MV, despite their known potential danger.
- Understanding the operational behaviors of healthcare professionals is the cornerstone to stop MV related CI.

14AP02-01
Morphine lethal overdose due to electromagnetic interference on intrathecal infusion pump

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Background: Electromagnetic interference can cause malfunctioning of certain Intrathecal infusion pumps used for chronic pain treatment. We present a case in which the recommendations given were not followed and ended in tragedy.
Case report: A 79-year-old woman, treated of chronic low back pain with an intrathecal infusion pump (Prometra®) and intra-abdominal reservoir, undergoes magnetic resonance imaging (MRI) at a Radiodiagnosis Centre. During this procedure she goes into cardiorespiratory arrest.
After resuscitation by the Extra Hospital Emergency Service, she was transferred to our ICU. Upon admission: Glasgow Scale 3 points, areflexic isochoric pupils and hemodynamic lability, gasometry: respiratory acidosis and high lactic acid. A TTE and cranial CT were performed, without findings.
We suspected an inadvertent intrathecal massive release of hydromorphone. The pump was checked, and it was noted that the medication potentially released could be a total of 20 mL of morphic chloride (2mg) and Bupivacaine 2% (400mg). The reservoir is emptied, extracting only 3 mL; therefore, we started treatment with a bolus and continuous infusion of Naloxone.
A few hours later, the patient began with VT, and subsequent asystole. Advanced CPR is started without success, resulting in the patient's death. Toxicological autopsy studies showed positive CSF morphine values, and also 3.6 mg/mL in blood (therapeutic range: 0.01-0.1 mg/mL, lethal range of 0.1-0.4 mg/mL).
Discussion: Intrathecal administration is a good treatment option, which allows low and long-lasting doses. Intrathecal morphine toxic doses can cause acute respiratory depression with risk of cardiorespiratory arrest. In 2016, the Spanish Agency of Medicines and Medical Devices, published an informative document with the conditions for performing an MRI procedure in patients with the implanted Prometra® device, motivated by the notification of several overdose incidents.
These devices, subjected to a strong magnetic field, could open the dosage valves allowing the free flow of the drug. For this reason, the manufacturer updated the product information and developed reference guidelines for performing a safe MRI procedure.

In Conclusion: physicians should:
1. Remove the drug from the pump before taking the patient to an MRI procedure.
2. Follow Guidelines and manufactures labelled instructions.
3. Know and consider the safety information notes from regulatory authorities.
4. Inform patients and/or caregivers.

14AP02-02
Air embolism associated with central venous access placement: a preventable complication

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Background: Venous air embolism is a rare but potentially lethal complication, caused by the entry of air into the bloodstream. This situation occurs when there is a communication between the atmospheric air and the circulatory system, and a favourable air-bloodstream pressure gradient. There are several clinical and surgical procedures implicated in the pathophysiology of air embolism, the insertion and remotion of central venous catheters being one of them. Most of the times this diagnosis requires a high index of suspicion, making its overall incidence difficult to predict.
Case report: A 60-years-old female was admitted in the post-anesthesia care unit (PACU) following the decompression and fixation of the thoracic spine, for a T4-5 spondylodiscitis. The patient was awake, breathing spontaneously, with no signs of dyspnea. A central line was placed in the internal jugular vein for vasopressor support. The Seldinger technique was performed with the head elevated 20 degrees. Air exposure of the needle occurred during the substitution of the syringe with the guidewire, allowing for a direct connection with the atmospheric air.
Following the substitution, the patient developed shortness of breath with hypoxemia (minimum SpO2 of 66%) and tachycardia (maximum 140 beats per minute). The technique was readily interrupted, oxygen support started, and the position of head corrected. The patient recovered within 15 minutes and the central venous catheter placement technique was completed, with no further occurrences.
The differential diagnosis included pneumothorax and pulmonary thromboembolism, which were both excluded by clinical and radiologic criteria. The patient was monitored in the PACU for an additional 18-hour period, while maintaining vasopressor and oxygen support. She was discharged after 33 days of hospitalization, with no complications registered other than infectious.
Discussion: Air embolism is a rare and challenging entity, with a wide range of clinical presentations. A high index of suspicion is mandatory to promptly initiate supportive therapy.
Reference:
1. Pennsylvania Patient Safety Authority 2012;58-64. 2. Journal of Clinical Anesthesia 1997;9(3):251-7.
Learning Points: The anesthesiologist must be aware that there are some measures one can implement to prevent complications associated with the different techniques and improve patient safety.

14AP02-03
Inadvertent intraoperative anticoagulation – a reminder to be knowledgeable about every medical device

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Background: Adverse events frequently occur in any medical system, and may originate from different factors. These can be either preventable or unpreventable and are often associated with medication errors.
We report a case of an adverse event due to the intraoperative administration of the heparin lock from the dialysis catheter.
Case report: A 61-year-old man, ASA III - end-stage renal disease under hemodialysis (HD), was proposed to a deceased-donor kidney transplantation. HD was performed 4h before surgery. Post-dialysis results: Hb 11g/dL, Cr 5.79mg/dL. General anesthesia included invasive radial arterial pressure monitoring and CVP monitoring through the HD catheter.
During surgery, a severe bleeding occurred with a Hb decline to 7,2g/dL. As no surgical cause for the bleeding was identified, we performed a ROTEM test and consulted with a hemotherapy specialist.
A total of 4 units of RBCs was administered, followed by repeated blood gas analysis . ROTEM showed an increase in the coagulation time (CT) by the INTEM test with a normal CT by the HEPTEM test, suggesting the effect of heparin. It was confirmed with the dialysis service that no heparin was utilized for the HD therapy. All vials in the operating room were verified and no heparin was found.
However, the dialysis catheter, locked with heparin (estimated amount of 11000U), was used during the procedure with no previous aspiration. Protamine was then administered allowing a progressive resolution of the hemorrhage. Transfer to PACU ensued uneventfully with Hb 10.2g/dL. The incident was registered in the hospital's health events reporting system.
Discussion: It is important being aware of all medical treatments as they may result in possible harmful events. Knowing medical devices used for clinical practice is crucial to securely prevent improper management. HD central catheter was used intraoperatively to minimize redundant invasive puncture which is not risk-free.
Thus, an alternative access site would be available for further employment. Perioperative period has a higher risk of health adverse events.
Early recognition and prompt correction of any adverse events is essential to minimize impact and prevent worse outcomes. Reporting all adverse events is key to collect incident data and provide an evidence base for the development of safety solutions.
Learning Points: Intraoperative adverse events are under-reported and may lead to increased postoperative mortality, morbidity, and length of stay.

14AP02-04
Airway management in oral surgery and mandatory nasal intubation in a patient with deformed nasal nostrils and difficult airway predictors

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Background: The management of the difficult airway (DA) is a challenge for anaesthesiologists, overmore in head and neck surgery, in which predictors are often attached. Usually a nasotracheal tube is mandatory in order to offer an easier surgical field. Nevertheless when nasal anatomy is unexpectedly not appropriated, an alternative pathway must be planned, prior to airway safe[1].
Case report: A 69 years old woman assessed as American Society of Anesthesiologists (ASA) grade III was scheduled segmentary mandibulectomy and non-pediculate reconstruction. Medical history included cervical dissection, neoadjuvant radiotherapy, Mallampati 3 and maximum mouth opening of less than 2 cm. Nasal tube was required by surgeons. There were prepared a videolaryngoscopy (VL) and flexible fibrobronchoscopy (FBO). Nasal nostrils were prepared with a vasoconstrictor drug (oxymetazoline).
When we firstly attempted intubation with a nasotracheal tube (size 6,5), there was non-enough space through nostrils. A second attempt with smaller nasal tube (size 6) was not successful either. Trying to avoid nasal bleeding and worsen ventilation (previously we had found a HAN 2 scale), we inserted an oral flexometallic tube (VL posterior commissure vision).
When airway was ensured, we introduced a nasal tube using FBO through nostril and reached carine, once deflated oral tube balloon. Aided with VL, we removed the orotracheal tube and inserted the nasal tube. During all the procedure the O2 saturation was over 97%.
Discussion: When a DA is expected, a safe management must be mandatory. In this case, in which a nasal tube was essential to the surgical procedure, securing the airway with an oral tube allowed us to design strategies for an easier and lower-risk nasal tube placement. Nasal bleeding could have produced a worsen of vocal cord vision. Moreover the risk of non-ventilation /non-intubation situation was a possibility and would have needed an emergent tracheostomy.
Reference:
1. Apfelbaum JL, Hagberg CA, Connis RT, et al. 2022 American Society of Anesthesiologists practice guidelines for management of the difficult airway. *Anesthesiology*. 2022;136(1): 31-81.
Learning points: Having a clear pathway in airway management continues to be a challenge in some patients. Anesthesiologist should be aware of the possibility of encountering unpredicted DA factors and must be prepared to manage these situations while guaranteeing patient security at all time.

14AP02-05
Unwanted curarization during induction of anesthesia due to siphon phenomena

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Background: Drug infusion systems are extensively used in intraoperative care. Critical incidents may occur due to inappropriate setting of these systems.
Case report: A 60-yo male was scheduled for elective lumbar surgery. ASA standard monitoring was used plus invasive blood pressure (BP), processed electroencephalogram (EEG) and neuromuscular block (NMB).
A Fresenius Orchestra™ infusion station was used with 3 infusion pumps: 2 were programmed with remifentanil and propofol for TCI and a 3rd received a rocuronium syringe, that was not programmed and had its clamp open. The extenders were coupled to three individual 3-way taps, placed in the IV system (saline at 200mL per hour) and connected to the IV cannula with a 0.9mL extender.
A few seconds later, the patient developed agitation, blurred vision, difficulty keeping the eyes open, dyspnea, and muscle weakness. Left eyelid ptosis, slurred speech, reduced strength in 4 limbs, and reduced chest expansion were observed, but ventilatory drive was maintained. SpO_2 dropped to 74% but cerebral oximetry, BP, heart rate, ECG, or EEG monitoring stayed normal. Curarization was suspected, oxygen was administered, the patient was reassured and remifentanil was started to allow painless NMB monitoring, revealing a TOF ratio of 64%. Within 10 minutes, there was a complete resolution without NMB reversal. The patient remained alert with a sustained and oriented verbal response and respiratory drive. After the procedure, he was calm and described the event with precision.
Discussion: A rocuronium leak was suspected, as the perfusion station was positioned 30cm above the IV access. This can be explained by siphon phenomena. A siphon is initiated due to the negative pressure generated at the lower end, in which the atmospheric pressure adds to the pressure of the fluid column, displacing the fluid until there is a pressure equilibrium. We did not find any similar case in the literature. By ruling out other causes, this case shows that safety precautions must be consistently applied. The fact that the 3-way tap was open, even with the infusions off, the clamp not closed and the use of anti-reflux instead of anti-siphon valves probably led to the unwanted curarization.
Reference:
Continuing Education in Anaesthesia Critical Care & Pain, 2004,4(3):81–5.
Learning points: Understanding physics is relevant to Anesthesia practice. Strict compliance with technical recommendations is key for patient safety.

14AP02-06
Risks associated with imported neglected diseases: surgery dangers derived from inmigration

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Background: It is tempting to assume that scientific advances imply that certain diseases belong to a different era, but immigration and its socio-economic implications brings old enemies to our operating rooms. Given that safety of anesthesia and surgery is partly based in risk analysis related to known individual and common diseases, unknown or neglected diseases may impact safety and quality of care of vulnerable patients. We present a case of tertiary hyperparathyroidism (3HPT) in an immigrant patient.

Case Report: We present a case of airway management of a 20-year-old North African male with 3HPT suffering from untreated end- Stage Renal Disease stage 5 A2 due to poor socioeconomic background. He was listed for total parathyroidectomy, thymectomy and autologous transplant due to parathyroid adenomas.

Preoperatively, abnormal general bone density with secondary cystic fibroid osteitis, maxillary hyperplasia, retrognathia, limited mouth opening and stiff neck were noted.

A strategy plan for difficult airway management related to his medical history was devised:

The approach of choice was induction of anesthesia and intubation with video laryngoscopy (King Vision®);

The back-up approach was rescue with fibroscopy according to current guidelines.

After pre oxygenation and anesthesia induction, ventilation was uneventful (HAN II) and the first attempt to intubation with King Vision® video laryngoscopy was successful.

Discussion: Access to quality medical and surgical treatment is frequently a challenge in some third world countries. 3HPT is an uncommon endogenous cause of excessive secretion of parathormone in secondary hyperparathyroidism related to chronic kidney disease.

If left untreated, extra skeletal calcifications and progressive loss of bone density with changes especially in facial bone structures leading to difficult airway ensue and give a classical clinical picture. Our patient presented difficult airway predictors requiring a thought-through management plan to avoid serious incidents. For this reason, our first choice was videolaryngoscopy, given the improved visualisation and higher successful rate achieved operating this device compared with classic laryngoscopy.

Clinical Learning Points: Review of evidence and planning for different possible management scenarios when dealing with less common diseases is essential in order to guarantee safety of anesthesia and surgery.

Reference:

V. D. Palumbo et al Clin Ter 2021; 172 (3):241-246

14AP02-07
General versus local anaesthesia for carotid endarterectomy: a case report

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Background: Atherosclerotic carotid artery disease,in the form of carotid intima-media thickening or luminal stenosis, accounts for 20% of ischemic stroke events.NASCET found that,for every six patients treated with carotid endarterectomy (CEA),one major stroke would be prevented at 2 years for symptomatic patients with a 70%–99% stenosis.The anesthetic plan should be made on an individual basis, taking into consideration patient's comorbidities and wish.

Case Report: Patient N, 66 years old was admitted to hospital with complaints of dizziness, impaired memory and vision. Developed for arterial hypertension and ischemic stroke.

Diagnosis: Stenosis of the left internal carotid artery.

Treatment: carotid endarterectomy on the left.ASA-III. In order to control the perfusion pressure and consciousness, it was chosen to perform the surgical intervention under local anesthesia. Standard monitoring was established, ECG, invasive blood pressure (IBP), pulse (HR) SPO2. Preoperative parameters: HR -78 min, blood pressure 150/80 mm Hg and SPO 95-99%.

During surgical access to the vessel after heparinization and medical hypertension necessary to clamp the carotid artery, the patient developed hypotension of 70/20 mmHg, bradycardia, facial asymmetry,right-sided hemiplegia. After stabilization of hemodynamics, consultations of a neurologist, neurosurgeon.

CT angiography was performed to rule out a hemorrhagic stroke,which was excluded.It was decided to perform an urgent endarterectomy of the internal carotid artery.

The patient was agitated,it was decided to continue the operation under general anesthesia. In the postoperative period,regression of neurological symptoms was observed, limb movements were restored,dysphasia remained. The patient was transferred to the ward. On the next day, the dysphasia symptoms regressed.

Discussion: Optimal planning with surgeon and the patient is of crucial importance.Locoregional anesthesia should always be an option for the anesthetist for CEA.

References:

Guay J. The GALA trial: Answers it gives, answers it does not. *Lancet.* 2008;372:2092–3.

Herrington W, Lacey B, Sherliker P, Armitage J, Lewington S. Epidemiology of atherosclerosis and the potential to reduce the global burden of atherothrombotic disease. Circ Res. 2016;118:535–46.

Learning Points: The anesthetic plan should be individualized according to concomitant pathology, expected intraoperative technical difficulties and patient's wish after informed consent is obtained.

14AP02-08
Serious adverse event during laparoscopic surgery: what to know

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Background: Laparoscopy is a widely performed surgical technique nowadays due to its many advantages. It requires to distend the abdomen by establishing pneumoperitoneum and several gases have been used to achieve it. However, carbon dioxide is the most frequent one as it is colorless, non-flammable and highly soluble in blood. Any mistake made concerning pneumoperitoneum can lead to serious consequences to the patient.
Case report: A 64-year-old male with no medical record underwent elective laparoscopic cholecystectomy. After the start of surgery and once the trocars were inserted and the pneumoperitoneum was established, a flame was observed inside the patient's abdomen, right where the tip of the electric scalpel touched the patient's peritoneum and that flame increased after the scalpel's removal through the trocar.
In light of this, all the laparoscopy equipment was changed and the surgery continued. However, this event happened again, so an abdominal suction system was introduced, which allowed the surgery to be completed without further incidents.
Before starting the second scheduled laparoscopic surgery, another cholecystectomy, the entire equipment was changed again. Nevertheless, the same scene happens again in the next patient, which makes it necessary to stop the surgery and carry out an exhaustive analysis.
At that time it was found that, although the oxygen and carbon dioxide wall outlets are different in terms of their internal structure, they have the same external shape. This led to the connection of the carbon dioxide to the oxygen outlet, leading to pneumoperitoneum induction with oxygen, a flammable gas, instead of carbon dioxide. Fortunately, the event did not cause any harm to either of the two patients.
Discussion: Pneumoperitoneum induction is an important step during a laparoscopic surgery not only because of its cardiopulmonary repercussions, but also because any mistake related to gas insufflation can develop severe and potentially fatal consequences.
Reference:
Asgari M, Ahmadzadeh M, Akhoundzadeh R, Pourmehdi Z, Dorostan N. A randomized clinical trial, comparing nitrous oxide and carbon dioxide for producing pneumoperitoneum in laparoscopic cholecystectomy. Iran J Surg. 2011;19(3):1930.
Learning points: High percentage of the adverse events in the operating room are preventable. Anesthesiologists play a key role in maintaining a safe surgical environment, detecting and solving incidents at an early stage.

14AP02-09
Esophageal temperature probe: wrong place, wrong time. A case Report

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Background: Adequate maintenance of body temperature during general anesthesia is necessary for safety and is essential to diagnose and treat temperature impairment in patients, as hypothermia or overheating. Generally, esophageal temperature probe is commonly used in practice for intubated patients because of its reliability and feasibility to monitor intraoperative temperature. Wrong placement of esophageal temperature probe conducts to complications.
Case report: In this case report, we describe our experience with a 46-year-old woman with a personal history of hypertension, diabetes mellitus, dyslipidemia and morbid obesity, undergoing to vertical gastrectomy (gastric sleeve) via laparoscopic under balanced general anestesia in whom the esophageal temperature probe, that was unexpected misplaced into intragastric position, was accidentally cut. Reopening of the mechanic suture was needed, with posterior suture by hand. Methylene blue test was performed according to surgical protocol and without leak evidence.
Discussion: Generally, esophageal temperature probe can be inserted into the esophageal orifice blindly at optimal depth of probe tip of 24 cm below the corniculate cartilages (lower fourth of the esophagus) in adult patient under anesthesia.
Correct placement of temperature probe is important to reflect accurate core temperature. The incident we had at our institution is of special interest because it happened a misplaced probe into intragastric position, during gastric surgery, despite good comunication between the OR team. If not noticed at all, it could led to stuck probe in the suture line and further possible damage while trying to remove it. Late discovery of probe fragment postoperatively could end in re-operation.
References:
Whitby JD, Dunkin LJ. Temperature differences in the oesophagus. The effects of intubation and ventilation. Br J Anaesth 1969; 41: 615-8. 15.
Mekjavić IB, Rempel ME. Determination of esophageal probe insertion length based on standing and sitting height. J Appl Physiol (1985) 1990; 69: 376-9.
Learning points: Accurate insertion of esophageal temperature probe and careful assessment of correct temperature probe position is essential. It is important to notice how easy such complications can be missed or underestimated during surgery.To avoid such a possible complication, we should reassess placement, fix the tube or remove it before the section or suture.

14AP02-11
Life-threatening metamizole anaphylaxis should question its widespread use - a case report

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Background: Perioperative anaphylaxis is usually an unexpected life-threatening scenario, despite patients' exposure to multiple drugs with hypersensitivity potential. Metamizole is an analgesic widely used in our practice, regardless of concerns of agranulocytosis and severe hypersensitivity reactions.
We report an anaphylactic shock related to metamizole in which rapid detection and adequate response in the post-anaesthesia care unit (PACU) allowed for positive outcomes.
Case report: A 72-year-old patient without known drug allergies underwent an uneventful transurethral resection of bladder tumor under general anesthesia and was admitted to the PACU. At arrival he started a 2g metamizole infusion for pain complaints. Ten minutes later, he complained of intense feet pruritus.
The medical team was alerted as the clinical picture evolved towards generalized pruritus, anasarca, agitation, shock, dyspnea, desaturation and bronchospasm.
Anaphylactic shock was suspected and metamizole infusion was stopped. Treatment with IV adrenaline infusion, clemastine and hydrocortisone, oxygen, bronchodilators and crystalloids was administered with progressive improvement. Acute-phase value of tryptase (30.9μg/L) and subsequent downward kinetics (10.3μg/L; 12h) were observed and the patient was referred to an Allergologist.
Discussion: The incidence of perioperative anaphylaxis has been widely underrated and its unexpectedness contributes to high mortality rates (52%)[1].
Metamizole is frequently (1:5000 parenteral administrations) associated with severe and sometimes fatal hypersensitivity reactions, both immediate and delayed, which makes awareness of these numbers of utmost importance as a high suspicion degree is crucial for early detection and better outcomes.
The frequency and severity of these reactions should question the safety of broad metamizole use after surgery, especially in ambulatory settings.
Reference:
1. Laguna, J. J, et al. (2018). Practical guidelines for perioperative hypersensitivity reactions. Journal of Investigational Allergology and Clinical Immunology. https://doi.org/10.18176/jiaci.0236
Learning points: Metamizole is a widely used drug associated with serious hypersensitivity reactions.
A high degree of suspicion is crucial for early anaphylaxis detection.
The frequency of these events should question its broad use in ambulatory settings.

14AP03-01
Intensive care airway trolleys

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Aim: After some time working in the intensive care unit, it became clear that the airway trolleys were not always fully stocked. This led to delays in finding equipment and potential patient harm when in an emergency situation. These trolleys are relatively new to the department, and their use has yet to be audited.
Our aim was to gather data on how frequently these trolleys were fully stocked, and to implement a way to ensure the trolleys were being checked, re-stocked and tagged on a daily basis.
Methods: We initially constructed a questionnaire to gain qualitative data from medical staff working on the intensive care unit to gather information on whether they knew whose responsibility it was to check the airway trolleys, how long it would take them to restock the trolley using the current checklist, and if they recognised all the equipment on the checklist.
Feedback included that medical staff who were not airway trained would find it difficult to identify and locate the correct equipment from the list. All participants agreed that a new airway trolley checklist would be helpful.
Cycle 1: We replaced the existing checklist with an updated checklist including pictures of each piece of equipment, where to locate it in the department, and where to place it in the trolley in a plan A to plan D order.
Cycle 2: We implemented a new morning handover checklist for the ICU MDT. This includes a prompt to check the airway trolley and delegate a member of the medical team to do this. This is overseen by the ICU consultant.
Results: Prior to cycle one, we audited the three airway trolleys on three separate occasions, and found that only 44% of the time they were fully stocked.
After replacing the checklist, we repeated our audit of the trolleys to find that 55% of the time they were fully stocked.
Following use of the morning handover checklist, we found an improvement up to 77%. This is still not in keeping with DAS and AAGBI standards requiring trolleys to be checked daily, therefore we have plans to implement cycle three with an update to the patient handover list.
Conclusion: This was a multi-cycle patient safety improvement project. The changes made from this project will hopefully remain in place for the foreseeable future. Although an improvement has been seen, we have made suggestions for further development and have engaged the junior doctors and consultant body. This can be easily re-audited to see if the changes have remained in place.

14AP03-02
Developing and piloting a self-evaluation process strategy of patient safety practices in perioperative care: SAFEST project

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Background and Goal of Study: Surgery care has been reported to have one of the highest pooled prevalence of preventable patient harm (1). Adopting standards promoting evidence-based practices can significantly improve the safety outcomes of surgical care (2).
In the context of the SAFEST project (www.safestsurgery.org), this study aims to develop and pilot a self-evaluation process strategy for patient safety practices (PSP) in perioperative care.
Materials and Methods: This study describes the development and piloting of a self-evaluation process of PSP in the complete perioperative journey (i.e., preoperative, intraoperative and postoperative). We will follow a four-step approach:
1. Development of a set of measurable criteria for the PSP in perioperative care to be evaluated in 10 hospitals from 5 European countries;
2. Development of an online platform with a self-evaluation tool containing a scoring system to assess the degree of implementation of the PSP;
3. Development of the evaluation strategy, educational and training material;
4. Testing and refinement of the evaluation process strategy.
Results and Discussion: We will present a set of measurable criteria to evaluate patient safety in perioperative care with the scoring system. The developed online platform, education, and training material, along with a manual including the list of the PSP and related evidence, will be shown.
Results from the pilot test and refinement will be presented.
Finally, we will share lessons learned from the process and potential barriers and facilitators for self-evaluation.
Conclusion(s): This study will ensure consistency in the assessment procedures of PSP in the SAFEST participating hospitals, allowing the adoption of this evaluation strategy by a broader range of hospitals.
References:
1. Schwendimann R et al. BMC Health Serv Res. 2018 Jul 4;18(1):521.
2. Nagpal K et al. Ann Surg. 2010 Aug;252(2):225-39.
Acknowledgements: Project funded by the EU- Horizon Europe Framework Programme, Grant Agreement Nº 101057825.

14AP03-03
Patient safety and the role of the surgical checklist on patient safety in Fundació Hospital Esperit Sant, Barcelona. Is it just bureaucracy or do we understand the essence of the procedure?

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Background and Goal of Study: The Surgical Checklist was launched in 2008 by WHO. Research published in 2009 showed strong evidence of its positive effects on morbility, mortality and infection prevention[1].
However, after more than a decade it hasn't been widely adopted in our country. The purpose of our study was to explore the implementation of the Checklist in our practice, to evaluate engagement of subteams, and to propose strategies to overcome resistances and poor implementation[2].
Materials and Methods: This was a pre-post observational study, after changing the Checklist administration paradigm. Checklist was redefined from a written record to a guided conversation using 3 posters hanging on the OR wall. Each of the surgical subteams (Anaesthesia, Surgery, Nursing) were responsible of one part in the Oral Checklist (OC). Corresponsability, teamwork and communication were encouraged.
A quality indicator of teamwork was defined. Incidents were analyzed 8 months before, and after introduction of the OC.
Results: The OC showed an improvement in Teamwork from 5/10 to 9/10. From March 2021 to July 2022, 9 incidents were analyzed. Five were adverse events and appeared when no OC was applied, although a written checklist was registered. Four were preventable if the checklist had been effectively administered, and one was due to negligence. The remaining 4 incidents out of 9, were classified as hazards that didn't result in harm thanks to early detection in the Oral Checklist.
Conclusion(s): Improvements in Teamwork and engagement, as well as compliance with administering the Checklist were observed after the Paperless OC introduction. No adverse events were detected when the OC was applied, showing a consistent trend to improved surgical safety results as sugested in previous studies[1].
Poor motivation and poor teamwork in organizations may help to forget the application of this safety tool. It has been suggested that success in applying the checklist requires a change in climate and culture of the organization.
Engagement, collaboration and effective communication are vital. In complex environments such as the medical one, Checklists have shown to be essential to try to overcome the human factor. A change of perspective is needed in order to accept that such a simple and inexpensive tool can make a powerful and dramatic change in our practice. No excuse can be argued in 2023 to not apply an Oral Checklist.

14AP03-04
Prospective evaluation of an enhanced electromyographic (EMG) detection algorithm

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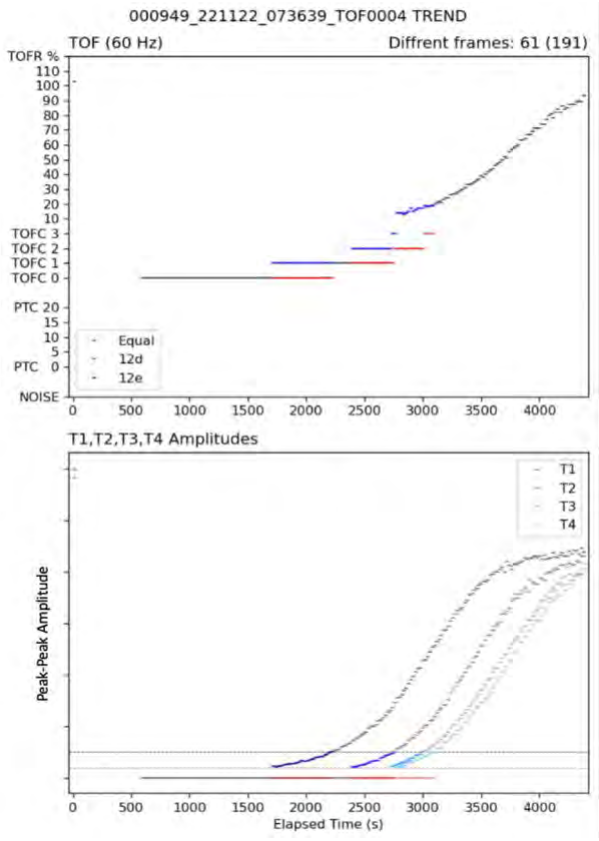
Background and Goal of Study: Electromyographic (EMG) monitoring involves stimulation of a nerve, and detection, recording and analysis of peak (-) and trough (+) amplitudes of evoked responses. EMG analysis depends on optimal selection of these EMG points.
Materials and Methods: The TetraGraph (Senzime AB, Sweden) EMG monitor records and analyzes EMG responses using an algorithm. The ulnar nerve is stimulated via surface electrodes (TetraSens, Senzime), and evoked EMGs are recorded at three hand muscles. We evaluated the effect of a new algorithm on sensitivity and consistency of EMG detection. We extracted clinical case data from a de-identified repository (TetraConnect) and processed data with both old (12d) and new (12e) algorithm.
Our a priori conditions were that the new 12e algorithm detected smaller signals without generating false positives or misidentifying neuromuscular responses at deep levels of block. The validity of detected signals was evaluated by ensuring that EMG signals (TOF ratio, TOF count, and twitch amplitude) followed clinically expected trends.
The 12e algorithm was evaluated by comparing 50 randomly selected pairs of anonymized intraoperative EMG data (duration 2-5 h each) that included thousands of datapoints. Printouts contained pairs of TOF ratios, TOF counts, post-tetanic counts (PTC), and individual amplitudes of TOF components (T1, T2, T3, and T4). The data pairs were plotted with color codes to identify the two algorithms for subsequent analysis (Fig 1).



Results and Discussion: Of the 50 pairs of EMGs, the 12e algorithm improved readings (TOF ratio, TOF counts, and T1-T4) in all 50 (100%) of recordings; in 1 case (2%), the improvement involved recovery parameters only (TOF ratio). In contrast, the old 12d algorithm improved readings in 0 (0%) instances. There were 0 (0%) cases of misidentification of EMGs at deep block.
Conclusion(s): The new 12e algorithm improved detection of EMGs in 100% of cases, without introducing false-positive EMGs. Improvements in EMG detection help better plan intraoperative drug dosing and optimal antagonism, decreasing residual paralysis and facilitating patient safety.

14AP03-05
European perioperative patient safety standard practices: preliminary results of a systematic review of clinical practices guidelines from the SAFEST project

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Background and Goal of Study: To identify recommended patient safety standard practices all along the entire perioperative journey (from surgical indication to 90 days after discharge) in the available clinical practice guidelines for surgical adult patients.
Materials and Methods: A systematic review of clinical guidelines was performed following the PRISMA 2020 statement (PROSPERO registration: CRD42022347449). We included publications with at least one recommendation promoting patient safety in the perioperative care in adult population, published from 2012 to 2022. We excluded technical, old version and non-original guidelines, and those related to percutaneous or non-common surgeries.
Main international databases were employed. Search terms related to each of the perioperative period, patient safety and clinical practice guidelines were used. Also, an extensive search of grey literature was made.
Independent review and data extraction was performed. Extracted standard practices were categorised for depicting their characteristics.
Results and Discussion: From databases, 4086 records were screened, and 504 documents were assessed for eligibility. From grey literature, 236 documents were also assessed for eligibility. After exclusion, 270 documents remained for analysis.
A total of 4732 standard practices were extracted from which 2101 (44.4%) were strong recommendations with a wide variability in their level of evidence. They were mostly addressed to inpatient care (40.5%) or applicable to both inpatient and ambulatory surgeries (55.7%). The most prevalent were infection and complication prevention standards (41.5%), whilst those related to diagnosis and referral, provider communication and handovers, safe medication use, safe blood derivates management, discharge and outpatient

follow-up, safety structures, and safety evaluation barely accounted for the 15% altogether. Distribution along the perioperative continuum seemed balanced, except for the post-discharge phase (2.1%).
Conclusion(s): A large number of evidence-based standards are available for their implementation in health care facilities. Specific guidelines for ambulatory surgery and recommendations for the post-discharge phase are extremely scarce.
Acknowledgements: This work is part of the SAFEST (www.safest-surgery.eu) European Horizon funded project (No 101057825)

14AP03-06
Improving patient safety in the operating room: an innovative one-step electronic tool to avoid medication errors

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Background: Medication error is a major cause of preventable patient harm. Medical prescription is a stage where medication errors can occur being the OR a dangerous environment due to:
1. The same anesthesiologist prescribes and administers the medication unsupervised
2. High-risk medication is handled.We developed a one-step program for electronic prescription in anesthesia and created a training strategy for anesthesiologists.
Materials and Methods: This study was carried out in a tertiary hospital with 39 operating rooms which performs more than 27,000 surgeries per year. It has an electronic medical record and electronic prescription established. In the OR the electronic medical record is available but the prescription is made manually. In 2020, a multidisciplinary group of anesthesiologists, pharmacists and IT was created to design the prescription program.In February 2022 the initial prototype was ready to start running.A training plan was carried out to introduce the program to the anesthesiologists.
Results: The one-step electronic prescription program for OR is a web program with a simple and very visual interface designed for Google Chrome and Internet Explorer and integrated with the prescription of admitted patients. It is designed in two tabs: one for prescription and another for administration. The patient's data, weight, height, allergies and alerts are always visible.
- Prescription is made by therapeutic groups or by established protocols,with standardized doses and concentrations.
- Administration is made by scanning the drug's barcode or manually. It automatically generates labels that identify the patient and medication to stick on the solutions to be administered.
The program generates alerts for allergies and maximum doses, and the possibility of viewing the administrations of the last 48 hours. Also, the program makes it possible to continue with the administration of the medication outside the OR and thus guarantee continuity of care.
Regarding training, a team of pharmacists was available in the OR to individually teach the program to the anesthesiologists and collect suggestions.
Conclusion: Multidisciplinary team has been essential for the creation of a self-designed electronic prescription program in the OR that meets the needs demanded by anesthesiologists.Its implementation is one barrier to reduce the risk of medication errors.The training program encourages user participation, improving customer loyalty and satisfaction.

14AP03-07
Bespoke educational training videos increase novice trainees' confidence with anaesthetic and critical care equipment

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Background and Goal of Study: It is known that videos enhance effective learning and are an important tool in medical education. However, there are no previous published studies focussing specifically on the effect of medical videos in the context of anaesthetic equipment.
We wished to identify whether bespoke instructional videos of commonly used equipment in anaesthetic and critical care practice can enhance novice trainees' confidence in their use.
Materials and Methods: A pre-intervention survey was sent to novice trainees joining the critical care and anaesthetic departments at the Great Western Hospital, Swindon to assess confidence in using 10 pieces of anaesthetic equipment using a scale of 1-10. We chose to pilot the Alaris syringe pump driver and the CMAC video laryngoscope as two pieces of equipment for bespoke instructional videos. A short video of each piece of equipment was made by one of the authors, highlighting the main indications, basic modalities, functions and troubleshooting of these pieces of equipment. A follow up survey was completed by the trainees immediately after viewing these videos to assess their confidence post intervention.
Results and Discussion: The n for this QIP was 10. All trainees answered pre and post intervention surveys. A paired sample T test showed a p value of 0.001 for the alaris pump video and a p value of 0.01 for the CMAC video.
There was a statistically significant increase in the confidence of the trainees in using the equipment after watching the bespoke videos. Although the sample size was small, the results of the quality improvement project were significant. Even though confidence in these pieces of equipment can arise from everyday practice, these videos offer confidence on first usage and the time to be confident in every day practice will hopefully be reduced.
The benefit of videos as an educational medium means they can be shared and assessed easily and used for new doctors rotating into the trust. Future plans for the project include: making more bespoke videos on anaesthetic equipment, retesting this group alongside a control group to see if the information from the videos is retained and upload these videos onto the trust intranet and Southwest Anaesthetic, Pain & ICM *Teaching* (*SWAPIT*) hub to support trainees regionally.
Conclusion(s): Bespoke instructional educational videos of everyday equipment increase novice anaesthetic and critical care trainee confidence in a district general hospital.

14AP03-08
AR in anesthesia care

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Background and Goal of Study: Anesthesia care is a high-tech environment where an increasing number of patients suffer from severe and complex conditions. The demand on quality of care and safety for patients are therefore increasing. Communication, expert knowledge, and patient related information are all key factors to maintain a high level of quality and safety in anesthesia care.
Augmented reality (AR) via smart glasses (SG) has shown to have the potential to improve communication, enhance availability of expert knowledge and improve access to patient related information such as vital signs (VS). There is a lack of knowledge regarding experiences with the use of SG.
The goal of this study is to evaluate in which situations SG are suitable for use and what kind of vital signs that is most relevant to visualize in these situations.
Materials and Methods: 28 individuals participated in the study. Participants were anesthesiologists and nurse anesthetist at a university hospital in Sweden. Data were collected using questionnaire surveys and focus group interviews. All participants answered the questionnaire after using SG in a simulated situation related to anesthesia care. Three different simulated anesthesia situations were created. Participants (n=4) from each situation joined the focus group interviews and additional questions regarding the feasibility of SG were asked.
Results and Discussion: This is preliminary result that refers to the initial ten participants questionnaire survey regarding the simulated situation of cardiac arrest. The preliminary result indicates that SG could be feasible in a situation like cardiac arrest. The most important VS to visualize during a cardiac arrest are Spo2, ECG, and blood pressure. The general perception of SG was that they functioned ok during the situation they experienced. Participants also answered that SG need further improvement to function in a clinical setting.

	Initial ten participants (n=10)
Age (y)	38,5*
Female gender	5
Anesthesia experience (y)	5,5*
Nurse anesthetist/Anesthesiologist	7/3

*Mean value
Table 1. Participants Characteristics

Conclusion(s): SG has potential to be used in a situation where a patient suffers from cardiac arrest. ECG, Spo2, invasive and noninvasive bloodpressure are the most important VS to visualize. More data need to be analyzed to confirm our results.

14AP03-09
Development and use of an open-source Arduino based display control, 3D-printed, bespoke, compact, anesthesia machine simulator

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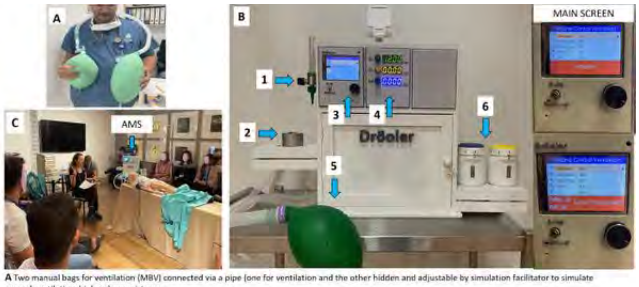
Background and Goal of Study: The TAST (Tel Aviv anesthesia simulation team) facilitates simulations of complex clinical situations at medical conferences. We performed a simulated operating room pediatric airway emergency in our national meeting hotel conference. Lacking an anesthesia machine, we designed, built and tested an anesthesia machine simulator (AMS), the “Drooler”. We present the concept, design and development of our open code/Arduino based display 3D printed AMS.
Materials and Methods: Requirements for the AMS included compact size, transportability, output display relevant to the clinical scenario and tactile features for the participants to operate in the simulated crisis. First, we constructed a wooden box prototype with ventilation pipes, APL, oxygen and vaporizer with rotating knobs. The simulate manual bag ventilation (MVB) is shown in Fig A. Incorporation of 3D designed & printed panels, Arduino based screen display and rotary knobs coding (by an anesthesia resident, OBN) enabled gas flowmeters with screen indicators of flow and adjustable controls on a main screen of simulated automatic ventilation parameters (FigB). The facilitator controlled the displayed pressure and alarm notifications via a phone application connected to the AMS by Bluetooth.
Results and Discussion: The “Drooler” AMS was used in a pediatric laryngospasm simulation (FigC). The AMS enabled participants to respond appropriately to apnea resulting from simulated laryngospasm. Apnea alarm and notification was apparent on the AMS main screen (activated by the facilitator) and noticed by the participants. They responded by BMV, administering 100% oxygen while adjusting the APL. Those who wished were able to adjust vaporizer output. We plan to add additional features eg MAC display, MAC notifications, pressure control notifications and alarms. Next, we plan to create a fully 3D printed, compact model that can be easily reproduced around the world.



A Two manual bags for ventilation (MBV) connected via a pipe (one for ventilation and the other hidden and adjustable by simulation facilitator to simulate normal ventilation, high or low resistance.
B “Drooler” anesthesia simulation machine. Arrows indicate features
1=Oxygen side outflow;2=APL;3=Main screen; 4=Flowmeters (O_2, air, N_2O);5=MBV;6=Adjustable vaporizers
Main screen showing adjustable ventilation parameters (respiratory rate, PEEP, tidal volume and I:E ratio). On the bottom of screen examples of notifications (high pressure, low pressure and apnea) accompanied by alarms, controlled by facilitators.
C Scenario debrief, Israel Society of Anesthesiology convention, 2022, Zichron Yaakov, Israel. The pediatric laryngospasm simulation run three times with groups of 10 participants. The Drooler AMS can be seen behind the simulator.

Conclusion: We described the need for our bespoke AMS, the construction process, and our pilot use. We envision an AMS that is easy to replicate, providing an accessible training tool.

14AP03-10
Introduction of a duty floor anaesthetist, the cost of the Cappuccini test and gaining Royal College Accreditation

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Background and Goal of Study: Ashford and St Peter's is a two site hospital with 18 theatres delivering general and obstetric anaesthesia. The Royal College of Anaesthetists introduced 'Anaesthesia Clinical Standards accreditation' (ACSA) with multiple standards across 5 domains. ACSA is a marker of quality and safety in the care of patients and our department sought accreditation. Compliance is assessed across 5 'domains'. Our department has failed the supervision standard ('Cappucini test') several times.
We also fell short in others, including ASA 3 patient follow up. In addition, contacting the emergency list anaesthetist in-hours was problematic and delivering emergency anaesthesia in remote hospital sites like Radiology or the Cardiac suite was inefficient.
Materials and Methods: Multiple Cappucini tests were conducted on trainees and non-autonomous SAS grades, which involved asking 5 standardised questions regarding supervision and contact. Incremental changes introduced included a duty phone, a department 'whatsapp' group, a starred consultant and finally a Duty Floor Anaesthetist (DFA). Each change was assessed for effectiveness of communication and supervision.
Results and Discussion: We failed 2 rounds of Cappucini supervision test despite raising departmental awareness via a presentation and asking management for an extra anaesthetist to cover emergencies. Introduction of a Duty phone did not make sufficient impact to pass the standard. Introducing a DFA on two sites proved highly popular and achieved required standards of supervision. Cost was estimated at 3 whole time equivalents (WTE) and approximately £300,000 per annum.
However, the benefit has been noticeable and the remit is expanding including; locum anaesthetist support, attending remote site emergency anaesthesia, follow up of ASA 3 patients and providing second opinion if on day cancellation is pending.
Conclusion: As staffing levels declined our department rarely had more than one anaesthetist on an operating list. SAS doctors were working solo, with no supervision arrangements and remote site emergency anaesthesia was causing delays to the emergency list. The introduction of a DFA has improved efficiency of staffing providing flexibility with trainees and SAS grades working solo with robust supervision. Multiple standards could not have been achieved without this 'DFA' role.
Reference:
1. RCOA. Chapter 1: Guidelines for the Provision of Anaesthesia Services The Good Department, 2021

14AP03-11
Implementation of Clinical Data Warehousing Information System (CLADE-IS) for improvement of workflow and counselling in Academic Centre for Malignant Hyperthermia Masaryk University (ACMH MU) – new encrypted electronic national Malignant Hyperthermia Registry

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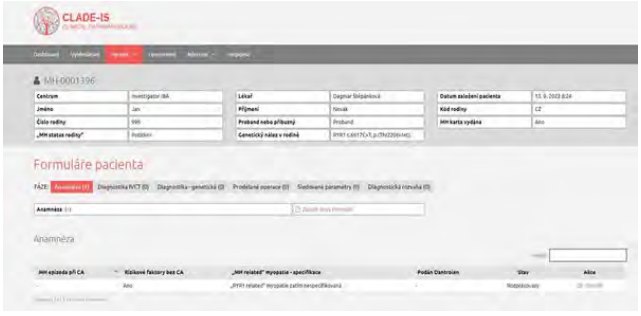
Background and Goal of Study: Malignant Hyperthermia (MH) is a rare, hereditary, life-threatening pharmacogenetic disorder triggered by some commonly used anaesthetics. MH diagnostics, both genetic testing and In vitro contracture test (IVCT), have been available in the Czech Republic for 20 years. ACMH MU centre consists of four academic departments of the Faculty of Medicine of Masaryk University in two tertiary university hospitals[1]. The diagnostic process contains a lot of important and confidential patient information which must be shared among involved personnel.
To provide better workflow and counselling in ACMH MU we implemented and adjusted the already existing Clinical Data Warehousing Information System (CLADE-IS) for creating a new encrypted electronic national MH registry as part of the national registry of intensive care.
Materials and Methods: CLADE-IS uses the so-called Entity-Attribute-Value (EAV) model and is robust enough to allow many different configurations of user rights, roles, and data flows. The online registry application is available to users via any internet browser and is characterized by a responsive web design. Only authorized users can access the CLADE-IS interface based on a unique combination of username and password. Communication between CLADE-IS and its users is encrypted via the Secure Sockets Layer (SSL).
Results and Discussion:



Conclusion(s): Modern database systems such as CLADE-IS can be successfully implemented into the national registry of patients with rare diseases and can help to provide modern and safe counselling.

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Acknowledgements: This research was funded by Specific University Research provided by MŠMT (MUNI/A/1166/2021, MUNI/A/1178/2021), supported by MH CZ - DRO (FNBr,65269705) and mainly supported by the fund from AZV - Czech Health Research Council (NU21-06-00363).

14AP03-12
Effect of a collaborative teaching approach on surgical checklist compliance in a European tertiary hospital

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Background and Goal of Study: Use of the surgical safety checklist has been demonstrated to reduce incidents in the operating room and mortality[1,2]. To promote a modern culture of safety in surgical departments, our Anaesthesia Safety Working Group organised the First Safety Week (FSW) in 2021 in order to improve adherence to surgical safety checklist.
Materials and Methods: Retrospective study in which we compared data of compliance with the surgical safety checklist during the year 2021-2022 in emergency and planned surgery. During this week, workshops and masterclasses were given to a total of 128 professionals in multidisciplinary groups (nurses, surgeons and anaesthesiologists) to promote compliance with the surgical safety checklist, teamwork, non-technical skills and communication. Data are shown as proportion (%) and a chi-square test was used for comparisons.
Results and Discussion: A total of 2,720 surgeries were collected. No statistically significant differences ($p = 0.466$) were observed in the Checklist performance (97.2 vs 98 .0%) in planned surgery, but there was an increase to statistical significance in emergency surgery from 50 % to 77.4 % ($p < 0.001$).
In relation to the degree of compliance with the three differential parts , a statistically significant improvement was observed in planned and emergency surgery with a per cent increase of 127 ($p < 0.001$) and 76 ($p = 0.001$) respectively.
Furthermore, this increase was at the expense of an improvement in compliance above 60% in all three parts of the checklist.
Conclusion(s): The training on the significance of checklist assessment has improved compliance data in our institution. Further evaluation and follow-up sessions are needed to assess learning and the long-term effect of this approach.
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Acknowledgements: To all the professionals involved in this workshop and to the local safety group for their efforts to improve patient safety.

14AP03-13
WHO safe surgery checklist: did the opinions about the SSC change in 2021?

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Background and Goal of Study: The WHO promotes the use of the Safe Surgery Checklist (SSC) since 2009 to reduce the incidence of complications. The first Belgian survey in 2016 showed that the majority of users were positive about using the SSC. Most opinions about the SSC point to the positive effects. In this follow-up study we investigate whether acceptance improved in the last 5 years.
Materials and Methods: An online survey, identical to the one of 2016, was open to all Belgian hospitals between Feb 15th and Mar 29th 2021. It was sent to the patient safety coordinators by the Federal Public Service of Health, requesting to forward the survey to all OR nurses, surgeons and anaesthesiologists. Using a forced 4 items Likert Scale, the survey explored the opinions and feelings about the SSC. The results were simplified into 2 groups (agree and disagree).
The results from 2016 and 2021 were compared using Chi-square and Fisher's exact tests, if indicated. Statistical significance was defined as $p < 0.01$. The Committee for Medical Ethics of the Sint-Blasius hospital (Dendermonde, Belgium) approved the study (n° B0122021000001).
Results: Significant more OR professionals participated in the 2021 survey (1419 vs. 2166; $p<0.0001$). Participation decreased among anaesthesiologists, but increased among nurses ($p=0.001$). There were more participants with >5y and less with >10y of OR experience ($p<0.0001$). Participation increased in hospitals with >1000 beds and reduced in hospitals with <200 and <500 beds ($p<0.0001$).
Use of the SSC was more common (93.6 vs. 95.7 %; $p<0.0001$). Systematic use of the SSC (use in >98% of cases) increased from 25.1% to 39.6% ($p<0.0001$).
Opinions about the SSC revealed significant change for patient appreciation of SSC use (more positive: 76,3% vs 81,6%, $p<0.001$) and for lack of knowledge of the patient file (less negative: 10,9% vs 7,6%, $p=0.001$).
The biggest change was seen in feelings towards the use of SSC. The results showed more bad feelings when not using the SSC (57,6% vs 65,8%, $p<0.001$). OR staff experienced decreased time pressure for completing the SSC (49,0% vs 42.7%, $p<0.001$).
Conclusion: Acceptance of the SSC continues to grow over time. The most important and significant changes were seen in the feelings towards the SSC: OR professionals perceived less lack of time for using the SSC and more bad feelings when not completing the SSC. The SSC is also increasingly appreciated by the patient.

14AP04-01
Greek Anaesthesiologists' Post-Traumatic Stress Disorder in the post COVID-19 era: an observational, multicenter, cross sectional study from COVID-19 referral, university/tertiary hospitals

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Background and Goal of Study: Anaesthesiologists actively involved with COVID-19 are at increased risk for post-traumatic stress disorder (PTSD). We assessed the PTSD, and possible determinants, of anaesthesiologist's in COVID-19 referral hospitals in the post COVID-19 era with the validated PTSD Checklist for DSM-5 (PCL-5) and the Eysenck Personality Questionnaire (EPQ).
Materials and Methods: A multicentre cross-sectional survey was conducted among anaesthesiologists' working in the 7 COVID-19 referral university/tertiary hospitals during November 2022 (post-COVID-19 era) in Greece. PCL-5 is a 20-item and a 5-point Likert scale self-report measure, scored with two different ways in order to ensure for a provisional diagnosis of PTSD.
Eysenck Personality Questionnaire (EPQ) explores 3 main dimensions of personality, whereas the Lie (L) scale serves as a measure of "dishonesty". T-test and one factor ANOVA, or their nonparametric equivalents, Mann-Whitney U and Kruskal-Wallis tests, were employed for comparison of continuous variables accordingly.
The Fisher's exact test was used for comparison of categorical variables. Multivariate logistic regression analysis was performed to identify predicting factors of PTSD.
Results and Discussion: One-hundred doctors (response rate 85%) from 7 hospitals (72% females, median age 46 [33–51.5] years) participated. The overall Cronbach's alpha for PCL-5 was 0.946. According to each scoring, 18% and 23% of responders were diagnosed with PTSD respectively, while 7% were classified as suffering from probable PTSD.
Interestingly, children (OR 0.17, p=0.048) and satisfaction with job position (OR:0.211, p=0.024) exhibited a protective effect against PTSD.
On the other hand, family obligations were identified as an aggravating factor (OR=4.274, p=0.026). Concerning the personality traits only neuroticism was identified as a statistically significant independent factor predicting PTSD (OR 1.524, p=0.001).
Finally, job ranking was also a statistically significant independent factor predicting PTSD, with a 3 times risk augmentation for each level in job hierarchy (from Residents towards Academics) (OR=3.034, p=0.022).
Conclusion(s): In the post-COVID-19 era up to 23% of Greek anaesthesiologists' working in referral hospital suffered from PTSD. Children and job satisfaction exhibited a protective role in contrast to higher ranks of job hierarchy.

14AP04-02
Sustainable Independent Measurement of Perioperative mortality and complication rates for low-and middle-income countries – initial evaluation of a pilot project at King Faisal Hospital, Rwanda (SIMPL-pilot KFH)

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Background and Goal of Study: Perioperative Mortality Rate (POMR) is an endorsed indicator of surgical and anaesthesia quality and safety. However, POMR is often not tracked in clinical routine in low and middle-income countries (LMICs). Without knowledge of POMR and perioperative complications the assessment of the current levels of quality and safety and the success of future interventions cannot be accurately and reproducibly measured.
In LMICs, resources are scarce and tracking POMR must be easily executed with little additional staff time. SIMPL-pilot KFH aims to evaluate local POMR at King Faisal Hospital (KFH), Kigali, Rwanda, with minimal effort for local staff via the smartphone-based REDCap app. Up until now, the REDCap app has not routinely been used for research in LMICs.
We aim to identify challenges that should be considered when setting up this digital data collection tool in LMICs.
Methods: SIMPL-Pilot KFH started 08/24/22 and is collecting data for 6 months via the REDCap app v.12.5.16. Information on challenges encountered during the conceptualization and implementation phase was collected in online meetings and in-person.
Results and Discussion: Hospitals from three countries in Sub-Saharan Africa expressed interest in joining the international research project. Conceptualization took place for 12 months. No challenges were reported. The first hospital completing the IRB approval process was KFH. Only local hospital-based IRB approval was required which facilitated time planning. Understanding patient flows and splitting responsibilities of data entry minimized the workload for involved local staff and aided ongoing data collection.
Set-up of the app on all involved staff's phones required 9 detailed working steps including e-mail communication on app and ethical training with the U.S. based provider. This was reported to be difficult and slowed installation for each data entry person. Entering data requires 15 steps in the app.
Despite minor connection problems, data on more than 1000 cases was collected within the first 3 months. Set-up of the app, training and data entry should be simplified.
Conclusion: Digitalisation facilitates conceptualization, communication, and implementation in international research collaborations. The REDCap app has the potential to enable widespread tracking of POMR and perioperative complications in settings without dedicated research resources. In order to be scaled up the tool requires simplification.

14AP04-03
Walkabout safety audit: a method for monitoring standards in anaesthesia

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Background and Goal of Study: Anaesthetics Clinical Standards Accreditation (ACSA)[1] is a Royal College of Anaesthetists accreditation scheme where participating departments benchmark their performance against a set of standards. ACSA is a marker of quality and safety in patient care. Compliance is assessed across five domains: the care pathway; equipment, facilities and staffing; patient experience; clinical governance; and sub-specialties.
The aim of the project was to achieve measurable improvement in compliance across multiple ACSA standards. The Walkabout is a cost-effective method to identify strengths and weaknesses across all domains.
Materials and Methods: A digital form was devised that required no expert knowledge to use. It contained 30 questions pertaining to ACSA domains. The form was adapted to address different unmet standards. Rota visibility, Handover, Emergency protocols, Equipment and Drugs were all addressed with one 'Walkabout'.
Direct questions were asked to a random selection of theatre staff, other questions were answered by checking equipment directly or asking relevant staff. Each walkabout took around 30 minutes. Interventions were made according to findings and repeat use of the walkabout tool made multiple incremental improvements in different areas simple to measure.
Results and Discussion: The Walkabout effectively measures standards of care as defined by ACSA and is efficient in identifying gaps and creating improvement opportunities. We have measurably improved our ACSA compliance and safety in multiple standards. Performing the audit improves the education of our staff and creates opportunity for multiple offshoot quality improvement projects to implement rapid change.
Of note, we introduced QR code checklists to improve documentation of the Difficult Airway Trolley and Transfer Bag compliance. We improved signage of emergency equipment and information. The results also allowed the department to secure funding for a duty floor anaesthetist.
Conclusion: Awareness of safety gaps, education and opportunity for rapid improvement were valuable aspects of the walkabout. Many staff had ideas and opportunity to improve the safety systems, ensuring all were empowered to implement sustainable change. Simplicity and adaptability will enable the walkabout tool to be rolled out, both within the Trust and other anaesthetic departments.
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14AP04-04
Drug errors in paediatric intensive care: a thematic analysis of frequency and severity

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Background and Goal of Study: edication errors are thought to be common in intensive care[1]. The busy, stressful environment, combined with the complexity of prescriptions and a vulnerable patient group mean that understanding high risk prescriptions is especially important. The additional burden of weight-based calculations in paediatric adds another portential source of error. Our unit uses an electronic prescribing system. Each prescription is reviewed by a pharmacist.
The aim of this study was to retrospectively review all medication errors to determine which drugs in paediatric intensive care carry the highest risk.
Materials and Methods: We retrospectively reviewed all medication errors as reviewed by pharmacists over a 2 year period at a tertiary paediatric intensive care. The medication errors were assessed with regard to the type of error, the level of harm, the frequency of the error and the source of the error. We paid particular attention to high risk drugs and 10 x errors. Through this analysis we were able to create patterns of high risk drug prescriptions and put strategies in place to mitigate error.
Results and Discussion: We identified the top 10 sources of medication error. Sedative drugs were not only drugs that had frequent errors, but also a high degree of potential harm. Fentanyl, chloral hydrate, midazolam and ketamine were all identified as high risk. Electrolytes were also associated with high risk of 10x overdose.
Conclusion(s): This study retrospectively reviewed and categorised all medication errors on a paediatric intensive care. We were able to demonstrate the highest risk drugs in order to put strategies in place to minimise harm to patients.
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14AP04-05
Intubation Bundle: Aa tertiary centre audit of clinical practice and adverse events of tracheal intubation out of operation theatre

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Background and Goal of Study: Tracheal intubation is commonly performed outside the operating theatre to secure airway during an emergency or while resuscitation of physiologically unstable patients. The present study is aimed to assess the current practice, compliance with the Difficult Airway Society guidelines, and the incidence of adverse events during out of theatre intubation in our hospital.
Materials and Methods: We performed an observational audit examining all tracheal intubations occurring outside the operating theatre in tertiary cancer centre over a 6 month period. Data were collected on intubation techniques, presence of essential safety equipment and monitoring, and adverse events.

Results and Discussion: Thirty-two out of theatre intubations were performed excluding cardiac arrest. The most common indication was respiratory failure [13 cases (40.6%)] followed by sepsis [5 cases (15.6%)]. Intubation for respiratory failure along with sepsis and aspiration were 4 cases respectively (12.5%). Crash cart and intravenous access were present in all cases.

A combination of etomidate and ketamine [9 cases (28.1%)] and ketamine alone [8 cases (25%)] were used as induction agent. Opioids were used in all cases and neuromuscular blocker succinycholine was used in 28 cases (87.5%).

Rapid sequence induction was performed in 26 cases (81.3%) and airway secured with endotracheal tube with first attempt in 22 cases (68.8%), with stylet in 21 cases (65.5%) and bougie in 5 cases (15.6%).

Capnography was used only in 3 cases (9.4%). Adverse events like death, hypotension, aspiration, dysrhythmias and oesophageal intubations were present only in 2 cases respectively (6.3%). Use of intubation aids and first attempt in securing airway has significantly reduced adverse events (p value= 0.070). Nineteen cases (59.4%) had no complications due to adherence to difficult airway guidelines.

Conclusion(s): Airway can be successfully secured and adverse events can be reduced by adhering to intubation bundle guidelines in out of theatre intubations.

Reference:

1. T. M. Bowles, D. A. Freshwater-Turner, D. J. Janssen, C. J. Peden, on behalf of the RTIC Severn Group, Out-of-theatre tracheal intubation: prospective multicentre study of clinical practice and adverse events, *BJA: British Journal of Anaesthesia*, Volume 107, Issue 5, November 2011, Pages 687–692

14AP04-06
Validation of a novel electronic monitoring system for hand hygiene of anesthesiologists during the induction of anesthesia – simulation based study

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Background and Goal of Study: Hand hygiene is one of the most effective ways to prevent transmission of healthcare-associated infections. However, the level of hand hygiene compliance among anesthesia providers is persistently low. We developed an artificial intelligence-based system, which continuously detects hand hygiene opportunities and the adherence to hand hygiene guidelines with performance feedback. In this preliminary study, the accuracy of the system was assessed.

Materials and Methods: An automated electronic camera-assisted system was installed in a simulation operating room. Three cameras were placed over hand sanitizer dispenser, head of the patient simulator, anesthesia cart and computer workstation. The system is based on artificial intelligence, deep learning, video analysis and rules control system.

Anesthesiologist's hands movements during the induction of anesthesia were detected and the compliance to hand hygiene rules was determined. Ten anesthesiologists participated in the study.

Each anesthesiologist was asked to prepare the operating room for anesthesia, insert an intravenous line, perform induction of anesthesia, and document the relevant information in the anesthesia record system. The ability of the system to detect hand hygiene opportunities and deviations from hand hygiene guidelines was compared to that of the direct observation by the researchers.

Results and Discussion: A total of 132 interactions with equipment and patient were performed by participants and observed by the researchers. The electronic monitoring system captured correctly 126 events (95.5%). From a total of 59 hand hygiene opportunities, 55 events were captured by the electronic monitoring system (93.2%). There were 4 false-negative events, that is, events that are observed but not captured by the system (false negative rate of 6.8%).

Conclusion: This preliminary data demonstrates a high level of precision for the evaluated electronic monitoring system to detect patterns of hand hygiene behavior among anesthesia providers under simulation conditions.

14AP04-07
Implementation of a new cognitive aid app for emergency management in anesthesia in a German pilot clinic – the DANGER study

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Background and Goal of Study: Since its release by the German Society for anesthesiology and intensive care medicine in August 2020 the "electronic cognitive aid for anaesthesiologic emergencies" (eGENA) has been available as a medical tool for emergency situations.(1)

As a pilot clinic, we performed a detailed assessment of our current emergency management. In the context of the introduction of eGENA we asked our personnel to participate in a survey. For the first time eGENA can be described before, during and after the implementation into clinical practice.

To answer the question whether the eGENA app leads to more safety in emergency treatment in anesthesia or not and if it is feasible to implement cognitive aids in our safety management of anesthetic emergencies.

Materials and Methods: From February to March 2021 98 employees were in-house trained. (Training rate >92%). They completed two emergency trainings and a 25 questions evaluation. Results were shown as the mean value +/- standard deviation. Wilcoxon-test was used for significance tests ($p<0,05$).

Results and Discussion: Physicians (n=47) scored with 6,15 +/- 2,20 out of 10 points in a self-assessment of their confidence managing anaesthesiologic emergencies. There was no significant difference between specialised and general nurses (n=38) with 6,55 +/- 1,86 points. ($p=0,31$) Trainee anaesthesiologists scored significantly lower (4,88 +/- 2,05) than trained anaesthesiologists (7,48 +/- 1,44). ($p<0,001$) 54,0% found the former emergency management predominantly or entirely satisfactory. Both groups see potential in the app but physicians consider the use of a digital checklist as more useful than nurses ($p= 0,003$), also in emergency situations. ($p<0,001$)

Since the app is completely new so far, there is hardly any data on it. Current results reflect investigations of the implementation in a large hospital and can be helpful for the further expansion of the app.

Conclusion(s): With good planning and initiative, the implementation of eGENA is possible. Repeated emergency training will enhance patient safety and eGENA will be a valuable adjunct. Further research should investigate the impact on quality of emergency management and patient safety.

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14AP04-08
Animal model for biomonitoring ropivacaine from plasma, urine and tissue: a useful tool for improving patient safety

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Background and Goal of Study: Ropivacaine is a local anesthetic used in regional anesthetic practices such as nerve blocks. Due to side effects associated with ropivacaine toxicity, biomonitoring studies are an essential tool for optimizing administration and dosage, which necessitate selective, accurate, and sensitive analytical methods to correctly assess the absorption, distribution, metabolization, and elimination pattern of ropivacaine.

Materials and Methods: An LC/MS system consisting of a highly sensitive and selective QTOF mass spectrometer coupled with a high-performance liquid chromatograph was used to develop a suitable method for quantifying ropivacaine and its main metabolite, 3-hydroxy-ropivacaine, from biological matrices. For analytical separation, a Gemini-NX C18-type chromatographic column was used with aqueous formic acid and methanol as mobile phases in gradient elution. Detection was optimized and carried out in MS/MS mode, by selective fragmentation of the analytes, after positive ESI ionization. Fast and simple protein precipitation of plasma and one-step liquid-liquid extraction for urine and tissue samples were used for analyte extraction and sample clean-up.

Results and Discussion: Ropivacaine was monitored by mass spectrometric fragmentation of m/z 275.2 to m/z 126.1, while for the metabolite fragmentation pattern m/z 291.2 to m/z 126.1 was used. Isotopically labeled ropivacaine-d7 was ideal as an internal standard and monitored through fragmentation of m/z 282.2 to m/z 133.1. Method gradient was optimized for short analysis times (10 minutes per sample) and good analytical separation. The calibration interval was 0.575-1150 ng/ml for both ropivacaine and its metabolite. The method was used on preclinical samples from rats and showed that ropivacaine and its metabolite are present in all organs, in a concentration between 57.32 ng/g and 611.93 μg/g, after ropivacaine infiltration.

Conclusion(s): Biomonitoring of ropivacaine is essential for understanding health risks to patients and improving treatment. The LC-MS method developed is simple, sensitive, and selective, and proved to be adequate for biomonitoring and bioavailability studies, while the large calibration interval allows for versatility in study designs. Results of the preclinical pilot study were encouraging and offer valuable information for further biomonitoring and bioavailability studies, enabling improvement of treatment for patients undergoing surgical procedures.

14AP04-09
Too noisy to be safe: an observational study on noise in the operation room during anesthetic induction

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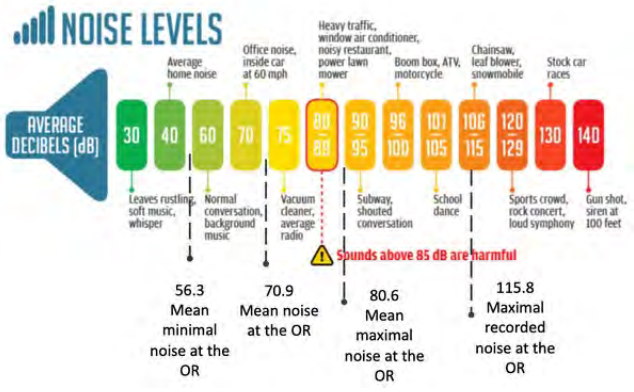
Background and Goal of Study: Noise in the operating room is common and is associated with negative effects for anesthesiologists, surgeons and patients. Induction of anesthesia is one of the noisiest perioperative periods. Despite its critical nature, there is little data on noise levels during induction, which represents the most critical moment for the anesthesiologist and also probably the most dreaded for the patient.

Materials and Methods: Our objective was to quantify noise exposure during anesthetic induction in patients requiring general anesthesia in elective noncardiac surgery in 3 operating rooms of a single center for 2 weeks. Decibels were measured using the calibrated Sound Meter IOS (Apple) application. Decibels (dB) were recorded from the cannulation of a peripheral line in the operating theater to the capnography check after orotracheal intubation, a time representing the period of greatest stress for both patient and anesthesiologist in charge.

One person collected the data. He positioned himself in each theatre so that he was as close as possible to the anaesthetist (so as to represent the anaesthetist's perspective most accurately) without causing any obstruction or interfering with the working environment.



Results and Discussion: Forty-two theater cases were included. Mean and standard deviation (SD) mean noise levels were 70.9 (6), while mean minimum noise levels were 56 (11) and maximum noise levels were 86 (8.4). The maximum noise peak was 115.8 dB. The mean monitoring time was 5 minutes, 6 seconds. Noise levels can be a contributing factor to a number of patient safety events; one of the most detrimental acute effects of noise pollution in the operating room is the interference it imposes on verbal communication, which

is necessary during the critical phase of anesthetic induction. While the average noise we have observed is acceptable, the maximum noise averages and peaks are unacceptable.

Conclusion(s): We documented noise levels well above recommended levels during anesthetic induction. anesthesia that may compromise the quality of the anesthesia.

14AP04-10
Using the PAPER acronym to improve clinical decision making in emergency situations in students from a German medical school

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Background and Goal of Study: Clinical Decision Making (CDM) is the process of choosing the best available option to treat a patient. CDM is an essential skill for all medical professionals. Nevertheless, CDM is only implicitly taught in many medical schools. So, training time should be dedicated to this topic.

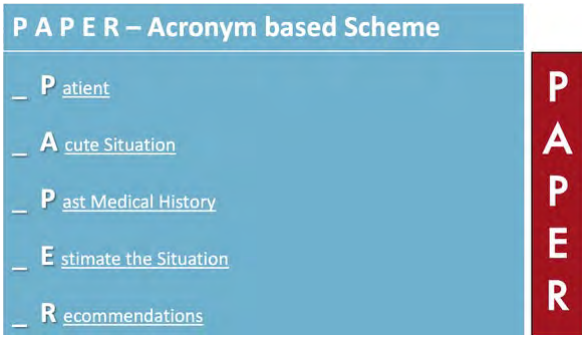
Our goal was to develop an acronym-based scheme to assist CDM in emergencies and pilot the acronym in clinical simulations.

Materials and Methods: The content of the acronym was established from the input given in a Delphi forecast (DF). Clinical experts were asked to submit aspects of clinical management which they thought were essential for CDM in an emergency setting. The final acronym was created after 3 Rounds.

The Acronym was then piloted in a randomized controlled study during simulation-based courses for medical students. We included students in the 4th and 6th year of training to assess the timing of implementation. The control group (CG) completed the simulation teaching with post simulation feedback, while the intervention group (IG) received a presentation on the theoretical aspects of CDM and the acronym as a CDM tool before.

Clinical performance was rated using a checklist and the Anaesthesia Non-Technical Skills (ANTS) checklist. Participants completed a cognitive load (CL). CG and IG were compared with ANOVA accounting for semester.

Results and Discussion: After three rounds of DF, a consensus on the items in the acronym was reached (see figure).



194 students participated in the study and were randomly distributed into CG and IG, no difference between the clinical management (p=.86) or in the ANTS (p=.79) was seen. Differences were seen in the cognitive processing between CG and IG (p<.05). Older students showed reduced CL compared to the younger students (p<.05). While CL increased for the younger students but did not affect performance.

Conclusion: The PAPER Acronym can be used to teach CDM for novices. Younger students show increased cognitive demands while practicing CDM. The timing as well as the method of teaching CDM is crucial to reduce CL. Research is needed to establish when and how CDM can be explicitly taught.

14AP04-11
Preventing medication errors during the administration of intravenous infusions by increasing the use of 'smart' pumps and drug libraries in a network of 5 hospitals

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Background and Goal of Study: Errors during the administration of intravenous (IV) medications can cause significant morbidity and mortality. Smart pumps with drug libraries reduce the risk of such errors. Yet many healthcare professionals do not use this widely available technology.

Aim: Decrease harm by preventing errors during the administration of IV infusions.

Materials and Methods: An audit identified underuse of the drug libraries in the smart infusion pumps at our institution. So the factors preventing use of the drug libraries were identified and addressed using several plan, do, study, act cycles. Each initiative was first piloted in one centre. Successful interventions were implemented throughout the healthcare network of 5 hospitals. All drug libraries were updated and standardized by March 2019. The drug library usage was monitored (monthly, quarterly, and annually) using the manufacturer's software.

Results and Discussion: Compliance with the use of the drug libraries increased from 48% in January 2017 to 98.5% in August 2022 throughout the hospital network (Figure 1). Standardization of the drug libraries was completed in March 2019.

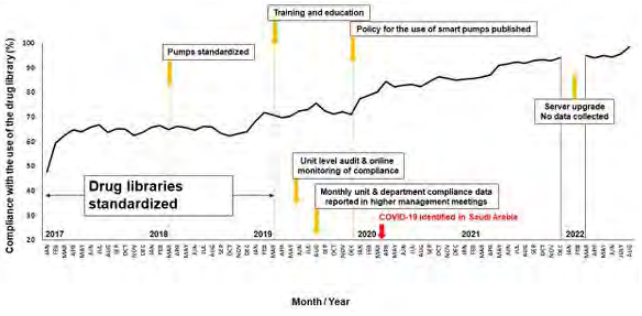

Figure 1. Increase in drug library use throughout the healthcare network.

In 2020 the pumps administered 7,197,472 medications. The drug libraries were used for 5,953,869 medications (83%) and prevented 134,080 attempts to exceed the programmed hard stop limits. It is unlikely that users attempted to exceed the hard stop more than once. Iatrogenic drug overdoses were prevented in up to 2.25% of infusions during 2020 alone.

Conclusion(s): Prevention of medication errors has significant benefits for patients, healthcare professionals and healthcare systems. After an audit highlighted the scale of the failure to use the drug libraries a survey of the end users identified the reasons for this. Targeted remedial actions increased the use of the drug libraries. The appropriate use of smart pump technology prevented many medication errors during the COVID-19 pandemic. As the error reduction software was already available within the institutions' smart pumps the financial cost of this initiative was negligible.

14AP04-12
Association of anesthesiologist's sex with 30-day-mortality: a retrospective analysis

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Background and Goal of Study: The influence of patient's sex on various outcomes is well known. Recently an increased mortality was found in female patients treated by male surgeons. This leads to the question of anesthesia provider's sex influence on postoperative outcomes, namely 30-day-mortality as a reliable endpoint.

Materials and Methods: Differences in 30-day-mortality between patients treated by male and female anesthetists were investigated. Therefore, a retrospective database analysis was done using the routine documentation of an academic center. To correct for competing risks, patient sex, age, ASA score and duration of anesthesia were used. Anesthesia quality benchmarks were compared as secondary outcome. The benchmarks were: Normotension (<65mmHg for < 15min), protective ventilation (tidal volume of <8ml/kg predicted body weight) and normothermia (>36°C within 30 minutes before anesthesia end time). A logistic regression was modelled using those factors as independent variables.

Included were all cases without changes in treating anesthesiologist between 1.1.2014 and 31.3.2022 at an academic center. Excluded were all cases with incomplete datasets, especially regarding quality indicators.

Results and Discussion: Complete datasets were available for 124.984 cases with a mean 30-day-mortality of 1.9% (SD: 13.7%) and a mean age of 49.6 (SD: 21.9). 47.2% of patients were male, 60.0% of providers were male. In a univariate analysis, there was a significant difference in 30-day-mortality between male and female providers ($p < 0.01$) In the multivariate logistic regression, again a small but significant association between male provider's sex and 30-day-mortatlity could be shown. (OR: 1.15, CI: 1.05, 1.26). In all three quality indicators, male provider sex was associated with slightly increased rates of normotension (OR: 1.07), normothermia (1.06) and protective ventilation (1.17).

To ensure that male and female providers had a similar case mix, ASA scores, anesthesia duration and age were compared with no significant differences between the groups.

These results show that there is an association between anesthesia provider's sex and 30-day-mortality. Further and more detailed research is necessary to show not only an association but to further investigate the possible causes of this phenomenon.

Conclusion(s): In a retrospective cohort of 124.984 cases, male provider's sex was associated with increased 30-day-mortality.

14AP04-13
Safe transfer from emergency department resuscitation area to CT: a quality improvement project

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Background and Goal of Study: To increase the use of 'Safe to Transfer Checklist' for patients going from to resus to CT at the RAH by 40%. Through this quality improvement project we hope to make transfer of unwell patients safer.

Why is this important? Datix data at the Royal Alexandra Hospital and Inverclyde Royal Hospital shows there is a 2222 call CT scan every 2 weeks. It is well documented that safety checklists can reduce adverse events, improve human factors and reduce morbidity and mortality, especially in busy, stressful situations[1].

Materials and Methods: Quality Improvement tools utilised:

- Process mapping to identify stakeholders and where changes could be made
- PDSA cycles
- Run charts to describe data

Tests of change: email advertisements, posters, QR codes, staff education

Measures:

Outcome measure: frequency of checklist use

Process measure: staff feedback regarding the user friendliness of the checklist

Balancing measure: time to complete the checklist

Results and Discussion: The diagram is a run chart of checklist use. The initial introduction of the checklist did not lead a sustained increase in use of the checklist. However, creating colourful posters and creating a QR code link to the checklist, increased use of the checklist by 75%. The average time to complete checklist was <90 seconds.

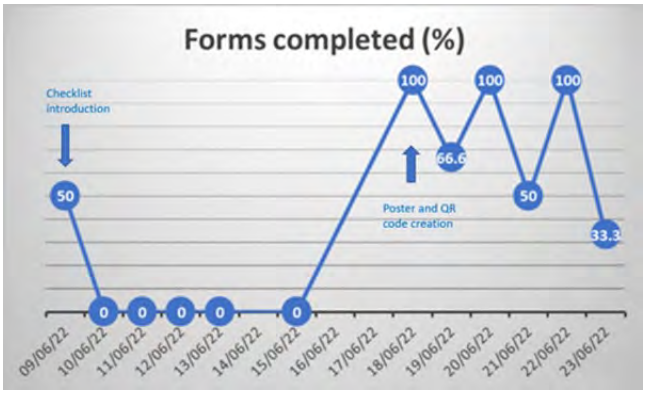

Figure.

Conclusion(s): This is an on-going quality improvement project. We are now in the process of creating an HDU safe transfer checklist.

Reference:

1. Application of the WHO surgical safety checklist outside the operating theatre: medicine can learn from surgery. DL Braham, AL Richardson, IS Malik. Clinical Medicine Journal. 2014. https://doi.org/10.7861/clinmedicine.14-5-468

Geriatric Anaesthesiology

15AP01-01
Modified frailty index may predict intraoperative complications in older women with endometrial cancer undergoing laparoscopic or robotic assisted surgery: a multicenter observational study

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Background and Goal of Study: To assess and evaluate the strength of the association between the modified frailty index (mFI) and intraoperative and postoperative complications in patients undergoing laparoscopic or robotic-assisted surgery for endometrial cancer.
Materials and Methods: A retrospective observational multicenter (five italian centers) study using data from a prospective filled up database was performed. Frailty was defined as a modified Frailty Index (mFI) score of ≥3. Logistic regression was used to assess the impact of mFI upon the rate of intraoperative and early (within 30 days from surgery) and delayed (beyond 30 days from surgery) postoperative complications.
Results and Discussion: The study involved 577 women, 7.9% (n= 40) were frail with an mFI ≥3 and 93.1% (n= 537) were non-frail with an mFI of 0-2. Notably, frail women had a significantly higher rate of intraoperative complications (7.5% vs 1.7%, p<0.01) with 4.76 greater odds (95% CI 1.23-18.32, p=0.02). There was no difference in the rate of intraoperative complications (15% vs. 6.9%, p = 0.06) and delayed postoperative complications (3.9% vs. 2.5%, p=0.65) for non-frail versus frail patients
Conclusion(s): This multicentric analysis of women with endometrial cancer who underwent robotic or laparoscopic surgery demonstrates that frailty, defined by an mFI ≥3, is associated with a significantly higher risk for intraoperative complications, supporting the practice of assessing frailty before surgery to predict the early outcome better
References:
1. Aceto P, Antonelli Incalzi R, Bettelli G, Carron M, et al. Perioperative Management of Elderly patients (PriME): recommendations from an Italian intersociety consensus. Aging Clin Exp Res 2020;32:1647-73.
2. Mullen MM, Porcelli BP, Cripe J, Massad LS, et al. Thaker, Modified frailty index is predictive of wound complications in obese patients undergoing gynecologic surgery via a midline verti- cal incision, Gynecol Oncol 2020;157:287-292.
3. Aceto P, Perilli V, Luca E, Schipa C, et al. Predictive power of modified frailty index score for pulmonary complications after major abdominal surgery in the elderly: a single centre prospective cohort study. Eur Rev Med Pharmacol Sci 2021;25:3798-3802.

15AP01-02
Surgical futility in elderly patients - a retrospective cohort study

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Background and Goal of Study: Metrics that define surgical futility based on patient-centred outcomes in older surgical patients are missing. We therefore aimed to evaluate the incidence of surgical futility, using the patient centred tool Days-alive and out-of-hospital during the initial 90 postoperative days ($DAOH_{90}$), among patients 80 years and older having non-cardiac surgery. We also aimed to identify risk factors associated with such surgical futility.
Materials and Methods: We conducted a retrospective analysis of patients 80 years and older having non-cardiac surgery in a single tertiary academic care centre from January 2017 to July 2021.
The primary outcome was the incidence of surgical futility, defined as $DAOH_{90}$≤45 days, or mortality within 90 postoperative days. Multivariable logistic regression models were used to identify independent risk factors for surgical futility.
Results and Discussion: Among 5,656 patients that were included in the analysis (median age 85 years, 56% women, 66% with ASA score ≥3), 991 patients (18%) were considered to have futile surgeries. Of these, 583 patients (10%) met the outcome definition due to 90-day postoperative mortality.
The most significant risk factor for surgical futility was urgent surgery with adjusted odds ratio of 2.02 (95% confidence interval 1.74-2.34). Age, comorbidities, and anaesthetic and surgical risk were also independently associated with futility.
Conclusion(s): Octogenarians and nonagenarians have a non-trivial rate of surgical futility. Age, comorbidities, and anaesthetic and surgical factors are associated with even greater risk. Future research should aim to create risk stratification tools for better prediction of futility, and improved decision-making processes regarding surgeries in elderly.

15AP01-03
Predicting primary postoperative respiratory failure in older adult patients undergoing hip fracture surgery

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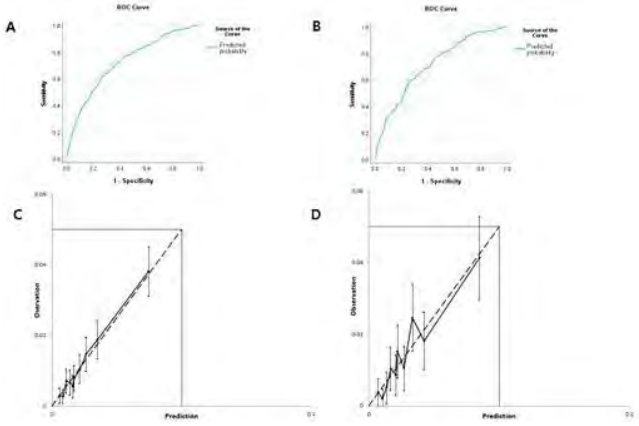
Background and Goal of Study: Respiratory failure (RF) is a serious complication following hip fracture surgery (HFS) in older adults, but the factors that denote increased risk of this complication have not been clearly delineated. This study aims to determine the incidence, pre-operative risk factors, clinical applications of postoperative respiratory failure in older adult underwent HFS.
Materials and Methods: The American College of Surgeons National Quality Improvement Program (ACS-NSQIP) dataset (2016-19) was used to identify a retrospective cohort of older adults (age >65) undergoing HFS. Independent preoperative risk factors for postoperative RF were identified using stepwise multivariable logistic regression. RF was within defined as failure to wean from the ventilator within 48 hrs after surgery or unplanned intubation/reintubation intraoperatively or postoperatively until 30 days after HFS,



Results and Discussion: We identified 41403 patients for inclusion, of which 28771(70%) and 12632 (30%) were randomly assigned to the derivation and validation cohorts, respectively. RF developed in 265 (1.2%) and 186 (1.4%) of patients in the derivation and validation cohorts, respectively. Stepwise multivariable logistic regression model identified 12 variables as independent risk factors for postoperative RF:
1. male,
2. ASA Physical Status 3-5 (vs ASA 1-2),
3. preoperative dyspnea,
4. chronic obstructive pulmonary disease,
5. congestive heart failure,
6. preoperative dialysis,
7. preoperative bleeding disorder,
8. preoperative transfusion,
9. preoperative blood urea nitrogen ≥30,
10. preoperative international normalized ratio,
11. surgery >1 day after admission, and
12. general anesthesia.

The model demonstrated good discrimination (c statistic = 0.724 (95% CI 0.694-0.754)) and was well-calibrated (Hosmer-Lemeshow p=0.747)). When applied to the internal validation cohort, the model had similar discrimination (c statistic = 0.712 (95% CI 0.679-0.753)) and calibration (p=0.246).
Conclusion(s): Postoperative RF is a serious complication after HFS in older adults. This model may help to identify patients who are at increased risk of RF during the perioperative period.

15AP01-04
Routine screening for preoperative frailty using the Clinical Frailty Scale in older elective surgical patients

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Background and Goal of Study: The American College of Surgeons recommends preoperative frailty screening in older surgical patients. The "Clinical Frailty Scale" (CFS) is a validated tool for frailty screening ≥ age 65. Since 2022, all elective surgical patients ≥70 years of age are screened for frailty using the CFS as part of the pre-anesthesia evaluation in the Tel-Aviv Medical Center. We aimed to evaluate the correlation of the CFS on cognitive impairment and postoperative delirium in elective elderly surgical patients.
Materials and Methods: Retrospective single-center cohort study of 2022. All elective surgical patients ≥70 years old without pre-existing dementia were included. CFS scores were grouped into 3 categories: 1-3 "non-frail", 4-5 "mild frail", 6-9 "moderate-severe frail". Impaired cognition is defined as a preoperative Mini-Cog score ≤2. Postoperative delirium is a 4A's test score ≥4 during PACU stay or 48-hours postoperative.
Results and Discussion: In total, 1,922 subjects were eligible and 1230 (64%) were screened for pre-operative frailty and included. Of whom 846 (70%) in the non-frail group, 236 (18%) were mild-frail, and 148 (12%) were moderate-severe frail (fig1). The moderate-severe frail patients were older (median [IQR], 79 (74,84) compared to the mild 77 (73,83) and non (75 (72,79) groups, p<0.001), had higher ASA PS (82% (severe) vs 70% (mild) vs 36% (non) P<0.001), only severe frail had a higher prevalence of cognitive impairment compared to mild or non-frail (37% (severe) vs 18% (mild) and 16% (non), p<0.001 [(OR=2.6 95% CI [1.6-4.3]), but even mild-frail had a higher incidence of postoperative delirium (15% (severe) vs 13% (mild) vs 5% (non) p<0.001, (OR=3.1 95% CI [1.8-5.3]). no differences were found between the groups in terms of sex or surgical severity (using the POSSUM system). (table1)
Conclusion(s):
• 30% of older elective surgical patients are frail.
• While only moderate-severe frailty was associated with cognitive impairment, even mild frailty was found to be associated with postoperative delirium
• Screening for frailty is simple, feasible and defines high-risk populations at whom interventions should be aimed
References:
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15AP01-05
Preoperative sarcopenia in elderly patients scheduled to colorectal surgery. Incidence and relationship to length of stay and postoperative complications

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Background and Goal of Study: Sarcopenia is common in elderly patients. Some authors suggest that sarcopenia is related to the appearance of postoperative complications[1].
The goal of the study is to evaluate the incidence of sarcopenia in patients over 70 years scheduled to oncological colonic surgery and the relationship between sarcopenia with length of stay and postoperative complications.
Materials and Methods: After ethics committee approval, we designed a retrospective study of patients over 70 years scheduled to oncological colonic surgery during 2021.
Sarcopenia was defined as probable by EWGSOP2 guidelines if the values of strength measured with hand grip dynamometer were <27Kg in men or <16Kg in women.
We revised the patients and divided them into 2 groups (sarcopenic group and control group) depending on the incidence of preoperative sarcopenia (hand grip recording was performed in the preoperative evaluation).
All patients were managed following the standard intraoperative protocol of our hospital.
We collected demographic variables (gender, age, BMI, ASA status and Rockwood Clinical Frailty Scale) and intraoperative data (type and duration of surgery).
We analyzed length of stay (LOS) and incidence of postoperative complications measured by the Comprehensive Complication Index (CCI) comparing the sarcopenic and the control groups.
Statistical Analysis: Mann-Whitney U test for LOS and CCI.
Results and Discussion: We included 46 patients, finding a 39% incidence of sarcopenia. We finally divided the patients in 2 groups:
- Sarcopenic Group (n=18)
- Control Group (n=28)

No statistical differences found between groups in demographic or intraoperative data.
The median (range) LOS in the sarcopenic group was 10 (4-30) days while in the control group was 5 (4-23) days ($p<0.05$).
The sarcopenic group also had a higher median CCI 21.75 (0-52.4) compared to the control group 8.7 (0-61.5) without achieving statistical significance ($p=0.4$).
Conclusion(s): Sarcopenia is common in elderly population and it's related to an increase in LOS and a tendency to develop more postoperative complications.
Sarcopenia in elderly patients must be investigated and treatment strategies directed to improve this condition should be designed.
Reference:
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15AP01-06
An immune signature of postoperative cognitive dysfunction (POCD), a prospective cohort study

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Background and Goal of Study: Post-operative cognitive decline (POCD) is one of the most common postoperative complications in elderly patients undergoing major surgery. While emerging preclinical evidence suggests that the systemic immune response to surgical trauma is a key pathobiological process driving POCD, studies in patients are critically lacking(1).
Materials and Methods: Blood samples from 33 elderly patients undergoing major orthopedic surgery - for whom the postoperative cognitive status was evaluated - were collected over four timepoints before and after surgery (day of surgery (DOS) and postoperative days (POD) 1, 7, and 90). They were analyzed using a combination of single-cell mass cytometry and plasma proteomics.
We employed unsupervised clustering from correlation networks and univariate analyses to characterize the trajectory of immune cell distribution and signaling responses in patients with or without POCD. A stacked generalization (SG) predictive modeling approach was applied to classify patients at risk for POCD before surgery(2).
Results and Discussion: Unsupervised analysis of the high-dimensional immunological data collected before and after surgery identified cell-type and signaling-specific immune trajectories differentiating patients with and without POCD.
Examination of the most prominent trajectory features revealed early exacerbation of JAK/STAT and dampening of IκB and NF-κB immune signaling responses to surgery in patients with POCD.
Further analyses integrating immune cell responses, proteomic, and clinical data collected before surgery identified a robust predictive SG model that classified patients with and without POCD with excellent accuracy (AUC = 0.86, p = 2.2e-03).
Conclusion(s): The single-cell immune system analysis of elderly patients undergoing surgery identified immunological trajectories differentiating patients with and without POCD, revealing a peripheral immune signature of POCD.
In addition, a pre-operative multi-omic model accurately predicted the later development of POCD, providing a promising strategy for future development of a diagnostic test for POCD guiding the individualized care of surgical patients.
References:
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15AP01-07
Mid-term survival among the eldest old undergoing elective surgery: when and if to start, and when to stop

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Background and Goal of Study: The sustained increase in the extreme elderly population poses important challenges when surgical decisions are needed. It is not always obvious which factors should discourage surgery, and once completed it is difficult to determine when further therapeutic efforts no becomes futile.
The aim of this study is to determine which pre-operative factors and which post-operative complications reduce 6 months survival rate in this population.
Materials and Methods: We performed a prospective cohort study. We included patients ≥ 85 years, who underwent elective surgery between 2011-2021. We excluded ambulatory and emergency surgeries and procedures that did not require anesthetic involvement. The dependent variable, days of postoperative survival, was studied at 6 months after surgery.
Pre-operatively, we collected demographic variables, comorbidities, type of surgery and key variables included in the Comprehensive geriatric assessment. Post-operatively, we registered complications, need to reoperate or readmission after discharge.
Categorical variables were analyzed using $\chi 2$ and Fischer's test. Kaplan Meier and log-rank test were used. To determine which factors independently reduced perioperative survival we used Cox regression analysis. Statistical significance was assumed at a P value of <0.05.
Results and Discussion: A total of 203 patients were included. Ninety eight were females. At 6 months follow up, the survival rate was 84.7%. The results of the Cox regression model shows that 5 variables were associated with a reduced 6 months survival rate: Severe dependency (Katz index) [HR 8.9 (95% CI: 3.7-21.6)], Alcohol consumption [HR 9.1 (95% CI: 2.4- 33.9)], Atrial Fibrillation [HR 2.8 (95% CI: 1.4-5.8)], Postoperative Pneumonia [HR 3.8 (95% CI: 1.1-13.9)] and Postoperative hydroelectrolitic disorders [HR 5.04 (95% CI: 1.9-13.2)]. Conversely, female gender was associated with better survival [HR 0.31 (95% CI: 0.14-0.72)].
Conclusion: These results suggest that elderly dependent men with alcoholism or atrial fibrillation are less likely to survive beyond 6 months after surgery. Similarly, post-operative pneumonia and hydroelectrolitic imbalances are serious complications that compromise survival. Consequently, our findings should help to make better informed decisions regarding surgery, and to actively prevent such postoperative complications.

15AP01-08
Complication and mortality predictors in elderly patients under hip fracture surgery

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Background and Goal of Study: Hip fracture in elderly patients is associate with complications and higher risk of mortality. Evidence showed that regional or general anesthesia has similar outcomes and early surgery could reduce mortality in elderly patients under hip fracture surgery. Our study goal was observed outcomes in elderly patients under hip fracture surgery.
Materials and Methods: Retrospective and one-center study to describe outcomes in elderly patients under hip fracture surgery.
Our primary outcome was observed complications and mortality.
Our secondary outcome was described complications and mortality predictors.
Results and Discussion: 144 patients were included. Median age was 88 years old, 89% women, 58% ASA 4 and 31% ASA 3. Pertrocanteric and subcapital fractures were present in 53% and 37% of patients, respectively. Spinal anesthesia was performed in 97% and general anesthesia in 3% of patients. Intraoperative hypotension requiring vasoactive drugs was seen in 59% of patients. Mortality was 3% and complications were present in 77% of patients. Tranexamic acid was administered intraoperatively in 39% of patients. Intraoperative hemorrhage requiring transfusion was present in 6% of patients. Postoperative anemia needing transfusion support was more frequent complication (71%), followed for Acute Kidney Failure (46%) and delirium (33.3%). Logistic regression showed that early surgery could reduce complications, but no predictor was found for mortality reduction.
Our little size study showed a typical elderly population presenting hip fracture requiring surgery. Patient variables like age, ASA, fracture type and anesthesia not affected complications or mortality, according to our analysis. A higher number of our patients presented complications but mortality was very low. Intraoperative administration of tranexamic acid probably explained a lower transfusion during this time. Postoperatively we found anemia as most frequent complication probably because this population is very prone to anemia worsening especially under losses related to hip fracture.
Conclusions: Our findings emphasizes that even in higher risk elderly patients an early surgery could reduce complications. Patient factors and anesthesia type not affected outcomes. Lack of mortality predictors in present study probably resulted of lower mortality observed and will require larger studies for describe variables influencing this outcome.

15AP02-01
The association between midazolam premedication and postoperative delirium: a retrospective cohort study

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Background and Goal of Study: Postoperative delirium is the most common postoperative complication in elderly surgical patients. Some evidence suggest that perioperative administration of benzodiazepines might increase the risk of postoperative delirium in elderly patients.
We therefore aimed to evaluate the independent association between midazolam premedication and postoperative delirium in a large retrospective cohort of patients ≥70 years.
Materials and Methods: We conducted a retrospective cohort study of patients ≥70 years having elective non-cardiac surgery under general anesthesia from 2020 to 2021.
The primary outcome, postoperative delirium, was a collapsed composite outcome including at least one of the following: a positive 4ATs test during post-anesthesia care unit (PACU) stay and/or the initial 2 postoperative days; physician or nursing records reporting new-onset confusion; or a positive 3D-CAM test performed by the geriatric health care team.
The association between midazolam premedication and postoperative delirium was assessed using multivariable logistic regression, adjusting for potential confounding variables. Several sensitivity analyses were performed using similar regression models.
Results and Discussion: In total, 1973 patients were included in the analysis (median age 75 years, 47% women, 50% ASA score ≥3, 32% high risk surgery). The overall incidence of postoperative delirium was 15.3% (302/1973). Midazolam premedication was administered to 782 (40%) patients (median [IQR] dose of 2 [1, 2] mg). After adjustment for potential confounding variables, midazolam premedication was not associated with increased odds of postoperative delirium, with adjusted odds ratio of 1.09 (95% confidence interval 0.82-1.45; P=0.538).
Midazolam premedication was not associated with postoperative delirium in any of the sensitivity analyses performed including separate investigation of delirium diagnosed in PACU and after PACU discharge, and sub-group analyses in patients ≥80 years, patients with preoperative cognitive impairment, and high-risk surgeries.
Conclusion(s): Our results suggest that low doses of midazolam can be safely used to pre-medicate elective surgical patients 70 years or older before non-cardiac surgery, without significant effect on the risk of developing postoperative delirium.

15AP02-02
Investigating anaesthetic factors for reducing postoperative delirium

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Background and Goal of Study: Postoperative delirium (POD) is an acute confusional syndrome that alters the consciousness, orientation, memory, perception, and behaviour of patients. Delirium is transient and reversible in most cases; it can occur immediately after anaesthesia or a seemingly normal recovery interval. Prevention of POD is a major healthcare concern, as this complication predicts mortality and lengthens hospitalization.
Currently, optimal intraoperative management of patients at risk for delirium is not well defined. To elucidate the potential anaesthetic role in reducing POD, we investigated POD risk factors during postoperative intensive care stay.
Materials and Methods: After the local ethics committee's approval (2020-1-1192), we conducted a retrospective review of patients transferred to the intensive care unit followed by desflurane- or propofol-based general anaesthesia. All cases were from the Tohoku University Hospital between January 2020 and December 2020. We excluded patients who were intentionally sedated or mechanically ventilated at the end of anaesthesia. The diagnostic criteria of POD were defined by the CAM-ICU, and the detailed characteristics of POD patients were compared with non-POD patients.
The chi-square test or the Goodness-of-Fit test, as appropriate, was used to compare non-parametric data, while parametric data were compared using Student's *t*-test.Multivariate logistic regression analysis was used to explore the relationships between POD and patient characteristics. Statistical significance was considered as $p<0.05$.
Results and Discussion: Among 1040 patients (62 ± 15 years old), 43 patients (4.1%; 71 ± 15 years old) were evaluated as POD. Univariate analyses showed a significant correlation between the incidence of POD and age ($p<0.001$), dementia ($p=0.019$), ASA-PS ($p=0.001$), surgical site ($p<0.001$), anesthesia method ($p=0.043$), anaesthesia time ($p=0.022$), operation time ($p=0.028$), tracheostomy ($p=0.003$), and lack of EEG monitoring ($p=0.010$).
Similarly, multivariate analysis with the logistic regression model showed that age (adjusted OR; 1.76, 95% confidence interval; 1.30-2.37), anaesthesia time (1.15, 1.05-1.27), surgical site (1.72, 1.25-2.39), tracheostomy (2.59, 1.02-6.58) and ASA-PS (2.18, 1.16-4.08) were significantly correlated with the incidence of POD.
Conclusion: Shorter anaesthesia time, among other patient- or surgical-related factors, could play a significant role in reducing the incidence of POD.

15AP02-03
Recovery from deep neuromuscular blockade using different sugammadex doses in elderly patients undergoing laparoscopic robot-assisted prostatectomy: a prospective, randomized, double-blind clinical trial (RECIR)

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Background and Goal of Study: A rapid and complete recovery from deep neuromuscular block (dNMB) in elderly patients could be required for clinical reasons, including an increased risk of postoperative recurarization (1).
It has been reported that, in elderly patients, adequate recovery of dNMB is achieved by an ED95 of sugammadex increased by about 50% compared to a standard dose (2).
We hypothesize that a dose of sugammadex increased by 50% compared to a standard dose could significantly shorten neuromuscular recovery time in elderly patients undergoing robotic-assisted laparoscopic prostatectomy (RALP).
Materials and Methods: After local Ethical Committe approval, this phase III, randomized double-blind controlled trial involved 34 patients (age ≥65 years) scheduled for RALP. All patients received 1 mg/kg rocuronium and intraoperative boluses (0.15 mg/kg) administered to ensure dNMB (post-tetanic count ≤2). Patients were randomized to receive sugammadex 4 mg/kg (group A) or 6 mg/Kg (group B) for dNMB reversal at the end of surgery.
The primary end-point was recovery time (in seconds) from dNMB to a train-of-four (TOF) ratio=1 measured at the adductor pollicis (TOF-Watch® SX).
Secondary end-points included: time to extubation; time to exit from the OR; PACU length of stay; hemodynamic and respiratory parameters after sugammadex administration. Mann-Whitney and chi-squared tests were used for statistical comparisons.
Results and Discussion: One patient was excluded due to a TOF-Watch battery malfunction. The time to a TOF ratio of 1.0 at the adductor pollicis was similar in group A (379±134;n=16) and in group B (328±149;n=17). Sugammadex 4 and 6 mg/kg reversed dNMB within 9.5 min and 10 minutes, respectively.
None of the secondary end-points showed a statistically significant relationship with the different doses of sugammadex. The occurrence of adverse events (25% vs 53%;p=0.10) and serious adverse (12.5% vs 17.6%;p=0.68) events was similar in A and B groups, respectively.
Conclusion: Sugammadex 4 mg/kg was sufficient to completely antagonize a deep rocuronium-induced neuromuscular block within 9.5 minutes.
References:
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15AP02-05
Time to recovery of two responses to train-of-four stimulation following different doses of rocuronium in patients 80 years and older: a secondary analysis

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Background and Goal of Study: A train-of-four (TOF) count of two allows administration of cholinesterase inhibitors for reversal of neuromuscular block. Limited data are available on time to recovery of two responses to TOF stimulation in elderly patients. We hypothesized that time to a TOF count of two would be shorter after rocuronium 0.6 mg/kg than after rocuronium 0.9 mg/kg.
In addition, we hypothesized that time to a TOF count of two would be shorter after rocuronium 0.3 mg/kg than after rocuronium 0.6 mg/kg.
Materials and Methods: This was a secondary analysis of data from two previous studies and included 50 patients > 80 years. A total of 16 patients received rocuronium 0.6 mg/kg, 16 patients received rocuronium 0.9 mg/kg, and 18 patients received rocuronium 0.3 mg/kg. All patients received total intravenous anesthesia, and neuromuscular block was monitored with acceleromyography. The primary endpoint was time to recovery of a TOF count of two.
Results and Discussion: Time to a TOF count of two was shorter after rocuronium 0.6 mg/kg than after rocuronium 0.9 mg/kg: 37 min (SD 10) vs. 59 min (SD 17) (difference: 22 min [95% CI 33 to 10], p = .0007). Time to a TOF count of two after rocuronium 0.3 mg/kg was shorter than after rocuronium 0.6 mg/kg: 19 min (SD 6) vs. 37 min (SD 10) (difference: 18 min [95% CI: 25 to 11], p = .00006). However, in 67% of the patients receiving rocuronium 0.3 mg/kg, a TOF count of zero was not obtained.

	Rocuronium 0.3 mg/kg	Difference with 95% CI p-value	Rocuronium 0.6 mg/kg	Difference with 95% CI p-value	Rocuronium 0.9 mg/kg
n	20		16		17
Age years	83 [82-84]		84 [81-83.5]		85 [84-86]
Sex M/F	10/10		3/13		4/13
BMI kg/m^2	25.4 (2.7)		26.7 (4.9)		25.1 (6.0)
ASA I/II/III	0/9/11		1/8/7		0/10/7
Type of surgery Orthopedic Plastic/breast Gynecology Other	 9 7 1 1		 0 9 1 6		 7 6 1 2
	n = 18*		n = 16*		n = 16*
Time to recovery of TOF 2 (min)	19 (6) n = 13 *	18 (25 to 11) p = 0.00006	37 (10) n = 13*	22 (33 to 10) p = 0.0007	59 (17) n = 14*
Onset time	227 (140) n = 6*	62 (-85 to 209) p = 0.34	165 (76) n = 16*	56 (12 to 101) p = 0.01	109 (40) n = 16*
Duration of action	46 (13) n = 16*	40 (56 to 24) p = 0.00005	86 (25) n = 13*	29 (-59 to 2) p = 0.065	115 (42) n = 11*
NMB reached TOF 0	6 (33%) n = 18*	67% (45%-88%) p = 0.00005	16 (100%) n = 16*	0 -	16 (100%) n = 16*

Continuous data presented as mean with (standard deviation) or with [interquartile range].
** number of patients with available data*

Conclusion(s): Time to a TOF count of two was shorter after rocuronium 0.6 mg/kg than after rocuronium 0.9 mg/kg. A dose of rocuronium 0.3 mg/kg resulted in a shorter time to a TOF count of two compared to 0.6 mg/kg, however, not all patients receiving 0.3 mg/kg obtained a TOF count of zero.

15AP02-06
The association between myocardial injury and 90-day mortality after hip fracture surgery

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Background: Hip fractures are a common cause of morbidity and mortality in elderly patients. Myocardial Injury after Non-cardiac Surgery (MINS) is associated with postoperative mortality, but it is unclear whether this association exists in patients having hip fracture surgery.

We therefore aimed to investigate the association between MINS and postoperative 90-day mortality in patients >65 years having surgical hip fracture repair.

Methods: We conducted a single-centre retrospective cohort study in a large volume tertiary medical centre and included patients >65 years who had hip fracture surgery between 5/2020 - 6/2022. MINS was defined as plasma cardiac troponin-I concentration >50 ng/L during the first 72 postoperative hours, supposedly of cardiac origin. Patients were therefore excluded for new diagnosis of PE, CVA, sepsis during the index admission, and end stage renal disease. Patient were also excluded for multi-trauma or pathologic and periprosthetic fractures.

The association between MINS and postoperative mortality was evaluated using pearson Chi-square correlation. Due to the small number of outcomes we were unable to perform a proper multivariate analysis.

Results: In total 1256 patients had hip fracture surgery during the study period. After excluding ineligible cases, 698 patients remained available for analysis (median [interquartile range (IQR)] age 84 [77, 90] years; 68% females; 68% ASA physical score 3-4). Incidence of MINS was 24% (n=165), and 90-day mortality rate was 6% (n=41). Patients with MINS had significantly higher mortality rate than those who did not experience MINS (10.9% vs. 4.3%, $p<0.01$). Age, creatinine clearance, and ASA score were also associated with 90-day mortality ($p<0.05$ for all). The time between hospital admission and surgery was not associated with mortality ($p=0.47$).

Conclusion: Our results suggest that MINS is associated with postoperative 90-day mortality in elderly patients having hip fracture surgery. This finding is in agreement with previous studies that investigated this association in other surgical populations. The relatively low 90-day mortality rate we found can be explained by the exclusion of high risk patients that was essential for MINS definition.

Our results are limited by our inability to perform a proper multivariate analysis. Future studies should aim to further determine the association between MINS and postoperative mortality in a larger cohort of patients having hip fracture surgery.

15AP02-07
Early hip fracture treatment in patients on clopidogrel treatment. Are we still concerned about its safety?

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Background: Hip fracture frequently occurs in frail elderly patients. It has been widely described that early surgery (<48h) reduces morbidity and mortality[1]. However, surgery continues to be delayed in many clopidogrel-treated patients due to concerns that it may increase the risk of bleeding.

We analyse four cases after early implementation of a hip fracture clinical pathway at our hospital.

Case Reports: These four patients were admitted for unilateral subcapital femoral fracture. 1-Male 90yrs-old ASA III, hypertension, COPD and double lacunar stroke under treatment with clopidogrel. 2-Female 69 yrs-old ASA III, hypertension, COPD and femoro-femoral bypass due to critical ischemia of the right lower limb under treatment with clopidogrel. 3-Female 92 yrs-old, ASA III, hypertension, dyslipidemia, CKD and ischemic stroke under treatment with clopidogrel. 4- Male 90yrs-old ASA III, hypertension, diabetes, dyslipidemia, COPD and CABG under treatment with clopidogrel.

According to our clinical pathway, surgery was performed in all cases in less than 48 hours under general anesthesia and reserving platelets before surgery due to the risk of bleeding.

Discussion: For scheduled surgery, clopidogrel must be stopped at least 5 days before. However, the hip fracture must be treated as an emergency and intervened in less than 48 hours despite this therapy. Clopidogrel should be discontinued upon admission, platelets reserved and proceed under general anesthesia to avoid the risk of spinal hematoma associated with neuraxial anesthesia, according to our clinical pathway.

There is always concern that decreased withdrawal time increases bleeding risk. However, the experience in our center is that intraoperative bleeding or transfusion requirements did not increase compared to patients without antithrombotic therapy or ASA alone. Thus, treatment with clopidogrel should not be a reason to delay surgery, allowing the patient to benefit from early rehabilitation.

Reference:

1. Anaesthesia 2021, 76, 225–237.

Learning Points: The timing of surgery is a pillar of the clinical pathway for a hip fracture. Antithrombotic therapy with clopidogrel should not delay surgery, and in the event of significant bleeding, platelet transfusion should be considered.

15AP02-08
Evaluation of 2183 cases followed by Acute Pain Service, facing the increase in elderly surgical patients, is pain control enough?

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Background and Goal of Study: Since its inception, the Acute Pain Service (APS) has aimed to improve postoperative pain management and related complications. The most recent guidelines have highlighted the priority to be increasingly tailored to the surgical procedure and patient.
The number of elderly patients who frequently access health care and the demand for surgical services is increasing worldwide. Within this population, APS plays a crucial role: elderly patients are often undertreated for pain with an increased risk of complications, such as delirium.
The incidence of delirium in elders adults hovers around 10% and is related to worse outcomes with prolonged hospitalization, increased 30-day mortality and loss of independence.The modern view of APS is based on pain evaluation (by Numerical Rating Scale, NRS), considering also other variables associated with complications like Post-Operative Nausea and Vomiting (PONV), Sleep Disorders (SD), itch and sedation, leaving out behavioral illness like delirium.
The goal of this analysis, as the average age increased, is to evaluate the requirement to improve our APS, in order to tailor the service towards elderly patients.
Materials and Methods: In our observational and prospective analysis, we collected data from patients undergoing major non-cardiac surgery from 2017-2018 vs 2021-2022 examining type of analgesia, pain (NRS at rest and in movement) and other parameters (PONV, SD, itch, sedation).
Results and Discussion: We compared 869 patients from 2021-2022, controlled to 1314 from 2017-2018. Although there were no statistically significant differences in the average age group (62+/-15.9 vs 63.6+/-15.7,p=0.8), we found a difference in the frequency of patients in the age group between 75-84 years (20% vs 25%,p=0.0001).
There was an increase of neuroaxial anesthesia (65% vs 71%,p=0.04) and perineural (2% vs 4%,p=0.001) but this not change the quality of pain control rated on NRS (2.1+/-1.6 vs 2.9+/-2.3,p=0,45).
Between the different age groups, the analysis doesn't detect differences in terms of complications except in the case of behavioral changes: the result is not statistically significant but it could be associated with the lack of use of scales adapted to the study population.
Conclusion: In light of the increasing age of patients, there is a need to reshape APS in order to evaluate the elderly patients: the standard assessments are to be supplemented with other additional rating scale.

15AP02-09
Effect of chronic oral anticoagulation in the early schedule for hip fracture surgery in elderly patients

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Background and Goal of Study: Hip fracture patients on oral anticoagulants(OAC), wait up to 3 times longer than non-anticoagulated, if taking direct oral anticoagulants (DOAC)[1].
Scientific evidence supports the benefit of early treatment in most of these patients too[2].
In our hospital a clinical hip fracture pathway was started in 1st January 2022 and new preanesthetic protocols were implemented for this population, with reduced suspension time for DOAC (if GFR >=15 mL/min/m^2, maximun 36h), or acceptance of INR <=1,7 when reversing vitamin-K antagonist (VKA), mostly acenocumarol (AC).
Our aim is to analyse the impact of these protocols on the time from admission to surgery.
Materials and Methods: We retrospectively reviewed the patients older than 65 yrs on chronic OAC, admitted to our hospital for surgical hip fracture treatment, between 1st January 2022 and 15 November 2022. SPSS V22 was used for statistical analysis.
Results and Discussion: Out of 269 patients, 76 (28,2%) took OAC on admission. Within these 76 patients: 33 (43,4%) used AC, and 43 (56,6%) DOAC. In the DOAC group: 25,11,4,and 3 patients were on apixaban, edoxaban, ribaroxaban and dabigatran, respectively, representing of the total of anticoagulated patients a 32,9%,14,5%,5,3% and 3,9% respectively. Early surgery (48h maximum from admission) was performed in 41 (54%) anticoagulated patients: 17(41,5%) on AC; 13(31,7%) on apixaban; 6(14,6%) on edoxaban.
Surgery was performed within the first 24h in 13 patients (17,10%), of them 8 (61,5%) on DOAC. Delayed surgery (<48h after admission) was carried out in 35(46%) patients: 16 (45,7%) on AC and 19 (54,3%) on DOAC.
Conclusions: More than a quarter of hip fracture patients are on OAC (mainly on DOAC), most of them with frailty due to severe cardiovascular morbidity. DOAC suspension time assumed for schedule surgery should not apply in this population, and reversal of AVK must be prompted. All aiming not to increase mortality due to surgical delay, since the need for a general anaesthesia is not a reason and perioperative blood does not change.
Reference:
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Leadership, Self-Development and Education

16AP01-01
Burnout, role stress, depression and anxiety: the huge challenges for PACU nurses during COVID-19 pandemic

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Background and Goal of Study: The strain on healthcare systems by SARS-CoV-2 has created increased psychological distress among nurses, especially the postanesthesia care unit (PACU) nurses, the guardian of the airway after anesthesia. The study aims to assess the presence of PACU nurse burnout, role pressure, depression, and anxiety, and their risk factors and protective factors during the COVID-19 pandemic and provide data support to improve the current situation of postoperative care.

Materials and Methods: This is a multi-center cross-sectional survey. 170 PACU nurses from six Grade-III Class-A hospitals in Western China were invited to complete the 71-question online questionnaire. Besides demographical data, each subject's characteristics and work information, MBI Scale, Depression-Anxiety-Pressure Scale (DASS-21), and Role Stressor Table were collected.The data was analyzed using the SPSS22.0 statistical software.

Results and Discussion: Among the 170 invited participants, 138 valid responses were received, giving an overall response rate of 81.1%, and 46 (33%) participants reported at least one symptom of burnout. There was one mild depression, five mild anxiety, and two moderate anxiety.

Working hours per week and nursing years were positively associated with role stress ($P = 0.004$). The higher pay satisfaction and a better attitude toward the prospects of anesthesia care were less prone to role stress and burnout.

In addition, physical health was a protective factor against burnout, depression, and anxiety.

The present study has certain limitations. We only focused on female subjects due to our study's extremely disproportionate distribution of male and female subjects.

Moreover, this cross-sectional study was conducted at a specific time and geographic location without a follow-up. Another limitation concerns the sample size. All of these limitations make us hard to extrapolate the results to the overall PACU nurses during the epidemic. A more rigorous prospective study with larger sample sizes is a more practical option with greater external validity.

Conclusion(s): Our study confirmed the high prevalence of burnout, depression, and anxiety in PACU nurses during the COVID-19 pandemic. And working hours, satisfaction with income, attitude towards the prospect, and physical health are significantly related to the burnout, role stress, and psychological distress of PACU nurses.

16AP01-02
Undergraduate 4th year Greek medical students' attitude and knowledge about organ donation

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Background and Goal of Study: In comparison to most European countries, the rate of organ transplantation in Greece is low. [1] Appropriate training of medical students (MS) could have a positive impact on organ donation (OD).

The aim of this study was to evaluate and analyze the knowledge and attitudes of undergraduate 4th year MS at the University of Thessaly on OD.

Materials and Methods: An anonymous survey, based on questionnaire created by Robert P. et al.[2], was conducted during the first class of anaesthesiology core rotation (October 2022), after obtaining permission by the authors. Apart from participants' demographic data, the survey consisted of 17 questions regarding MS knowledge of OD and 13 questions regarding attitude towards OD, scored in a 3 point Likert scale.

Descriptive statistics and frequencies were used for statistical analysis while knowledge and attitudes are presented with proportions of answers. Data were summarized using means (SD), and are presented as numbers and percentages.

Results and Discussion: A total of 91 MS (82.7% response rate) responded to the survey, with a mean age of 22.6 years old, 65.5% of whom were female. Although 57.3% knew that a brain dead patient cannot "come back to life", 67% did not know that a brain dead person is considered dead even if the heart is beating. Most of the MS knew how someone can legally give consent to OD (86.2%).

On the other hand only 39.8% knew that family members have the last word on OD. About three quarters of MS (74.1%) were unaware of OD after circulatory death. Regarding attitude towards OD, 57.1% wish to donate organs after their death and 83.5% would donate a kidney to a loved one.

While most of the MS believe that OD learning activities are important for their undergraduate training program, they felt that they were not adequately exposed to these during their medical studies (85.7%).

Conclusion(s): Medical students' knowledge about organ donation in our medical school proved to be insufficient and full of misconceptions. Hence, an updated curriculum seems mandatory in order to improve the knowledge and attitude towards organ donation.

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2. Robert, P., Bégin, F., Ménard-Castonguay, S. *et al.* Attitude and knowledge of medical students about organ donation – training needs identified from a Canadian survey. BMC Med Educ 2021;21(1):368.

16AP01-03
Survey evaluating the prevalence and the severity of feelings of self-doubt in European anesthesiologists

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Background and Goal of Study: Impostor syndrome (IS) is a form of erroneous self-assessment, defined as the inability to believe that one's success is earnt and that positive outcomes are the result of one's skills(1).
The syndrome has already been described in the healthcare setting and among academic faculty members which work in a competitive environment. A recent scoping review of IS in physicians concluded that low self-esteem, gender, and institutional culture are linked to high rates of imposter syndrome(2).
The fact that burnout has also been linked to IS is more worrisome. Moreover, this syndrome might have negative effects such as preventing physicians from acting in stressful situations. Although IS has been studied in doctors across other specialties, it has yet to be investigated within anesthesiology.
We hypothesise that IS prevalence will be high in this population due to core attributes of the profession itself. With the present survey study, we aim to investigate the prevalence and severity of IS in European anaesthesiologists and to identify key demographics that are linked to increased rate of IS.
Materials and Methods: This survey is endorsed by the ESAIC and will be distributed via email from February 2023 onwards to its members for a period of 6 months.
First, anesthesiologists will be asked to provide demographic data.
Second, imposter syndrome will be measured through the Clance Impostor Phenomenon Scale (3), a previously validated score with questions that investigate self-assessment of competency, praise, and success. Impostor characteristics are graded "few" if the total score is 40 or less, "moderate" between 41 and 60, and "intense" between 61 and 80. The higher the score, the more frequently and seriously the Impostor Phenomenon interferes in a person's life. Pearson chi squared test will be used to highlight predictive attributes.
Results and Discussion: Results will be presented at the end of the survey period. This survey will allow us to identify the prevalence and severity of imposter syndrome among anesthesiologists, which has never been evaluated on a large scale.
In parallel, it can identify risk factors associated with imposter syndrome, allowing a better understanding of the phenomenon, and offering better guidance to colleagues in the future. In the discussion we will also suggest solutions, such as mentor-mentee programs and coping strategies.

16AP01-04
Burnout in a single surgical centre

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Background and Goal of Study: Burnout syndrome is characterized by the dimensions of emotional exhaustion, depersonalization, and low sense of personal accomplishment. Healthcare professionals' burnout is associated to decreased quality of life, patient satisfaction and quality of care.
We aimed to determine the prevalence of and risk factors for burnout in our surgical centre, since data from all working professionals in a single surgical centre is limited.
Materials and Methods: In May and June 2022, anaesthesiologists, nurses, and operating room assistants of our surgical centre were anonymously surveyed, using the Maslach Burnout Inventory Human Services Survey and additional questions querying professional and personal factors.
High risk for burnout was defined by high scores on the emotional exhaustion subscale and on the depersonalization subscale and burnout syndrome by demonstrating high score in all three dimensions.
T-student and ANOVA tests were used for continuous variables and Fisher's exact test for categorical variables. All variables with $P < 0.05$ on univariate testing were included in the multivariable logistic regression modelling.
Results and Discussion: 97 healthcare professionals completed the survey (response rate 66.7%); 18.6% were at high risk of burnout, and 6.2% met criteria for burnout syndrome. High levels of emotional exhaustion, depersonalization, and reduced feelings of personal accomplishment were experienced by 50.5%, 21.6%, and 29.9% of respondents, respectively.
Unlike other studies, a regular working schedule and daytime-only shifts were associated with high risk of burnout ($p=0.001$ and $p=0.005$, respectively), possibly due to work overload and relocation to other working places.
Differences were detected within professional category, where high risk of burnout was greater in circulating/instrumentalist nurses ($p=0.014$) and burnout syndrome in operating room assistants ($p=0.017$).
On multivariable analysis, professional category – operating room assistant (OR, 11.1; 95% CI, 1.1 to 113.4) and a regular working schedule (OR, 4.6; 95% CI, 1.3 to 16.5) were independently associated with high risk for burnout.
Conclusion: The prevalence of burnout in our surgical centre was low, but the degree of emotional exhaustion was high. The authors identified professional category – operating room assistant and regular working schedule as factors influencing high risk for burnout.

16AP01-05
Undergraduate 4th year Greek medical students' attitude and knowledge about blood donation

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Background and Goal of the Study: Greece encounters shortage in blood supplies to cover the high transfusion needs arising from trauma, surgery, and treatment of thalassaemia. Furthermore, the blood supply in Greece relies exclusively on voluntary nonpaid blood donations (BD). Appropriate training of medical students (MS) could have a positive impact in BD.

The aim of this study was to evaluate and analyze the knowledge and attitudes of undergraduate 4th year MS at the University of Thessaly on BD.

Materials and Methods: An anonymous survey (based on Arslaan J. et al.[1]), was conducted during the first class of anaesthesiology core rotation (October 2022), after obtaining permission by the authors. Apart from participants' demographic data the survey consisted of 13 questions regarding MS knowledge of BD and 11 questions regarding attitudes towards BD, scored in a 3 point Likert scale.

Descriptive statistics and frequencies were used for statistical analysis while knowledge and attitudes are presented with proportions of answers. Data were summarized using means (SD), and are presented as numbers and percentages.

Results and Discussion: A total of 91 MS (65.5% females), with a mean age of 22.6 years old completed the survey (response rate 82.7%). Only 21,1% of them knew the weight requirements for BD, while almost half of them knew the appropriate time interval between two BD and the appropriate age of the donor (46.1% and 53.9% respectively).

While 50% believed that females can't donate in the perimenstrual period, the majority knew the limitations on BD. Although 71.1% knew the difference between blood products and whole blood, only 45.5% were aware of the concept of autologous components. Regarding their attitude towards BD, the majority of MS declared that they would donate blood (80%) and would encourage other people to do that also (82.2%).

More importantly 88.9% would like to receive training about BD, believing in the necessity of the spread of knowledge about BD in healthcare professionals (93.3%). Interestingly only 44.4% of the MS agreed with the current voluntary BD policy in Greece.

Conclusions: Although medical students in our medical school display a positive attitude towards BD, there are gaps in some aspects of their knowledge regarding BD. Hence, a curriculum that confronts these educational oversights seems mandatory in order to improve the knowledge about BD and enhance its propagation.

Reference:

1. DOI 10.7759/cureus.7733

16AP01-06
Changes in motivation in choosing the specialty "Anesthesiology" during the martial law in Ukraine: sociological research

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Background and Goal of Study: Despite the war, the tasks and the ultimate goal of medical education do not change - to educate qualified specialists from yesterday's medical students. The purpose of our study was to compare the motivation of intern doctors in the first year of training regarding the choice of the "anesthesiology" specialty before and after the start of war in Ukraine.

Materials and Methods: At the Department of Anesthesiology and Intensive Care of the P.L. Shupyk National Health Care University of Ukraine, a comparison of the results of a sociological study was conducted among first-year interns in 2021 – before the start of the war (I group - 72 people, average age - 23,9 years old) and in 2022 - during the war in Ukraine (II group - 63 people, average age 24.2 years). Participation in the survey was voluntary and anonymous.

Results and Discussion: When comparing the results to the question: "Who or what influenced your choice of the future specialty of an anesthesiologist?" in the I and II groups, the following answers were received: independent choice - 36.11% versus 49.20%, p=0.125, parents - 13.88% vs. 23.80%, p=0.139, friends or acquaintances - 11,11% vs. 15.87%, p=0.417, previous experience of working in the intensive care unit as a nurse – 8.33% vs. 14.28%, p=0.586.

Further, to the question: "What attracts you to anesthesiology as a specialty?" significantly more often in the II group, the answer "the possibility of achieving a quick positive result of one's activity" was recorded - 33.33% vs. 85.71%, p=0.001. While "satisfaction from saved human life" and "prestige" did not differ significantly between groups.

In addition, among the most important directions in anesthesiology, we recorded a significantly higher the importance of "anesthesia for trauma" (40.27% vs. 68.25%, p=0.002) in II group. We also noted the significantly higher motivation of II group to perfect study at the department of anesthesiology and intensive therapy of cardiopulmonary resuscitation (44.44% vs. 92.06%, p=0.001), prevention and treatment of pain syndromes (44.44% vs. 80 .95%, p=0.001) and diagnosis and intensive therapy of acute poisoning (38.88% vs. 68.25%, p=0.002).

Conclusion(s): An increase in the autonomous motivation of intern doctors was established when they choose the specialty "anesthesiology", which can be connected with the long military law in Ukraine and the awareness of the importance of the chosen profession.

16AP01-07
Assessing engagement and burnout in anaesthetists in a university teaching hospital

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Background and Goal of Study: It is well recognised that burnout is increasingly prevalent in healthcare workers. Despite an association with impaired performance and reduced patient safety, many departments will be unaware of the incidence, therefore appropriate support may not be in place. Likewise, engagement is fundamental to staff wellbeing and improved patient outcomes. The goal of this study was to evaluate the impact of burnout and level of engagement in the anaesthetic department of University Hospital Aintree.
Materials and Methods: We used the shortened 9-point Utrecht Work Engagement Scale (UWES-9) to assess engagement across 3 domains[1] and the Burnout Assessment Tool (BAT-12), a 12-point questionnaire, across 4 domains.[2]
Both surveys were distributed among all consultant and trainee anaesthetists and anaesthesia associates during October 2022. Statistical significance was assessed using a single sample t-test comparing study population means with statistical norms from BAT-12.
Results and Discussion: There were 51 and 43 responses for engagement and burnout respectively. Burnout was likely in 28% of consultants and 50% had some evidence of burnout. Conversely, 75% of registrars did not demonstrate any features of burnout. We demonstrated significantly higher rates of burnout overall. Only 5.8% of anaesthetists had high levels of engagement with 40% of consultants reporting low or very low levels.

	Exhaustion	Mental distance	Cognitive impairment	Emotional impairment	Overall Score
BAT-12 statistical norms - mean (SD)	2.26 (0.66)	1.98 (0.90)	2.12 (0.70)	1.73 (0.74)	2.02 (0.66)
Study population - mean (SD)	3.23 (0.71)	2.65 (0.85)	2.10 (0.57)	2.19 (0.75)	2.54 (0.54)
Significance	P<0.00001	P<0.00001	p 0.41379	P 0.00009	P<0.00001
No burnout	21 (49%)	11 (25%)	40 (93%)	23 (53%)	22 (51%)
Risk of burnout	5 (12%)	20 (47%)	2 (5%)	8 (19%)	10 (23%)
Burnout most likely	17 (39%)	12 (28%)	1 (2%)	12 (28%)	11 (26%)

Table 1. BAT-12 results

We have shown high levels of burnout among anaesthetists in our trust and intervention is paramount to improving staff satisfaction and performance. Engagement was found to be lower than average and further evaluation is required to determine the most appropriate course of action.
Conclusion: Burnout and engagement were worse than expected highlighting the importance of monitoring wellbeing. Further evaluation may allow strategies to be employed to improve these results.
References:
1. https://www.wilmarschaufeli.nl/publications/Schaufeli/Test%20Manuals/Test_manual_UWES_English.pdf
2. https://burnoutassessmenttool.be/wp-content/uploads/2020/08/Test-Manual-BAT-English-version-2.0-1.pdf

Ethics

16AP01-08
Perioperative ethical dilemma in adolescent with ataxia telangiectasia: does the end justify the means?

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Background: With careful perioperative planning,many high risk paediatric cases are performed with little impact on morbidity and mortality.[1] The quest to save lives pushes the boundaries of anaesthetic practices.How far do we go in the pursuit of patients' best interest?

Case report: L is a 17-year-old refugee presented with severe malnutrition. He has severe chronic restrictive pulmonary function and neurological symptoms diagnosed as ataxia telangactasia (AT). The anaesthetist was asked to assist in percutaneous endoscopic gastrotomy (PEG) for his nutritional problem. At that point, L had a BMI of 13 and received TPN. He was also treated for pulmonary and line sepsis.

A multidisciplinary meeting was held due to the complexity of the case. The anaesthetic team considered this is as a high risk anaesthetic case due to the combination of malnutrition, low BMI, deteriorating chronic lung function and sepsis. However, the referring team felt he should be given the chance despite those risks. L consented and received GA for his PEG. He was admitted to the PICU postoperatively and was discharged to the ward the next day where his respiratory function rapidly deteriorated. L died peacefully 48 hours later.

Discussion: AT is an incurable genetic disease manifested by neuro degeneration and chronic lung disease. L was likely to be in his final palliative stages. Although, the PEG would address his malnutrition, undergoing GA poses a greater threat to his physical condition. Ethically, was this the right decision? Such parallel scenarios are often confronted within our anaesthetic practices.

Too often is the anaesthetic risks and advice are underestimated by other healthcare professionals. This forces the anaesthetist to confront and deal with the eventuality of expected anaesthetic related adverse events. Although such events are anticipated, the psychological impact to the anaesthetist is immense and often overlooked. There is a need for proper guidance.

Reference:

1. CRONJE, L.(2015) A review of paediatric anaesthetic-related mortality SAJAA, 21(6) p147

Learning Points: Although anaesthesia is safe, many underestimate the systemic impact of GA on the body.

Informed consent is questionable when anaesthetic risks outweighs the benefits of the procedure.

Local ethics committee should be part of the consultation process if one of the clinicians raised their doubts in such cases.

Attention should be given to the psychological impact of the anaesthetic provider in such cases.

16AP01-09
Euthanasia and organ donation. A new challenge for the anesthesiologist

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Background: The euthanasia law was approved in Spain on June 2021[1]. Patients suffering from a chronic incurable disease with significant physical and psychological burden are able to request euthanasia. The physician responsible for the patient is the leader of the process. In our hospital, the Anesthesiology department provides support in the management of intravenous drugs. Many patients suffering chronic neurological disease choose organ donation in asystole-controlled Maastricht III[2].

Case Report: A 75-year-old patient suffering from amyotrophic lateral sclerosis, whose physician provided information on prognosis, evolution, therapeutic alternatives and palliative care. The patient requested euthanasia as well as offered organ donation.

A multidisciplinary assessment was performed. A favorable answer was obtained. The patient arrived to the operating room accompanied by his family and referring physician. Medication was administered by the anesthesiologist, as a key part of the support team. When asystole was detected, the death of the patient was certified and organ harvesting begins.

Discussion: Euthanasia was recently approved in Spain. Medications to cause death could be self-administered by the patient or intravenously (iv) by the usual physician. The majority of the team involved in euthanasia is not familiar with iv medications (midazolam, lidocaine, propofol and rocuronium).

Even though all iv-administration process is very well stablished in the euthanasia guidelines[1], the presence of an anesthesiologist, who is familiar with the drugs, the cannulation of venous line and with the problems associated, improves the safety and quality of the process.

Organ donation after controlled circulatory death (Maastricht III) following the withdrawal of life-sustaining treatment is an increasing procedure in Europe[2] and could be applied to patients requesting euthanasia.

References:

1. Ley Orgánica 3/2021, Regulación De La Eutanasia. 2021;1–13.
2. Coll E et al. Informe de actividad de donación y trasplante de donantes en asistolia controlada . Organ Nac Traspl. 2018.

Learning Points: Respecting the patient's wishes must be a priority.

Treating physicians must provide the necessary support.

Interdisciplinary communication between the patient and caregivers is mandatory.

Healthcare professionals need more training in the psychological and emotional aspects involved.

16AP01-10
Do you know what you are consenting to? Readability of Informed consents for anaesthesia in Croatia accessed by SMOG score

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Background and Goal of Study: The Simple Measure of Gobbledygook (SMOG) formula is testing tool designed to grade a text based on the number of sentences and syllables per word. SMOG Readability Formula estimates the years of education a person needs to understand a text. It has been used in many instances to analyse the readability of medical texts.

Informed consents for anaesthesia are the base of patient's autonomy in a situation where they will surrender that autonomy to the anaesthesiologist in full faith, therefore it is crucial to understand what they're consenting to.

The goal of this study was to compare the readability of informed consent form for anaesthesia (A-IC forms) across Croatia.

Materials and Methods: A-IC forms were collected from various Croatian hospitals. The text was analysed using SMOG-Cro, a validated variation of SMOG formula for Croatian language: $2+\sqrt{4+}$syllables, where a coefficient of 2 is added to the nearest square root of the total number of words with at least four syllables.

Results and Discussion: 14 consent forms were collected. 12 of them were accessed by SMOG score, while 2 were excluded due to insuficcient amount of text (those hospitals provide oral explanations of anaesthesiology procedures to patients) Average SMOG score was 11,12 which means that level of education needed to comprehend text is at least 11 grades of formal education (finished 3rd year of high school). The highest score was 14,5 while the lowest was 10,4.

According to the 2014 statistics of the level of formal education of Croatian population, 27.4% of the population over the age of 19 have completed only primary school (8 years). 54.8% have finished high school (11-12 years of education), and 17.6% of Croatian citizens have a high level of education (14+ years of education). 35.6% of those have Bachelor, 35.6% Masters degree, and 2% completed doctoral studies (14+, 16+ and 19+ years of education).

Therefore, it is important to implement Informed consents that are easily readable to all citizens with at least Elementary school education, which in case of Croatian Anaesthesiology informed consent is not the case.

Conclusion(s): The comprehension problems this study found should alert institutional review boards to review consent forms currently in use, making sure they are easily readable by all citizens.

Only thus are the interests of both patients and doctors protected, and the obtained consent truly informed.

16AP01-11
The patient perspective on informed consent for anesthesia in patients scheduled for cardiac surgery, an observational study

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Background and Goal of Study: In current practice anesthesia and surgery require separate informed consents. It is not known, however, whether patients value a separate consent for anesthesia, whether information about risks influences consent and how patients assess anesthetic risks compared with surgical risks.

Materials and Methods: This cross-sectional study included patients scheduled for cardiac surgery in a tertiary referral hospital in the Netherlands between May 2021 and March 2022. Patients completed a questionnaire exploring patient perceptions about information provisioning, anesthetic risks, informed consent and how anesthetic risks relate to surgical risks and benefits.

Results and Discussion: Of 120 patients eligible, 100 completed the questionnaire and those were analyzed. Twenty-six were female and 62 were older than 60 years. Sixty-five patients valued information about anesthesia and 35 not. Most patients worried about surgical risks instead of anesthetic risks. Seventy-six patients felt no need for a separate consent for anesthesia, mainly because of the feeling of 'no choice but to undergo surgery'. Even when probabilities for severe anesthetic complications were high, 63 patients would still be willing to undergo surgery.

Conclusion(s): The majority of patients scheduled for cardiac surgery reported to have no need for a separate informed consent for anesthesia. Although most patients valued information about anesthesia, this information was not needed, nor did it influence their consent as surgical risks and benefits outweighed any anesthesia risk. In the future, surgeons and anesthesiologists may offer information tailored to patients' preferences after which combined consent for the complete anesthetic and surgical process can be obtained.

Leadership, Self-Development and Education

16AP02-01
Ventilation effectiveness during paediatric cardiopulmonary resuscitation: simulation-based comparative study

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Background and Goal of Study: This prospective simulation-based comparative study aimed to evaluate the ventilation during simulated paediatric cardiopulmonary resuscitation (CPR) provided by health care professionals (HCP) and lay rescuers (LR). European Resuscitation Council (ERC) guidelines 2021 were considered standard of care.(1)

The primary outcome was the number of effective breaths out of 5 initial CPR breaths before and after structured training. The secondary outcomes were: a sub-analysis of 2 first ventilation attempts, the time to first effective ventilation, and the time to the start of chest compressions.

We hypothesised, that in HCPs more than 80% of ventilation attempts from 5 initial breaths will be effective (4 out of 5 breaths). In LRs, more than 60% of ventilation attempts (3 out of 5 breaths) and there will be a significant improvement in the number of effective ventilation in both groups after simulation-based training.

Materials and Methods: HCP and LR performed 90 seconds of CPR on 2 simulation mannequins: 5 kg Baby and 20 kg Junior. The HCPs provided bag-mask ventilation; LR dispatcher-assisted CPR with mouth-to-mouth ventilation. The effectiveness of ventilation (defined as a visible chest rise) was recognized by a mannequin and visually confirmed by trained independent observers. Both had to be in concordance to mark a ventilation attempt as effective.

Results and Discussion: Data were obtained from 40 HCPs and 46 LRs. Significant improvement was detected in the number of effective ventilations in Baby in HCP before and after the training 26 (65%) vs. 40 (100%), respectively and in LRs 28 (60.9%) vs. 45 (97.8%), (both $P<0.001$). The improvement before and after the training in Junior was significant only in the LR group [32 (82.1%) vs. 37 (94.9%), $P=0.005$], not in the HCP group [31(77.5%) vs. 32 HCP (82.1%), ($P=0.77$)].

Conclusion(s): ERC guidelines recommendation to start pediatric CPR with 5 initial breaths, was based on the experts' opinion.(1)

Other resuscitation guidelines worldwide do not include initial resuscitation breaths in lay rescuers.(2)(3)

To our knowledge, this is the first study investigating ventilation effectiveness in paediatric CPR. Our data confirmed that lay rescuers providing dispatcher-assisted CPR can deliver effective breaths for both Baby and Junior. Obtained data display the benefit of practical paediatric CPR training by improving the number of effective initial breaths in both HCPs and LRs.

16AP02-02
Using Rapid Cycle Deliberate Practice simulation to teach Rapid Sequence Induction to nurse anaesthetic providers in Tanzania

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Background and Goal of Study: Nurse anaesthetic providers in Tanzania complete a one-year course before being expected to work autonomously, often in rural locations. Simulation-based-education has an established role in teaching anaesthetic providers however its role in low-resource settings is limited. In Rapid Cycle Deliberate Practice (RCDP) simulation, facilitators provide 'within-event' debriefing and allow participants to correct mistakes, thus reinforcing the correct choreography of the procedure[1].

The goal of this study was to evaluate the use of RCDP simulation to teach Rapid Sequence Induction – a core skill for nurse anaesthetic providers.

Materials and Methods: A simulation suite featuring a high-fidelity mannequin situated within a regional referral hospital in Tanzania was utilised. Thirteen student nurse anaesthetic providers at Kilimanjaro Christian Medical Centre, Moshi, took part. Participants carried out an obstetric general anaesthesia RSI scenario with feedback delivered using the RCDP model within the sim suite. Written questionnaires were completed before and after the scenario to assess confidence (on a 1-5 scale) in carrying out an RSI. Additional feedback relating to general aspects of the simulation session was also sought.

Results and Discussion: Mean confidence score amongst participants pre-simulation was 3.5 (range 1-5). Post-simulation mean score was 4.8 (range 4-5). 11/13 participants (84.6%) showed an improvement in RSI confidence score following simulation with a mean score improvement of 1.3 points.

77% of participants strongly agreed that the stated aims of the simulation were clear (remaining 23% answered 'agree').

92% strongly agreed that the simulation enhanced their learning of RSI (remaining 8% answering 'agree').

69% strongly agreed that the debriefing allowed them to reflect on their performance (remaining 31% answering 'agree').

92% strongly agreed that the facilitator created a safe and enjoyable learning environment (remaining 8% answering 'agree').

Conclusion(s): These results suggest a role for RCDP simulation in improving confidence in performing a RSI amongst nurse anaesthetic providers in a low-resource setting. Using simulation as part of a more comprehensive skills teaching program is suggested.

Reference:

1. Gross et al., (2019). Rapid Cycle Deliberate Practice (RCDP) as a Method to Improve Airway Management Skills – A Randomized Controlled Simulation Study. *Cureus*. doi:10.7759/cureus.5546.

16AP02-04
Launch of a novel Virtual Reality environment in the training of anaesthetists in aviation medicine

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Background and Goal of Study: Management of medical emergencies of critically ill ICU patients requires a wide range of knowledge, especially under particular circumstances, like a fixed-wing ambulance aircraft.
Virtual Reality (VR) can be used in numerous ways in education, but its role is remarkable in medicine, by giving the opportunity to safely experience the most challenging real-life scenarios. Using the new VR application under development in collaboration of TrustAir Aviation and ARWorks, skillful intensivists can be trained by scenario-based simulations of in-flight patient care.
The main target of the multi-stage development is to improve patient safety by an innovative continuous medical education program.
Materials and Methods: While wearing the VR headset, the user is surrounded by a photorealistic 3D virtual on-board patient transport milieu colored with real environmental noises (aircraft engines, radio communications, medical equipment, etc.).
At the beginning of the simulation, the intubated patient's vital parameters are steady and within normal limits, but in an unexpected moment, the level of oxygen saturation decreases for randomised reasons.
By physical examination of the virtual patient and checking the equipment, the user has to identify the problem that is altering the condition of the patient and solve it as quickly as he/she can.
For success, knowledge of the medical equipment's operation is also indispensable, furthermore the player has to get acclimatized to the limited-sized workplace that is offered by the aircraft cabin.
Results and Discussion: The system is able to monitor and record response times and reactions, and collect details in an aggregated database, wherefrom statistics are easily available for the administrators. Hereby mistakes are identifiable and after multiple repetitions improvement is well traceable.
Conclusion(s): For the above-mentioned reasons the proposed method is appropriate for extending manual and non-manual medical skills under prehospital or hospital circumstances, and in a later iteration of development can be expanded to further techniques (i.e. ultrasound, RSI, insertion of peripheral or central lines, nerve blocks, surgical methods etc.).
The major advantage of VR technology is the ability to create a learning tool in virtual reality, when the prospect of carrying out the same practice in the real world would be extremely dangerous, challenging and expensive.

16AP02-06
The impact of the first palliative care in ICU course in Czechia

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Background and Goal of Study: Palliative care is an important area of everyday care in the ICU. The previous study (PEOpLE-C19) carried out in the Czech Republic among more than 300 physicians, and nurses showed us that palliative care is challenging for most physicians and nurses, and focused training was stressed as an important topic.
These results were one of the driving forces to establish the Research Initiative in Palliative Care and Ethics in the ICU (RIPE-ICU) in Czechia, and the first multidisciplinary education course focusing on palliative care in the ICU was held in November 2022.
Materials and Methods: Online 10 mostly multiple-choice question survey (pre- and post-test) in 16 course participants and 5 lecturers with non-obligatory participation.
Results and Discussion: In total, 19 course participants (physicians and nurses) filled out the questionnaire before and 17 after the course. The goals and outcomes of providing high-quality palliative care could be determined by 13 out of 19 respondents before the course compared to all 17 respondents after the course.
Good clinical practice in palliative care was clear for 13 respondents (agree 13, undecided 3, disagree 3) before and 17 (agree 9, strongly agree 8) after the course.
The difference between withdrawal life-sustaining therapy and euthanasia was clarified during the course for 9 participants. The rest of them were familiar with the difference even before the course.
Conclusion(s): The first course aiming at palliative care in the ICU showed very good results concerning clarifying the terminology in end-of-life decisions and making participants more familiar with setting the goals of treatment and palliative care practice. Based on positive feedback, the new advanced course will be prepared for autumn 2023.
Reference:
Prokopová, T., Hudec, J., Vrbica, K. et al. Palliative care practice and moral distress during COVID-19 pandemic (PEOpLE-C19 study): a national, cross-sectional study in intensive care units in the Czech Republic. Crit Care 26, 221 (2022). https://doi.org/10.1186/s13054-022-04066-1
Acknowledgements: We would like to thank RIPE-ICU initiative members and course lecturers.

16AP02-07
Motivation and knowledge in anaesthesia moving medicine graduates to start an anaesthesiology residency in Madrid

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Background: Over the past years, choice of specialization in anaesthesiology and intensive care has become more popular in Spain[1]. The COVID-19 pandemic has increased this phenomenon: now it lies as a top-pick option for our graduated medical students who see in our specialty many career opportunities. We designed a survey to assess theoretical knowledge and factors which participated to the choice of our specialty, among first-year resident having started recently their training.
Methods: A survey was designed to evaluate the background, exposure to anaesthesia as a specialty during medical school training and motivation. The survey finalized with a theoretical test on knowledge concerning basic principles of anaesthesia (using 15 best single answer multiple choice questions). The questions were transferred to a GoogleForm survey and proposed to the seventy first-year residents of the Madrid Autonomous Region (Spain). Results are presented as N (Percentage).
Results: Between September and December 2022, 40/70 (70%) residents answered the survey. 55.6% residents had studied in Madrid before starting residency program, 86.1% had attended a public university and 100% had chosen anaesthesia as their first option. During their medical degree, 51.4% of them had received theoretical lectures in anaesthesia. For 68.2%, these lectures were mandatory, and were given during their third year of medical school for 47.4% of them. 91.9% residents were offered opportunity to do clinical rotations in anaesthesia, even though it was optional for 72.2% of them. When asked about the main reason for selecting this specialty, 91.9% considered that the career opportunities were the most important factor, 86.5%, the width of knowledge and 81.1%, the variety of technical skills available. Having received a theoretical course of anaesthesia during their degree didn't influence their choice for the specialty.
The average score for the knowledge test reached 12/15 (80%) of correct answers, demonstrating a good level of knowledge at the beginning of the residency. The most failed question concerned general physiology (only 10.3% of residents answered correctly).
Discussion: Most of our first-year residents did a clinical rotation during their medical degree and were exposed to their future specialty, which oriented their choice. When considering anaesthesia as a choice, career opportunities was the most influencing factor.
Reference:
1. Sánchez Gil, JC, REDAR 2011

16AP02-08
Impact of policy documents & faculty opinions in Altmetric Attention Scores of 17 anaesthesia & pain medical journals

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Background and Goal of Study: Almetric Attention Score (AAS) includes a number of sources related to public attention. No association between Altmetric impact factor (IF) and traditional IF was found. Assessing quality of articles and journals by AAS has been questioned. We studied the impact of Policy Documents and Faculty opinion in the AAS of anaesthesia and pain medical journals.
Materials and Methods: We included 4881 articles in 17 journals with an AAS published during the year 2020. From the Altmetric details page of each article we recorded the Policy Documents and the Faculty Opinions which cited the relevant article. Results for each individual journal are presented as
a) percentage of Policy Documents over the number of articles and
b) percentage of the articles mentioned by the Faculty Opinion.
Results and Discussion: Results are shown in Table 1.

Journal	N articles	Altmetric Impact Factor (total AAS/n of articles)	Numbers of policy documents over the number of articles (%)	Numbers Faculty Opinion over the number of articles (%)
Anaesthesia	281	15227/281 **(54.2)**	13/281 (4.63%)	3/281 (1.07%)
Anesthesiology	413	4445/413 (10.8)	8/413 (1.94%)	17/413 (4.12%)
AnesthAnalg	795	6261/795 (7.9)	9/795 (1.13%)	0
Br J Anaesth	481	5283/481 (11)	60/481 **(12.47%)**	4/481 (0.83%)
Can J Anesth	310	4466/310 (14.4)	10/310 (3.23%)	3/310 (0.97%)
Clin J Pain	116	768/116 (6.6)	1/116 (0.86%)	0
Cur OpinAnesth	131	458/131 (3.5)	0	0
Eur J Anaesthesiol	191	530/191 (2.8)	0	0
Eur J Pain	182	1758/182 (9.7)	6/182 (3.3%)	0
J ClinMonitComput	174	808/174 (4.6)	2/174 (1.15%)	1/174 (0.57%)
J ClinAnesth	475	892/475 (1.9)	10/475 (2.11%)	0
J Neurosurg Anesthesiol	63	638/63 (10.1)	3/63 (4.76%)	3/63 **(4.76%)**
Pain	298	6874/298 (23.1)	0	0
Pain Med	522	5258//522 (10.1)	3/522 (0.57%)	0
Pain Pract	109	274/109 (2.5)	0	0
Perioper. Med	92	1461/92 (15.9)	0	0
Reg Anesth Pain Med	248	2348/248 (9.5)	2/248 **(0.81%)**	0
TOTAL	4881	57749/4881 (11.8)	127/4881 (2.6%)	31/4881 (0.64%)

Table 1. Number of articles, Altmetric Impact Factor, percentage of Policy Documents and percentage (%) of Faculty Opinion for each of the 17 journals published during the year of 2020

Of the 17 journals 12 had mentions in Policy Documents and only six had articles mentioned by the Faculty Opinions platform with a 2.6% and 0.64% frequency respectively.
Conclusion(s): The incidence of mentions in the Faculty Opinions is weaker than the incidence in Policy Documents as only 6 journals have articles included in this platform. Ranking of these journals does not follow ranking by the Altmetric Impact Factor.

16AP02-09
Experience in a pre-commercial procurement about patient empowerment and stress avoidance: the STARS project

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Background: Perioperative stress is a widespread problem with a high impact on surgical patients, which needs to be treated and mitigated. STARS project was designed as a pre-commercial procurement, with European Union funds, amongst five European hospitals that challenged the industry to develop an innovative support tool for patients planned for surgery, with the aim to reduce stress and improve patient's health condition during the care path.
Materials and Methods: Public procurers challenge companies to develop new solutions. Two contractors, Evidenze with CARINAE Solution and Adhera Health with SAM Solution, reached the last phase and managed to undergo a field testing in these hospitals. Inclusion criteria were adults planned for major surgery in 2 to 4 weeks after the inclusion.
We developed a multicenter study, open-label, randomized to the intervention and control group during December 2021 to April 2022 with 60 patients recruited by each contractor. The main objective was the assessment of changes in stress levels suffered by patients using the solution versus those in the control group during the patient journey. Secondary objectives were the assessment of changes in pain level, empowerment, quality of life, control of wound healing, usability and satisfaction with the solution.
Results and Discussion: In SAM group, 40 patients were analyzed and randomized, 53,5% to SAM group and 47,5% to control group. The 81,1% finished the study. In CARINAE group 50 patients were analyzed and randomized, 46% to CARINAE group and 54% to control group. The 78% finished the study.
In both groups, changes in stress levels, pain, empowerment, quality of life, and wound healing did not significantly differ between intervention and control group. Patients perceived the experience as pleasant, clear, helpful and they would recommend the apps to other patients. Patients who used the solution scored higher in satisfaction evaluations showing greater perception of mental well-being, self-efficacy and self- management. In both solutions, patients negatively reported the communication chat with the health care professionals. No statistical differences were found.
Conclusions: STARS field testing is the first stone in validating with patients an integrative digital solution about stress with promising functionalities that could have a positive impact on the reduction of stress, although it is necessary to test with more patients in order to find clinical signification.

16AP02-10
Beyond a national advanced airway training course – steps to education deployment

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Background and Goal of Study: At academic institutions, anesthesiology residents may be responsible for airway management inside and outside the operating room, either independently or with another resident. Poor judgment along with lack of education and training may be the leading preventable cause of adverse outcomes related to airway management. A national standardised advanced airway course would implement the same course content for all anaesthesia trainees, independent of local attitudes to airway management in view of optimising patient's care perioperatively and in the Intensive Care environment.
Materials and Methods: An international working group representing 3 societies: ESAIC (European Society of Anaesthesiology and Intensive Care), SESAM (Society in Europe for Simulation Applied to Medicine) and SRATI (Romanian Society of Anesthesia and Intensive Care) designed a standardised course in advanced airway management for anaesthesiology trainees. The project started with a train the trainers course followed by delivering the course to all the 2nd year anaesthesia residents in the main five simulation centers from Romania (Bucuresti, Timisoara, Tg. Mures, Cluj, Iasi).
In this paper, we analyze the challenges encountered along the way from the design of a national advanced airway training course to it's actual use in medical teaching.
The study assessed whether the intended aims of the training programme were clearly conveyed by the trainers, and how participants understood and subsequently inplemented the training programme intentions into practice.
Evaluation was two-fold:
(a) trainees' perception and attitude towards this course and it's actual effectiveness in teaching;
(b) feedback from the trainers regarding the course development and their own development as faculty.
Results and Discussion: Trainees' overall impression on the usefulness of a standardised airway management course were high (total scoring was in the upper 20 percent of the anonymous questionnaires' scales). Previous studies have shown that the trainees' knowledge increased as well as their competencies in technical skills and NTS after an advanced airway course. We foresee similar results with our national course and plan to integrate it within the national specialist training programme.
Conclusions: The positive feed-back received from trainers and trainees are compelling arguments for employing such standardised airway management courses in anesthesia trainees' curricula.

16AP02-11
Effects of simulation-based education on the acquisition of non technical skills in nurse anesthesia students

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Background and Goal of Study: In patient care, both Technical Skills (TS) and NonTechnical Skills (NTS) are necessary to maintain best practice as well as reach a high level of expertise. The "Anesthetists' Non-Technical Skills (ANTS) system" evaluates the effect of simulation training and debriefing on nontechnical skills (NTS). Studies suggest that residents' NTS may improve after simulation training but the effect on NTS of nurse anesthesia students is unclear. The purpose of this study was to determine whether high-fidelity simulation training and debriefing improved the NTS of nurse anesthesia students using the ANTS tool.
Materials and Methods: It was a prospective cohort study involving 16 nurse anesthesia students in their final year of graduation. The students managed a 45-minute anesthesia crisis using high-fidelity simulation and returned one month later to manage a second case. ANTS system rating forms was used by a clinician who was familiar with its use. The averages of scores between categories and elements of ANTS were compared between the two simulations sessions using the Wilcoxon nonparametric test (= 0.05).
Results and Discussion: The mean ANTS score for each category had progressed by 25.42%. The principle component analysis distinguished two groups (marginal and acceptable) during the first simulation, whereas in the second simulation, the marginal group no longer appears. The ANTS categories scores had a significant evolution (p-value <0.05) between the first and the second simulation, which confirms the effect of the simulation on the acquisition of non technical skills, despite the short delay of the study period
Conclusion(s): Our study highlights the positive impact of high-fidelity simulation on the acquisition of non technical skills in nurse anesthesia students. Simulation based nontechnical skills training should be incorporated into educational training programs, quality improvement projects and ongoing professionnel development as for doctors.
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16AP03-01
A novel subspecialty anesthesia immersive simulation curriculum for trainees: a cohort study

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Background and Goal of Study: Simulation is essential for medical education, especially in the field of Anesthesia[1]. We aim to describe a simulation program's- structure, content, and resident feedback that will help implement simulation-based learning.
Materials and Methods: Cohort survey study, our participants were 33 anesthesia trainees from our department.
Trainees participated in five courses (Passports) for different anesthesia subspecialties: obstetric, pediatric, cardiothoracic, beginners, and advanced airway, developed on Kern's 6-step approach for curriculum development[2].
Each course was offered annually between 2019 and 2022. Trainees were sent an anonymous online survey to assess the program.
Results and Discussion: All trainees participated in at least one Passport. Thirty-one trainees completed the survey (94% response rate); all questions had a positive median response (Fig. 1)
Conclusion(s): Our survey showed positive feedback, with trainees considering it helpful in building confidence and practicing skills, communication, troubleshooting, and emergency scenarios.
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2. Khamis NN, Satava RM, Alnassar SA, Kern DE. A stepwise model for simulation-based curriculum development for clinical skills, a modification of the six-step approach. *Surg Endosc*. 2016;30(1):279-287. doi:10.1007/S00464-015-4206-X
Acknowledgments: None.

Passport	Simulation scenarios included
Pediatric anesthesia	Laryngospasm Apnea during caudal anesthesia Post tonsillectomy bleeding Sinus tachycardia during surgery Pre-operative evaluation* Anesthesia for a child with increased intracranial pressure
Obstetric anesthesia	Failed epidural anesthesia for emergent cesarean delivery Fetal bradycardia after epidural analgesia Eclampsia during vaginal delivery Accidental dural puncture* Epidural consent*
Cardiothoracic anesthesia	Coming off bypass Acute protamine reaction Pump failure during coronary artery bypass graft surgery Hypoxia during one-lung ventilation Type A aortic dissection*
Advanced airway management	Video laryngoscopy and use of Frova catheter Supraglottic devices, Fast-trach Awake fiberoptic intubation Jet ventilation A case of a complex airway algorithm
‚Beginners' course	Standard, elective induction of anesthesia Rapid sequence induction Aspiration during induction Oesophageal intubation Anaphylaxis Bronchospasm

** Scenario for communication skills*

Table 1. Passport curriculum

Pediatric anesthesia - Laryngospasm	• Identification of laryngospasm • The laryngospasm algorithm • Importance of preparation of intramuscular drugs for a child without intravenous access during induction
Obstetric anesthesia - Failed epidural anesthesia for emergent cesarean delivery.	• Evaluation of epidural block • Preparation and timing of conversion to general anesthesia • Multidisciplinary communication and conflict resolution
Cardiothoracic anesthesia - Coming off bypass	• Procedure for coming off bypass - methodical approach • The differential diagnosis for hemodynamic instability when coming off bypass • Complex multidisciplinary communication between surgeons, pump technicians, and anesthetists
'Beginners' course - Aspiration during induction	• The correct choice of rapid sequence induction • Initial measures for regurgitation during intubation • Identification of emergencies and call for help • Importance of equipment preparation (e.g., suction)

Table 2. Predefined debriefing points for sample scenarios

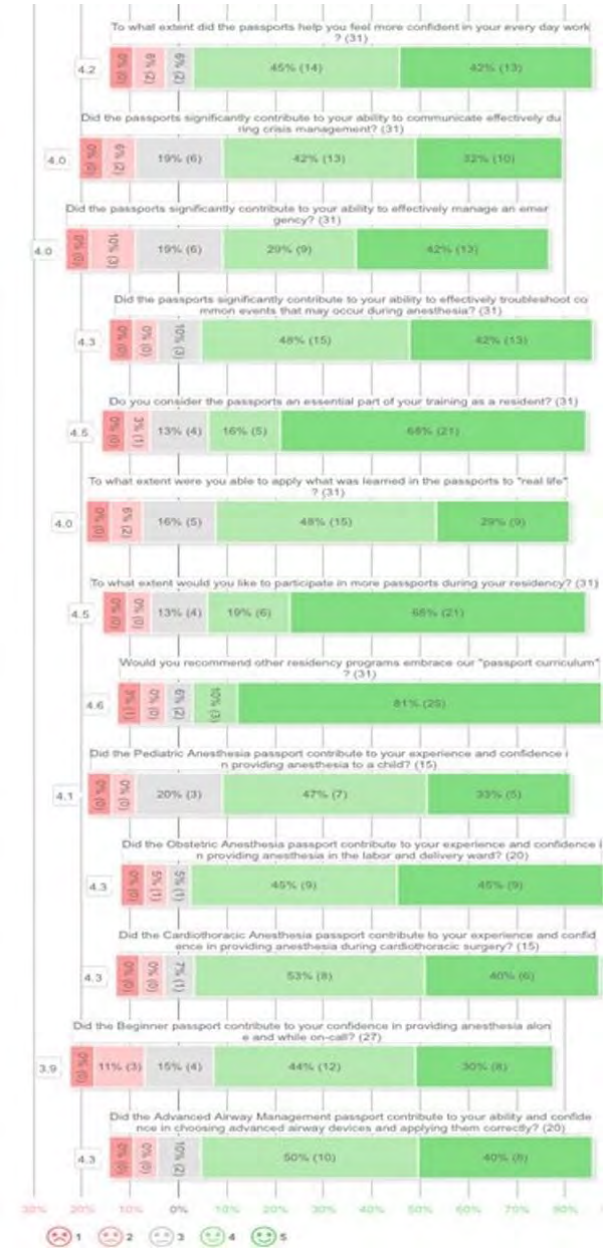

Figure 1.

16AP03-02
Influence of a novel teaching program in critical care on the career intentions of undergraduate medical students

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Background and Goal of Study: Faculty of intensive care (FICM) census data demonstrates a need for significant workforce expansion in order to meet predicted levels of demand for critical care. The vulnerability of current critical care staffing levels has been further exposed by the pressures of the COVID-19 pandemic.

Studies have shown that experiences as an undergraduate impact the career choices made by medical students. Historically, critical care has been under-represented in the curriculum.

The FICM/RCoA undergraduate framework was developed to support increased delivery of undergraduate education in ICU by focusing on generic competencies required by a newly qualified doctor. Expanding the role of ICM in undergraduate education in this way could improve recruitment.

Materials and Methods: A teaching program focused on transferrable skills was devised, based around a practical approach to the deteriorating patient. Sessions were all relevant to the competencies of a foundation doctor, such as oxygen delivery, fluid prescribing, and a mastery approach to A-E assessment of a sick patient.

Feedback was collated at the end of the block via an anonymous on-line form, focusing on career intentions, as well as evaluating the quality of teaching provided. Results were analysed using simple percentages and paired student's t-test.

Results and Discussion: The response rate was 73.7%. For 66.7% of students, this was their first exposure to critical care. On a scale of 1 to 5 (1 = not at all interested, 5 = very interested), students rated their pre-block interest in a career in critical care at 3.1. Following our teaching program, this increased to 4.1.

This difference was statistically significant ($p < 0.05$). 93.3% expressed an interest in returning to our unit for additional exposure to critical care. Quality of teaching was rated 4.9/5.

Conclusion(s): Even in the penultimate year of medical school, the majority of students have no previous experience of critical care. This is concerning given the known link between exposure and career intentions. We report a statistically significant increase in interest in a career in critical care following provision of a high quality, skills-focused teaching block.

Over 90% of students wished to return to ICU, reflecting the positive nature of their experience and providing a potential route to improve exposure and recruitment. This will require investment in terms of protected time and increased resource.

16AP03-03
In vivo placental vein catheterization as a simulation model for medical students

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Background and Goal of Study: Medical schools' programs dedicate more and more hours to practical teaching and skills training in the recent years. One of these skills, useful for any medical student and future doctors, is peripheral vein canalization (PeVC).
Simulation is useful in this context, but mannequins may be poor for this purpose, and often scarce.
We have recently described a new model(1), based on "in vivo" placental vein catheterization. (PlaVC). Our goal was to validate this simulation model compared to traditional simulation model with mannequins in students on their last year of medical school. We also wanted to evaluate the competence acquisition with both models.
Materials and Methods: After ethical committee approval, we performed a prospective observational study on 10 students who started their learning in PeVC. We divided the 10 students in 2 groups. Group 1 started learning with mannequins and group 2 started with placental model. We considered 10 attempts per student with each model, before trying in one real patient.
Every student attempted 10 times PeVC. After these 10 attempts the groups were exchanged. We measured the success rate with each model and if they reached or not the competence level based on CUSUM methodology.(2)
Results and Discussion: All but 2 students on each model, reached the competence, with a median range of attempts of 5 (placenta) and 6 (mannequin) for each student. We asked in an anonymous survey to each of the students about usefulness of the learning model and 70% of them evaluated placental model as superior. Mannequin model was found more difficult in 80% of students, and 100% of students considered themselves ready for their first attempt for a real patient PeVC after this simulation with a high degree of satisfaction (7 students 10/10, 2 students 8/10 and one student 7/10). As limitations we can describe placenta availability depends on the number of deliveries and the mannequins cost and repeated punctures on the same place.
Conclusion(s): The placental model is valid for teaching peripheral vein canalization in medical students, and most of the students reach the competence with less than 10 attempts with a high degree of satisfaction among medical students
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16AP03-04
Improving knowledge of 2021 Resuscitation Council UK guidelines and identifying gaps in training: A retrospective review of resuscitation training in Renfrewshire

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Background and Goal of Study: Despite the infrequency of cardiac arrests encountered in general practice, all staff must be equipped with basic life support skills, as prompt CPR will determine outcome success. Patients treated by bystanders with better CPR awareness, more confidence in their abilities and more training are likely to have better outcomes. Research suggests that the UK is falling behind in figures. The Out-Of-Hospital Cardiac Arrest (OHCA) survival rate in Scotland was 6% in 2013 compared to 9% across Europe.
The purpose of this study was to improve knowledge of the Resuscitation Council UK (RCUK) 2021 guidelines and emphasise the importance of resuscitation training. We aimed to evaluate the current resuscitation training methods employed by three general practices in Renfrewshire and identify hypothesised gaps in training provision.
Materials and Methods: A clinical audit was performed by sending a retrospective questionnaire to staff working across 3 general practices over a 2-month period. Questions assessed the type and frequency of resuscitation training received and how comfortable staff were with basic cardiac arrest management.
Results and Discussion: Two thirds of staff did not meet RCUK standards for resuscitation training within general practice. 22.2% of staff members did not receive training when joining their practice and 44.4% of staff were not comfortable in recognising cardiac arrest, calling for help and starting CPR. 55.6% of staff did not know who their practice resuscitation officer was and all staff expressed that further resuscitation training would be beneficial.
There is a relationship between willingness to perform bystander CPR and the level of confidence in training. CPR training is clearly both vital and effective, but skills become outdated and forgotten quickly. Training of non-clinical staff is just as important as training of clinical staff, and we need to concentrate on fostering confidence and leadership capability.
Conclusion(s): General practice resuscitation officers should examine their staff databases, as the recent Covid-19 pandemic may-have created gaps in training provision. Governance at health board level would be beneficial to prevent future breaks in training. Further research should comprise larger sample sizes. It would be valuable to assess the efficacy of different training formats and more comprehensively study the effects of the covid-19 pandemic on resuscitation training.

16AP03-05
The simulation-based CPR training for 700 students

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Background and Goal of Study: Basic life support (BLS) is an essential skill for every physician. At Masaryk University First Aid course is obligatory for all the students of General medicine and Dentistry. According to the research using simulation in CPR training is one of the most effective teaching tools. For this reason, we decided to change the teaching method from frontal lessons to the simulation-based concept. Because of the high number of the students (750) in a semester and limited financials and human resources, the peer learning concept was used. This research aims to prove that this concept is not inferior to the previous one.
Materials and Methods: The research was an analysis of the process of evaluation. The exam of the First Aid course is based on OSCE (Objective Structured Clinical Examination) principles. Students undergo one simulation aimed at adult or child CPR. Their performance in the simulation is evaluated according to a checklist. The quality of the CPR is evaluated by the software of an advanced mannequin.
Results and Discussion: Peer learning simulation-based course managed to prepare the students for the OSCE because the success rate was 100 % in the Dentistry and 99 % in General medicine which is not significantly different from previous concept (Dentistry 100 %, General medicine 99.8%). The most omitted step in the approach to the unresponsive victim was shouting for help, with a success rate of 89.9 %, head tilt (in adults) at 95.3 % or neutral head position (in infant) at 96.7 %. The best achieved CPR technique parameter was the ratio 30:2 (in adults) with a success rate of 97.5 % and 15:2 (in infant) with 98.5 %. The worst achieved CPR technique parameter was the depth of chest compressions in adults 60.2 % and in infant 56.4 % students achieved an accurate (not too deep, not too shallow) depth of 80 % chest compressions during 2 min CPR.
Conclusion(s): One of the most efficient ways to teach BLS is through simulations. Our research shows that using the peer learning concept with simulation-based training is a way to make it possible for large groups.
Acknowledgements: Many thanks to the student lectors and teachers of the First Aid course, personnel of the Simulation Centre of the Faculty of Medicine of Masaryk university, Martina Kosinová and Daniel Barvík.

16AP03-06
Use of artificial intelligence (AI)-assisted imaging for teaching point of care cardiac ultrasound - a pilot study

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Background and Goal of Study: Point of care ultrasound (POCUS) describes the use of bedside ultrasound (US) for diagnosis/ procedures. Benefits include better diagnostic sensitivity and specificity with faster institution of treatment. Teaching POCUS to medical students has shown benefits[1], though resource intensive. AI-assisted imaging could be a useful adjunct for teaching. It is unknown whether this teaching method translates into superior skill/ knowledge gain versus conventional methods.
This pilot study compared the use of an AI-enabled US machine (Kosmos by EchoNous) with a standard US machine for POCUS Cardiac teaching.
Materials and Methods: 33 US-naïve medical students were randomised into 2 groups for learning:(A) with an AI-enabled US machine, (B) with a conventional machine. A pre-training multiple-choice question (MCQ) test was conducted to assess baseline knowledge followed by a standardised 3-hour faculty-led hands-on learning. The AI-enabled machine provided real-time cardiac structure annotation, acquisition guidance and image grading for the apical 4 chamber view. All students took a post-training MCQ and practical skills test using a conventional US machine. 26 students underwent an interval assessment.
Pre- and post-training MCQ test results were analysed for all students. Immediate and interval post-training MCQ and practical skills test results were compared between both groups.
Results and Discussion: Results showed significant improvement between pre- and post-training MCQ test scores in both groups, no significant difference in post-training MCQ test scores between groups, and similar immediate and interval practical skills scores.
This suggests that AI-automated labelling and image guidance may not translate into better learning outcomes. This may be due to our study design with AI used in a single setting. AI-assisted probe guidance could also reduce the need for faculty guidance when learning POCUS.
Conclusion: Use of an AI-enabled US machine to teach cardiac POCUS in a single setting is non-superior to traditional methods. Further research on using AI machines for teaching in multiple settings is recommended to establish benefits.
Reference:
1. *Davis JJ et al. Ultrasonography in undergraduate medical education: A systematic review. J Ultrasound Med. 2018;37: 2667–2679.*
Acknowledgements: Bluestone Corporation(SG) for loan of the Kosmos by EchoNous machine; Prof Chen FG, Drs Swapna, Ashokka, Donald; Tan XY, V. Chua for their support.

16AP03-07
The feasibility and efficacy of training medical students in intravenous cannulation using the Microsoft HoloLens 2

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Background and Goal of Study: The Microsoft HoloLens 2 is a head-mounted device which renders a Mixed Reality (MR) environment and facilitates a two-way broadcast to a remote location.
Devices such as the HoloLens may provide procedural training remotely, and MR elements such as holographic diagrams may improve knowledge integration and technical performance.
We aimed to evaluate the feasibility and efficacy of intravenous cannulation training delivered using the HoloLens to compare this to in-person teaching.
Materials and Methods: Medical student volunteers were allocated to receive tutorials either in=person (IP) or via the HoloLens (HL). The HoloLens group were given a structured familiarisation session lasting 10-12 minutes. Holographic elements including diagrams were employed in the HL group, and physical images in the IP group.
Students performed cannulation on a training model. Baseline competence in cannulation was assessed using a 29-point validated tool. (1) Students then received metrics-based feedback from a tutor and carried out supervised practice. They then performed a second cannulation which was assessed using the same tool.
Both assessments were video recorded and scored by two tutors. Scores from both tutors were then averaged and a paired T-test employed to test for significance.
Results and Discussion: Sixteen medical students participated and were allocated equally to the HL and IP groups.
Both IP and HL groups had similar pre-tutorial procedural performance: mean (SD, [range]) 18.63 (3.1, [15-22.5]) and 18.56 (2.7, [14.5-22]) respectively, p= 0.97.
Both groups showed statistically similar improvement in performance, absolute increase 8.03 (43.1%) and 8.12 (43.75%) with post-tutorial scores of; mean (SD, [range]) 26.68 (1.37, [25-29]) and 26.75 (1.85, [24.5-29]) respectively, p= 0.17.
Conclusions: We demonstrated that procedural training in IV cannulation via the Microsoft HoloLens 2 was feasible, with modest additional training /familiarisation requirements, and showed similar improvements in competence as in-person training.
Further evaluation of the usability of the device in this context is planned, and future research may evaluate the generalisability of our findings to other elements of medical education.
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16AP03-08
Undergraduate 4th year Greek medical students' knowledge, attitude and perspectives of artificial intelligence

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Background and Goal of Study: Although artificial intelligence (AI) is a new field, it is constantly developing in medicine and especially in anesthesiology.
The aim of this study was to evaluate and analyse the knowledge, attitude and perspectives of undergraduate 4th year medical students of University of Thessaly on AI.
Materials and Methods: An anonymous survey was conducted during the first class of anaesthesiology core rotation (October 2022). Besides participants' demographic data the survey consisted of 19 questions, scored in a 5 point Likert scale, about AI. Descriptive statistics and frequencies were used for statistical analysis. Data were summarized using means (SD), and are presented as numbers and percentages. Statistical analysis was performed with SPSS vs 27 and GraphPad Prism vs 9.4.1.
Results and Discussion: A total of 64 students completed the survey (response rate 74%). From them 59.4% (n=38) were males and 40.6% (n=26) were females, with a mean age of 21.6 years old.
The Cronbach's alpha was 0.75. Although almost half of students (40.6%) reported that "they have sufficient knowledge of AI", the majority of them disagreed (42.2%) or felt undecided (32.8%) about "following emerging technologies".
Interestingly, 59.4% of students disagreed that "AI offers useful applications in the field of medicine" and 46.9% that "AI will lead to drastic changes in every field of medicine", respectively.
Lastly, although 37.5% of our students agreed that "the ability of AI to establish a diagnosis may outweigh clinical experience of physicians", 45.3% of them cannot decided if "they will always use AI when making medical decisions in the near future".
Conclusion(s): Medical students seem to have a sufficient knowledge of AI. However, they do not follow emerging technologies and they do not believe that AI will bring drastic changes in the near future.

16AP03-09
Simulation-based training as mandatory part of anaesthetic curriculum

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Background and Goal of Study: Simulation-based training is a technique where one can learn and train technical and non-technical competencies and cognitive skills with different technological devices.
Simulation based training was introduced in the Slovenian anaesthetic curriculum as mandatory since year 2017 and anaesthesiology is the first medical specialisation with such education in Slovenia.

Materials and Methods: The specialisation of Anaesthesiology and peri-operative intensive medicine in Slovenia lasts 6 years, so we have introduced 12 educational modules (2 times per year) in the curriculum. Modules in which total syllabus is included according to European Training Requirements are performed in the Medical Simulation Center (MSC) of University Medical Center Ljubljana and University Medical Center Maribor. The knowledge is achieved by lectures and scenarios using part-task trainers, ultrasound machines, high-fidelity patient simulators, virtual reality and etc. The first 32 residents who completed the training evaluated this simulation-based training in a short survey.

Results and Discussion: Residents have evaluated delivered modules by marks in the range from 1 to 5 (Table 1).

Modul	Mark
Modul 1. General anaesthesia I	4.3
Modul 2. General anaesthesia II	4.3
Modul 3. General anaesthesia III	4.3
Modul 4. Reanimatology	4.8
Modul 5. Regional anaesthesia	4.4
Modul 6. Special anaesthesia I	4.2
Modul 7. Special aneaesthesia II	4.5
Modul 8. Special anaesthesia III	4.2
Modul 9. Intensive medicine I	4.6
Modul 10. Intensive medicine II	4.6
Modul 11. Intensive medicine III	4.4
Modul 12. Acute and chronic pain management	4.3

Marks are presented as mean values ;range (1-5)

Table 1. Average evaluations of delivered modules.

Conclusion (s): Slovenia is one of the 8 European countries with mandatory simulation-based training in the anaesthetic curriculum (1). Our survey showed good evaluation marks and resident satisfaction. The current generation of teachers are obliged to introduce simulation-based training in the curricula.

Reference:

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16AP03-10
Non-academic challenges faced by anaesthesiology residents during post-graduate training in Pakistan

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Background and Goal of Study: Recent literature reveals that Anaesthesiology residents experience high levels of stress, burnout and depression during their training. These not only affect the clinician personally, but it also impairs work performance and consequently patient care. Factors contributing can be academic and non-academic. Apart from academic stressors which may be faced equally by female and male residents, some non-academic may differ between genders, as well as being influenced by cultural factors. In South Asia, there is paucity of literature on this aspect. Currently no data is available regarding non-academic stressors faced by physicians undergoing post graduate medical education training in Pakistan, thus, there is a need to explore such factors and encourage the residency directors and institutions to adopt policies to effectively deal with this aspect as it may also affect the working performance of trainees and eventually patient safety.

Materials and Methods: We used qualitative participatory research method based on focus group discussions to generate themes exploring the non-academic stressors. These sessions were held online and recorded to aid logistics. The groups contained volunteers from each year of residency with authors as the moderators.

Results and Discussion: The most common non-academic stressors identified during group discussions were guilt of not being able to spend quality time with family/friends, inability to indulge in recreational activities, worsening political situation and a grave state of law and order in the country. Most of the stressors were common among both the genders. There were a few factors affecting females more than males like no reliable means of public transport, inadequate child care system and gender discrimination. Some senior residents also highlighted that a change in their personalities during residency and uncertainty about future career avenues after training were non-academic contributors to their stress.

Conclusion: The factors identified by the study reflect that non-academic stressors indeed affect postgraduate anaesthesiology trainees. Some of these factors are unique to this part of the world which were not explored by studies done in the developed countries. This information will help the institution to devise policies that might help alleviate these factors and contribute towards the wellbeing of their trainees.

16AP03-11
War and medical education: is there influence?

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Background and Goal of Study: Due to ongoing military conflicts, the countries where they take place have limited access to some basic needs that, during peaceful times, are widely available. Thus, while the demands for medical help during armed conflicts are increasing, it is simultaneously more challenging for medical universities to continue to provide medical education.

The aim of our research was to determine whether the full-scale invasion, which is currently happening in Ukraine, has an influence on the final-year residents-anaesthesiologists knowledge level and ability to perform the independent medical practice.

Materials and Methods: Since the beginning of the full-scale Russian invasion on the 24th of February 2022, the educational agenda for residents had to be modified. The majority of offline lessons were substituted by online classes or recorded sessions, expanding the amount of time for independent education.

In our research, we compared the results of OSCE of the residents in 2020, 2021, and 2022 years, we sent questionnaires to all the second-year residents for them to share their satisfaction with the education process and their capacity to work independently. Separate questionnaires we sent to educators for them to evaluate the results of their educational process and the impact of full-scale invasion on it.

Results and Discussion: In research took part 36 residents in 2022 and 36 residents in 2021, and 15 teachers were participating in the study. The number of residents, who failed OSCE in 2021 and 2022

did not vary substantially. The number of residents who received a higher percentage of competence accession was gradually growing in 2022 while comparing with the previous year. Talking about the assessment of the knowledge of the residents by teachers, 7 out of 15 noted that 2022-year graduates had a higher level of knowledge, in comparison with previous years though, 8 out of 15 responded it stayed on the same level.

Conclusion(s): While the full-scale Russian invasion was happening in Ukraine, the residents of anaesthesiology and intensive care were still able to receive knowledge and practical skills, and be prepared for autonomous medical practice due to different approaches, such as expanding the hours of their practical work in the hospitals, making recordings of online classes and setting aside more time for self-education.

Reference:

UNESCO «The quantitative impact of conflict on education»

Sustainability

18AP01-01
"Ditching the Des": a QI initiative in sustainable anaesthesia to remove Desflurane from anaesthetic practice in a District General Hospital

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Background and Goal of Study: Anaesthetic gases use has profound global warming consequences. Desflurane has a particularly poor environmental profile. It contributes 80% of estimated greenhouse effects from all measured anaesthetic volatiles[1], yet despite growing evidence for removal, desflurane remains stored and used in NHS facilities. The anaesthetic department at the Royal Alexandria Hospital (RAH) surveyed and audited its use, and undertook a QI initiative to limit its clinical use.

Materials and Methods: A survey of the department use and attitudes to Desflurane was performed along with obtaining pharmacy details of baseline usage. Following this a "compromise" intervention was performed (Desflurane removed from anaesthetic machines but available on a patient to patient basis from theatre stores). The use of Desflurane was then measured over one week. The lists running over the course of the week were considered to be a standard roster, and thus gave a fair representation of weekly usage in the theatre suite. Figures were also obtained for requests from stores for Desflurane vapourisers.

Results and Discussion: The initial survey found a cohort of consultants (26%) regularly used it and 14% of felt that removal would impact their practice. Pharmacy records showed a median of 5 bottles were being restocked per month. Our intervention was initiated and after one month and ran alongside a poster campaign and talks at our departmental meeting. Our follow-up audit showed no Desflurane use during the audit period. No deflurane vapourisers were signed out from stores and no critical incidents or theatre delays were reported since the intervention was initiated.

Conclusion(s): While there was initial resistance to its removal, placing vapourisers in stores rather than on machines was a helpful step in adjusting practice and demonstrating that a Desflurane-free department was possible. With Desflurane's increase cost over Sevoflurane, there will also be finacial as well as environmental savings. The removal of Desflurane did not impact on clinical care. Simple QI measures can be used to change practice which can show both financial and environmental benefit. We would encourage other departments to conduct similar interventions.

Reference:

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18AP01-02
Anaesthesia and global warming: the environmental impact of maintenance hypnotics

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The current climate emergency requires reducing your professional carbon footprint. Given the exceptional heat-trapping potential of volatile anaesthetics, we aim to quantify the ecological impact of the choice of maintenance hypnotic.

To determine the difference in greenhouse gas emissions depending on the choice of maintenance hypnotic in a secondary hospital in Belgium.

For all general anaesthesias, aged > 5j between 1/4/2022 and 30/11/2022 in Sint-Jan Hospital, Brugge, Belgium, the anaesthesia time and body weight was collected from the electronic medical record. We simulated the CO_2-equivalent emissions in two scenarios:
1. Propofol 3mg/kg + sevoflurane 2% in 50% O_2 in air 2L FGF,
2. TIVA propofol 1% 3 mg/kg + 6 mg/kg/h with 50% O_2 in air 8 L FGF.
Emissions from production and disposal of sevoflurane, propofol, O_2, air and required auxiliaries, each with its usual packaging material, were included. New propofol vials were assumed for every patient and new syringes for every new propofol vial taken into account when more than one vial is needed. The cost of medication and consumables were calculated according to customary Belgian tender prices.

For 11909 procedures with a median [IQR] anaesthesia time of 74[45-113] minutes and an average (SD) patient weight of 77(20) kg, sevoflurane anaesthesia resulted in 669,256 kg CO_2e, and €159,438. TIVA resulted in 18,655 kg CO_2e and €73,034.

		amount	kg CO_2e	Price
sevo 2L FGF	20ml propofol ampules	20542	187 kg	11,298 €
	20ml syringes	20542	1,251 kg	2,054 €
	blunt fill needles	20542	107 kg	616 €
	sevoflurane ml	310424	662,631 kg	117,961 €
	sodalime canisters	1833	4,107 kg	27,252 €
	O_2 kg	888	622 kg	229 €
	air kg	1532	352 kg	27 €
	Σ		669,256 kg	159,438 €
propofol 8L FGF	50ml propofol vials	28518	9,782 kg	42,777 €
	extension lines	11909	467 kg	5,955 €
	3-way valves	11909	215 kg	1,786 €
	back-check valves	11909	96 kg	8,336 €
	microclaves	11909	114 kg	4,883 €
	blunt fill needles	28518	148 kg	856 €
	50ml syringes	28518	3,935 kg	7,415 €
	O_2 kg	3553	2,487 kg	917 €
	air kg	6126	1,409 kg	109 €
	Σ		18,655 kg	73,034 €

In our hospital, extrapolated for one year, maintenance anaesthesia with sevoflurane results in an additional 976 tons of CO_2e emissions and €129,606 higher cost than with propofol. Using automated mini-

mal flow would reduce this, but the difference would still remain 404 tons and €27,711.
For this reason, and coupled with various strictly medical grounds, we consider it recommendable that propofol should be the default maintenance hypnotic, with sevoflurane retained only for when specifically indicated. To facilitate this, mastery of TIVA in the different surgical circumstances should be a core objective of training programmes. Government incentives could be considered to incentivise sustainability considerations in anaesthesiology practice.

18AP01-04
Taking climate-smart actions in anaesthesiologic daily clinical routine - a cross-sectional before and after study within the "Provider and Education & Evaluation Project" (PEEP)

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Background: Anaesthesia contributes significantly to a hospital's carbon footprint. Climate-smart actions have the potential to reduce CO_2 emissions. However, a basic prerequisite for sustainable behaviour is knowledge and awareness of providers. The prospective observational multicentre "Provider Education and Evaluation Project" (PEEP) was initiated by anaesthesiologists at the TU Munich and intended to identify and increase the level of awareness of climate change and sustainability in three German Hospitals. At RWTH Aachen University Hospital, we aimed to assess the change in anaesthesiologists' climate friendly behaviour before and after educational interventions in three areas that every anaesthesiologist can address in daily clinical routine: 1) Energy 2) Recycling 3) Volatile anaesthetics.
Methods: We conducted a cross-sectional assessment before and after a bundle of educational interventions within PEEP, which included presentations, posters and stickers on computers, light switches and vaporizers. For each cross-sectional assessment all central 28 ORs were observed for one week. For the before (2021) and after (2022) comparison we analysed: 1) Wasted energy in unoccupied theatres by operating computers and turned-on lights at 9pm 2) Feasibility of recycling of preoperative anaesthesia plastic packaging by determining the difference between calculated weight of presently unseparated preoperative plastic waste in the 1st assessment and the weight of actual separated waste in the 2nd assessment 3) Fresh gas flow (FGF) in balanced anaesthesia cases in steady state at 9am, and purchased hypnotics converted to bottles/1000 procedures in 2018-2022.
Results and Discussion: We observed a reduction of wasted energy by 44% in unoccupied theatres. Usage of low FGF settings increased from 58% to 82%. The average of purchased desflurane in 2018-2020 decreased by 79% in 2022. We calculated 10.3kg of preoperative plastic waste in one week, but we were unable to implement waste separation due to infrastructural and logistical reasons. While a structured cross-speciality approach is most desirable, we showed that anaesthesiologists can take low effort actions with high impact immediately.
Conclusion: We found that environmentally friendly working behaviours increased after the implementation of educational interventions. Due to the cross-sectional before and after design, the causality between the interventions and the observed improvements remains to be proven.

18AP01-05
No laughing *(gas)* matter: nitrous oxide manifold downsizing and decommissioning in one Scottish hospital

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Background and Goal of Study: Nitrous oxide (N_2O) is a potent greenhouse gas[1]. The Nitrous Oxide Project, using Chakera methodology, provides a framework for nitrous oxide reduction[2]. At University Hospital Ayr (UHA), we identified a disproportionate number of N_2O cylinders ordered compared to clinical use; especially given UHA has no on-site paediatric or maternity services. We aimed to reduce N_2O use via exploring its clinical use and reviewing the methods of delivery to theatre.
Materials and Methods: Two cylinder manifolds were identified in UHA: 2 banks of 4x Size G cylinders supplying the theatre complex, and 2 banks of 2x Size G cylinders supplying a community dental unit.
A survey was sent to all anaesthetists in UHA to understand N_2O usage and explore support for manifold decommissioning.
The number (and cost) of Size G N_2O cylinders ordered over a 5-year period between 2017 and 2022 was obtained from pharmacy. Blanking plugs were then installed on N_2O pipeline outlets in theatre. N_2O could still be utilised on request via a portable cylinder. The volume used clinically over the following six-week period was obtained from electronic logs on theatre anaesthetic machines and any cases using N_2O in the anaesthetic room were noted.
Results and Discussion: Survey response rate was 68%. One third stated they never used N_2O, with another third using it on average less than six-monthly. The majority (87%) agreed to a trial without piped N_2O. 323L N_2O were used clinically over next six weeks, however despite this the theatre cylinder bank was replaced during this time. On average 80 size G cylinders per year were being ordered by pharmacy.
We demonstrate minimal clinical use of nitrous oxide along with substantial wastage within the piped manifold system and underutilisation of a second manifold resulting in unused cylinders expiring. Consequently, the theatre manifold has been decommissioned and the dental manifold downsized. This is projected to reduce the carbon footprint of UHA by approximately 400 tonnes CO_2 per year and save £3000/year.
Conclusion(s): Clinical review of N_2O usage and decommissioning and downsizing of manifolds has resulted in significant environmental and financial benefits.
References:
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18AP02-01
Reducing hospital carbon footprint by improving renal replacement procedure taking into account auto-effluent systems: taking care of human team, saving money and being sustainable

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Background and Goal of Study: According to the data provided by the hospital's Residual Waste Office (Punto Verde), our ICU generates an average of 5000 kg of *type III waste* per month, which means *an annual production of 68,000 kg*, representing between 1/3 and ¼ of the hospital's total production in terms of environmental impact. The management of this waste has a cost of approximately 1 euro/kg which is an annual cost of approximately 68,000 euros Furthermore, in terms of occupational health, there is also an ergonomic impact due to handling this waste. This waste is disposed in containers whose weight should not exceed 20-25Kg for Occupational Risk Prevention of the personnel who have to handle them.
Goal of the study. To reduce the generation of type III waste and promote the ergonomics of the ICU staff.
Materials and Methods: There is a clear area for improvement in the management of waste from filter bags. These bags, when full, have a weight of 10kg each and an approximate average of 5 bags per day of Renal Replacement Therapy are needed (for a standard treatment dose of 2000ml/h, a refill is needed every 5h, about 5 times a day, total 5 bags). These bags could be recycled, according to the criteria of "Preventiva", after emptying them into the sinks of the Boxes.
However, this indication conflicts with the criteria of Occupational Health Department, that consider this action to be non-ergonomic and harmful to the worker. Renal Replacement Therapies in our ICU lead to an annual consumption of 6,320 filter bags at a cost of 58,239.72 euros. As the option of emptying and reusing the bags was not available, RRT provider companies were contacted for the incorporation of auto-effluent pumps in the RRT machines at a kit cost of 120 euros/therapy (for the whole duration of the therapy).
Results and Discussion: The use of auto-effluent systems with their direct discharge into the drains eliminates the use of filter bags and saves costs (*economic impact*) of *43,839 euros*, as well as the waste generation reduction (*environmental impact*) accounting for *63,200 Kg* meaning *a 92% reduction of the total waste production*, while gaining a *resource for nurses as well as nursing assistants*.
In addition, there is a secondary benefit in terms of *occupational health and occupational risk prevention* for the staff, as they do not have to move and transport the waste. Moreover, the reduction in the generation of waste containers frees up space in the Unit.

18AP02-02
Sustainability at pre-anaesthesia outpatient clinics. Telemedicine as chance to reduce carbon dioxide (CO_2) emissions. A monocentric cross-sectional study

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Background and Goal of Study: Due to the COVID-19 pandemia, digitalisation and remote services in health care accelerate dramatically. Pre-anaesthetic preparation by phone provids a successful alternative compared to inpatient assessments, without divergence of diagnostics and process-related decisions. Given the imminent climate crisis, sustainability at every level of health care should be considered, while quality and patient safety is garanteed.
The goal of this study was to estimate the reduction of CO_2 emissions by pre-anaesthesia outpatient clinics using telemedicine.
Materials and Methods: A cross-sectional mono-center study was conducted between April 11th and June 17th 2022. After routine telemedical pre-anaesthesia visit a self-made questionnaire on climate-relevant aspects was assessed via another telephone call. Sevenhoundred and fourteen patients were invited to participate and informed about the study; 80 patients gave their written consent for descriptive analysis.
Results and Discussion: When asked which transportation patients would have used if the appointment for pre-anaesthesia visit had been in person at the hospital outpatient clinic, 61,3% replied by using an automobile and 38,7% would have arrived by public transportation. A distance of 74 km on average was calculated. Based on conservative estimations (new registrated cars 2019) of the emission-relevant share (35% diesel, 23,8% petrol), in total 0,703 tons CO_2 had been saved.
Assuming constant proportions and extrapolation to all patients receiving telemedical pre-anaesthesia preparation within one year at the study centre (n = 2016) a CO_2-reduction of 30,15 tons was calculated. The CO_2 emission-sparing effect of telemedical pre-anaesthesia assessment was even higher when considering the avoidance of preventable pre-operative appointments for chest X-ray, laboratory testing, and consultation of internal specialists; such detours before hospital admission are still prescribed by family doctors despite national quality standards on pre-operative diagnostics exist.
Conclusion(s): Telemedicine in pre-anaesthesia outpatient clinics combined with preventable appointments contribute to climate protection in a relevant extent, even at a hospital in the centre of Vienna with surgical patients travelling within the city.
Further analyses are necessary to explore reductions in CO_2 emissions at a national level including surgical patient flows in rural and remote areas.

18AP02-03
An alternative approach towards Operating Theatre sustainability in an Italian University Hospital

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Background and Goal of Study: Operating Theatre (OR) sustainability impacts health and health care practitioners (1). To reduce the environmental impact of operating theatres and provide information, specific in our setting, the Salerno University - School of Medicine has founded the Green Operating Theatre group, to work together to reduce the footprint of the perioperative environment.
Materials and Methods: Our group has developed a Green Operating Theatre agenda to follow along on the sustainability journey, aimed at: waste reduction, anaesthesia gas management and improvements of energy use.
Our first action is to reduce mishandled noninfectious waste in OR, in particular the use of disposable shoes covers, for patients and health care workers, since they not only produce non recyclable waste, but are not sufficiently effective at reducing contamination (2).
Results and Discussion: We implemented the use of a shoes sanitizing station, a system which, through ozone gas and UV light, sterilizes health personnels' shoes at each OR access. This patented system not only guarantees an effective reduced contamination of the OR but leads to lower environmental burden with the management of non-infectious waste, thus combining clinical needs and sustainability considerations.
Conclusion(s): This approach is a tiny, little step towards sustainability but it may encourage similar policy considerations at national level to incentive green practices in the operating room and throughout the healthcare system.
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Acknowledgements: The Authors are grateful to all the nurses working in the OR of the University of Salerno Hospital for their efforts to reduce pollution.

18AP02-04
Bundled measures of an individual university hospital to reduce its carbon footprint

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Background: The global healthcare sector is a major contributor to the climate crisis with 4% of total CO_2 emissions (CO_2e) worldwide (1). The German Society of Anesthesia and Intensive Care Medicine has published a position paper including a bundle of actionable measures to reduce anaesthesia carbon footprint. This paper served as a blue print for the Department of Anesthesiology and Intensive Care Medicine to develop different measures at the university hospital Bonn, Germany. The goal of the study was to demonstrate that concerted bundled actions are needed to reduce healthcare CO_2e.
Materials and methods: A multiprofessional "green" anesthesia team networking with other hospital facility teams was established in September 2020. Different projects were developed since then and led to measurable reduction of CO_2e over two years. CO_2e reduction was scientifically evaluated by Life-Cycle-Assessments: 1) Drugs: Eliminate the use of desflurane, use of minimal flow volatile anesthetics, smart use of propofol induction 2) Consumables/ Waste: upcycling of CO_2 absorber, recycling of single use scopes and surgical material 3) Mobility: Development of alternative concepts for staff commute 4) Energy: light management, rooftop photovoltaic 5) Education: Lectures were introduced to the medical student curriculum.
Results and discussion: Since 2020 hospital-wide CO_2e were significantly reduced: 1) elimination of desflurane and establishing minimal flow was a major contributor to CO_2 reduction by 97 tCO_2 in anesthesia. 2) 1,065 tCO_2 reduction was achieved by increase of waste recycling. Amount of waste was reduced by 295 t. 3) employees` mobility by car produced 6,731 t CO_2e and was reduced by possibility to work from home during the Covid -19 pandemic in 2020 4) Installation of rooftop photovoltaic energy generation saved 8,000 t CO_2e annually (2).
It is estimated that the German healthcare system produces 70 Mt CO_2e per year (0.84 t CO_2e per capita). Bundled actions can reduce hospital-wide CO_2 e, as demonstrated by the Federal Environment Ministry (KLIK green). A reduction of 200,000 t CO_2e over 3 years in 250 hospitals was achieved (3). There are a total of approximately 2,000 hospitals in Germany.
Conclusion: Bundled measure of a single university hospital can lead to a significant CO_2e reduction. However, based on our data, and given the increasing demand for surgery worldwide, efforts to reduce the carbon footprint of hospitals clearly need to be intensified.

18AP02-05
Burnout syndrome among anaesthesiologists in the post-COVID-19 era: a prospective, observational, multicenter study from COVID-19 referral, university/tertiary hospitals in Greece

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Background and Goal of Study: Studies have confirmed the high prevalence of burnout syndrome (BOS) and high risk for BOS (HR-BOS) in Greek anaesthesiologists during the pandemic (21.55% and 67.24%, respectively)[1].
We aimed to evaluate the levels of BOS and potential determinants in the post-COVID era, and to compare them with those during the pandemic.
Materials and Methods: In this multicenter, cross-sectional study, an anonymous survey consisting of the validated Maslach Burnout Inventory (MBI) and the Eysenck Personality Questionnaire (EPQ), was conducted in the 7 anaesthesiology departments of COVID-19 referral University hospitals in November 2021 (Covid era) and again in November 2022 (post-Covid era). MBI is a 22-item self-report measurement of BOS. Eysenck Personality Questionnaire (EPQ) explores 3 main dimensions of personality (Neuroticism, Extraversion and Psychoticism) whereas the Lie (L) scale serves as a measure of "dishonesty". Prevalence of BOS and HR-BOS was investigated comparatively, as well as possible associations with personality traits, as assessed by the EPQ. Multivariate logistic regression analysis was performed to investigate possible predictors of BOS and HR-BOS.
Results and Discussion: The response rate was 85% (100/118) and 98% (116/118) in 2022 and 2021, respectively. During the post-COVID era, prevalence of BOS and HR-BOS dropped to 11% and 48%, respectively. The post-Covid period exhibited a protective effect against BOS and HR-BOS (OR 0.123, p=0.001 and OR 0.4, p=0.011, respectively). Of note, concerning the dimensions of the EPQ questionnaire, Neuroticism and Psychoticism were identified as significant predictors of BOS (OR 1.24, p<0.001 and OR 1.16, p=0.024, adjusted for study period, respectively). Moreover, Neuroticism and Extraversion were identified as significant predictors of HR-BOS, with Neuroticism exhibiting an aggravating and Extraversion a protective effect (OR 1.22, p<0.001 and OR 0.91, p=0.043, adjusted for study period, respectively).
Conclusion(s): Our findings revealed a drop in BOS and HR-BOS prevalence one year after the Covid-19 crisis. Personality traits are consistently associated with BOS and HR-BOS.
Reference:
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18AP02-06
Project Shutdown: Switching Off Theatres

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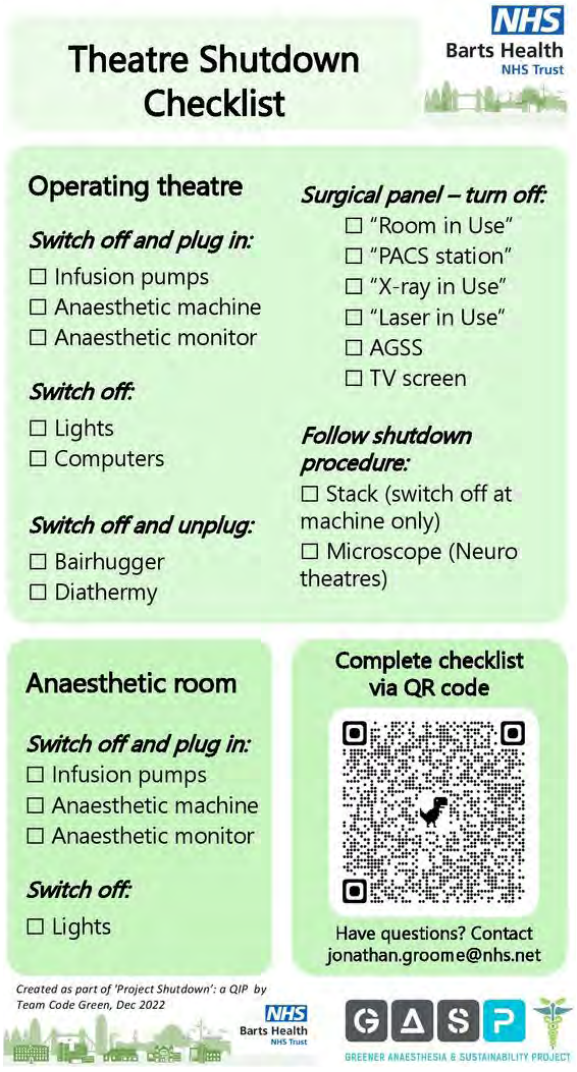
The climate crisis has complex, far-reaching impacts on health. Energy-efficient health systems have the triple benefit of reduced carbon emissions, cost-savings and, ultimately, improved wellbeing. Operating theatres ('theatres') are the most energy intensive areas within hospitals. Up to half of this energy powers lights, medical appliances and IT equipment, with the remainder powering scavenging and ultra-clean ventilation[1]. The aim of this project is to achieve a sustainable reduction in energy use in our theatres by turning off all aforementioned non-essential equipment by January 2023.
85 spot-checks across 19 non-emergency theatres were carried-out between 12am and 7am to determine the extent to which non-essential equipment was left switched on out-of-hours. Overhead lights and the surgical TV screens were switched on in 70.5% and 67% of theatres respectively. Diathermy and Bairhuggers were on in 58.8% and 60% of theatres respectively. The scavenging was never switched off.



Based on our findings we have developed a draft electronic 'shut-down checklist' to be completed by theatre staff at the end of the day via a QR code. This details what equipment can be safely switched off, including scavenging. Roll-out of the checklist is scheduled for December 2022.

As completion of the checklist online will provide us with a discrete outcome data, we will be able to monitor checklist completion. We will repeat our spot-check survey in the weeks following checklist roll-out and we look forward to sharing our findings regarding its efficacy with Euroanaesthesia.

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18AP02-07
Greener anaesthesia: waste management project

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Background and Goal of Study: The NHS spends over £700M a year on waste disposal (1). Post pandemic we have seen a huge rise in the use of clinical waste bins resulting in missed collections and huge cost. These clinical waste bins often contain recyclable waste. Pre-Pandemic, an NHS Freedom of Information Report estimated that if waste was correctly classified, the NHS could save almost £8M a year (1).

Our anaesthetic rooms currently only contain hazardous waste bins. We worked closely with the estates team to introduce recycling bins and designed a project to estimate the total annual saving following their introduction.

Materials and Methods: We formed a Greener Anaesthesia team within our Anaesthetics Department in a District General Hospital. Over a 1 week period, we weighed all our hazardous waste bins at the end of each day and extrapolated the results to estimate our annual waste production.

We performed spot checks to estimate the amount of clinical, hazardous and recyclable waste in our bins. We could then project the total annual savings by correctly re-classifying waste with estates advising us on the cost of waste collection.

Results and Discussion: We estimated that we produce 3.99 tonnes of waste per year, our spot checks found that 95% of this was recyclable waste and the remainder clinical waste, there was no hazardous waste.

Type of waste	Current Projected Annual Waste (Tonnes)	Current Collection Cost (Pounds Per Tonne)	Total Annual Cost (Pounds)
Hazardous	3.99	1400	5583
Clinical	0	640	0
Recycleable	0	0	0
Total			£5583

Type of waste	Projected Annual Correctly Classified Waste (Tonnes)	Current Collection Cost (Pounds Per Tonne)	Total Projected Annual Cost with Recycle Bins (Pounds)
Hazardous	0	1400	0
Clinical	0.2	640	127.62
Recycleable	3.79	0	0
Total			£128

Figure 1. Current annual cost of waste vs proposed annual cost post introduction of recycle bins

Conclusion(s): Nearly £5,500 saving per year whilst doing our bit for the environment. Relies on all team members to use the correct bins, NHS resources available to understand what goes in what bin. Highlights the benefits of a good relationship with hospital estates team

Reference:

Freedom of Information Follow up Report on Management of Waste in the NHS 2018

Acknowledgements: A big thank you to the Darent Valley Hospital Estates team

18AP03-01
Audit on drug wastage in the operating room at Tawam hospital

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Background and Goal of Study: The advancements in the field of anesthesia have led to a significant increase in cost in healthcare systems. Within anesthesia departments, a significant portion of the operating budget is devoted to pharmaceuticals. Wastage of anesthesia drugs is common and a possible target for cost-reduction strategies. In addition to the financial burden, drug wastage can have hazardous effects on the environment. Drug wastage represents a significant portion of the entire anesthesia drug budget. The aim of the audit was to estimate the current wastage of anesthesia drugs in the operating room at our facility and to decrease the waste by optimizing drug usage to achieve cost control and environmental sustainability.

Materials and Methods: It was a prospective audit conducted over 1 week. Data was collected by completing a proforma by the anesthetists. The proforma was paper free to support the environment. The proforma included questions on anesthetist's opinion on the percentage of medication that is wasted on a daily basis for commonly used medications like Propofol, Ketamine, Midazolam, Muscle relaxants, Phenylephrine, Ropivacaine and Lidocaine. The drug wastage options included three classifications: 10-30%, 30-50%, more than 50%.

Results and Discussion: Data was collected from 24 anesthetists with a 90 percent response rate. More than 60% of anesthetist opined that "more than 50%" of drugs which included Ketamine, Midazolam and Phenylephrine are wasted on a daily basis. More than 80% of the respondents opined that there was a wastage of around 30% for lidocaine and around 10-30% for Propofol, Ropivacaine and muscle relaxants on a daily basis. More than 90 percent of responders were in agreement that wastage could be minimised if lesser concentration vials of medications were made available. We plan to present these results by having a multidisciplinary team meeting involving all Anesthetists, Operation Room staff and pharmacy managers with an aim to raise awareness about drug wastage and to implement an effective action plan by making available different concentration of medications. We intend to re- audit to ensure change in practice.

Conclusion(s): Drug wastage can be explained by some of the common practices. Due to concerns about infection control, pre-prepared medications often remain unused and discarded. Waste reduction strategies are eminent to be established to aid in reducing cost in healthcare systems.

18AP03-02
Emergency atropine: will prefilled syringes be the future?

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Background and Goal of Study: In the operating room (OR), atropine is routinely drawn up to ensure its immediate availability. As a result, many prepared syringes remain unused and are discarded, contributing to increasing costs and environmental impact.
Recent studies suggest that prefilled syringes might be cost-effective and reduce potential mistakes associated with drug preparation.
The aims of the study were to quantify the wastage of atropine in a period of scheduled OR activity and to evaluate if the use of prefilled syringes would be cost-effective.
Materials and Methods: The total number of atropine vials prepared and administered were collected during 10 consecutive days, in 11 operating rooms of a tertiary hospital.
Additionally, we calculated the number of prepared and administered syringes of atropine expected in a year by proportionally extrapolating the total number of annual surgical procedures. To achieve this, we applied a direct proportion between the 297 procedures conducted during our period of observation, and the 8219 procedures expected in the year.
The direct costs associated with the preparation of this drug were calculated and compared with the costs of prefilled syringes.
Results and Discussion: In 10 days of scheduled surgical activity, atropine was prepared 136 times and was administered only in 16 cases. There was a wastage of 88% of prepared syringes.
We estimate that 3764 syringes of atropine would be prepared and 443 used during a year. The cost of atropine preparation is €0.95 (€0.91 atropine vial, €0.023 syringe, €0.017 needle), while a prefilled syringe costs €4.90. During a year, the estimated cost of current practice would be €3575.80. With prefilled syringes we expect a cost of €2170.70 - a 39% decrease.
Our study has some limitations. We extrapolated results for a year only based on a short period, not controlling possible variation in the number of procedures and atropine administration. Additionally, it was conducted in a single center. Thus, studies in other tertiary centers may help weed off potentially site-specific variables impacting on vial wastage.
Conclusion: These data demonstrate that the use of a prefilled atropine is cost-effective. Indirect or waste treatment costs were not taken in account, which could further increase the economic advantage. This alternative would significantly minimize drug wastage and improve the environmental sustainability of our practice.

18AP03-03
Implementing green theatre changes: are reusable drapes a viable option?

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Background and Goal of Study: Sustainable change within the healthcare system will have a direct impact on current and future health relating directly to the principle of non-maleficence, to 'do no harm' following the founding principle of medicine(1).
Surgical theatres are the largest consumers of single use plastic within the hospital (2).
A switch to reusable items will help to reduce this. Hence, we aimed to see if reusable drapes are a viable option in the surgical theatres of The Royal Hospital for Children, Glasgow (RHCG).
Materials and Methods: An electronic, 9-item questionnaire was designed by the author and hosted online. A link was distributed to all currently working in RHCG theatres and explored the following key areas: Role within the RHCG, Opinions on disposable drapes, Opinions on reusable drapes and willingness to implement the use of reusable drapes in theatre.
Results and Discussion: There were 32 respondents to this survey. 88% of respondents said that if they had the option they would be happy to use reusable drapes for selected procedures (16% of which said they would be happy to use exclusively reusable). Similarly, 81% stated that they would be happy to use a mixture of different types of drapes in their practice.
Conclusion(s): There is an understanding of the environmental impact disposable drapes have, however there continues to be misinformation around reusable drapes and their infection control properties (3).
Overall, it can be concluded that there is a willingness to implement to the use of reusable drapes in theatres at the RHCG and through this small change we may be able to create a big impact. By involving theatre users at the outset this study provides a platform for discussion of both current environmental evidence and willingness to change practice in a large group of specialties.
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1. Boag K, Ho T, Culmer P, Pike T, Jayne DG, Peckham-Cooper A, Quyn AJ. Introducing green innovation into clinical practice. The Bulletin of the Royal College of Surgeons of England. 2022 May;104(3):140-4.
2. McGain F, Muret J, Lawson C, Sherman JD. Environmental sustainability in anaesthesia and critical care. British Journal of Anaesthesia. 2020 Nov 1;125(5):680-92.
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18AP03-04
Can stickers and lectures change anaesthesiologists' attitude towards climate mitigation? Results from a German multicentre survey-study

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Background: Climate change is a major threat to global health. Anaesthesia claims responsibility for significant greenhouse gas emissions and high energy consumption. It has repeatedly been shown that providing information and raising attention can change employees' attitudes and lead towards climate action. Thus, we evaluated if a bundle of educational interventions can change attitude and knowledge of anaesthesiologists and intensivists about climate action.
Methods: Employees of anaesthesia departments at three German University Hospitals were asked to complete a survey about their attitudes and knowledge on climate action. The 65-item survey was sectioned in five areas of interest, addressing demographics, personal attitudes towards climate change, organisational readiness for change, chances and possibilities to improve sustainability in the workplace, and specific knowledge on climate friendly anaesthesia. Afterwards, the departments implemented a climate action program involving lectures, informative wallpapers, and stickers on vaporizers and light switches. One year later the employees were asked to complete the survey again. Differences between attitude and knowledge before and after the interventions were evaluated using Mann-Whitney-U and Chi-square tests. Replies of anaesthesiologists who participated in both questionnaires were evaluated using t-tests for paired sample analysis.
Results and Discussion: 256 anaesthetists and intensivists participated at the first round of the survey, while 166 employees completed the second questionnaire. There were no differences between the first and second survey, except for an increased agreement on the importance of climate action. Interventions were mainly reviewed good or rather good (>25%). Lectures and wallpapers were not noticed by around 15% of the participants. Except for an item on sustainable investment, knowledge did not differ between the first and second survey. Interestingly, the participants of the second survey agreed to significantly more suggestions for a climate friendly work environment. Considering the findings of previous studies, we reason that stickers, wallpapers and lectures may help to increase awareness of climate action. Our educational interventions did not increase knowledge.
Conclusion: Stickers and lectures may increase anaesthesiologists' awareness about climate action. In order to prove causal associations, larger randomized controlled studies are needed.

18AP03-05
The journey of recyclables from the operating theatre: identifying gaps for intervention

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Background: Healthcare waste accounts for 1% of a nation's solid waste; 25% are contributed by anesthesia waste. [1] While recycling is happening in operating theatres (OT) worldwide, the full journey of recyclables after end users dispose into the recycling bin is not fully explored. Our quality improvement project reviewed the journey of recyclables in Singapore General Hospital (SGH) OT, identified the gaps that resulted in low recycling rates and implemented solutions to fill these gaps. Our aim is to increase the weight of recycled plastic and paper by 50% from baseline weight per case.
Methods: Using the Institute for Healthcare Improvement model for improvement framework, multi-stakeholder engagement from project conception was prioritized, to ensure accurate identification and implementation of effective improvement measures. The journey of recyclable items was mapped via hospital walkthrough sessions. A questionnaire was administered to assess existing knowledge, attitude and current recycling practices of SGH OT personnel.
Results and discussion: From our root-cause analysis (Figure 1) and questionnaire, the highest contributory gaps in existing recycling practices are: limited knowledge on types of recyclable medical items, manpower and time constraints, and lack of recycling bins.
Chosen interventions included installation of colour-differentiated recycling bins, educational posters on types of recyclable medical items, and regular talks to educate SGH OT personnel. With ongoing implementation of recycling bins and educational posters, our preliminary results show 37% increase in weight of recycled plastic and paper from baseline.

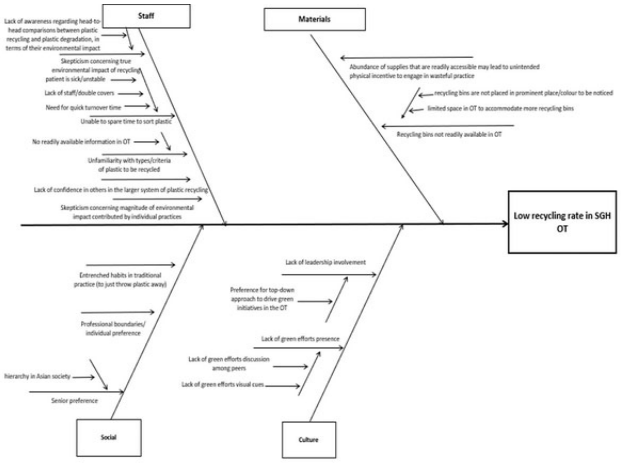

Figure 1.

Conclusion: With education involving all key stakeholders, implementation of recycling bins in OT and reaching out to green environmental champions to encourage and sustain a culture of recycling, the weight of recycled plastics and paper will increase significantly.
Reference:
1. Beloeil H, Albaladejo P. Initiatives to broaden safety concerns in anaesthetic practice: The Green Operating Room. Best Practice & Research Clinical Anaesthesiology 2021;35:83–91.

18AP03-06
Economic and plastic waste associated with the use of pulse contour disposable sensors for perioperative hemodynamic monitoring

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Background and Goal of Study: Pulse contour techniques are used for cardiac output monitoring during high-risk surgery. Some require the use of specific pulse contour disposable sensors (e.g. FloTrac sensor), whereas others, known as "disposable-free" techniques, can be used with a regular low-cost pressure transducer.
Materials and Methods: To assess the potential carbon footprint and economic impact of pulse contour techniques in France, the following assumptions were made:
1) number of surgeries = 10 million/yr,
2) proportion of high-risk procedures = 12.5%,
3) plastic carbon footprint = 1.7-3.5 kg of CO2 per kg (woodly.com),
4) average hospital cost of a pulse contour disposable sensor and of a regular pressure transducer = €160 and €10, respectively.
A pulse contour disposable sensor and a regular pressure transducer were weighted (table).
Results and Discussion: If all high-risk surgical patients could benefit from perioperative hemodynamic optimization - as recommended by the French Society of Anesthesiology, SFAR – using a pulse contour disposable sensor instead of a regular pressure transducer would result in 69 extra tons of plastic waste/yr, which translates into 118-240 extra tons of CO2/yr (the equivalent of the yearly carbon footprint of 24-48 French citizens). Hospital extra-costs associated with the use of pulse contour disposable sensors were estimated to €187 million/yr (the budget necessary to purchase >36,000 handheld ultrasound devices or to hire >5,000 new nurses in France).

	Pulse contour disposable sensor	Regular pressure transducer	Difference
Weight per unit	86 g	31 g	55 g
Nb of high-risk surgeries/yr	1,250,000	1,250,000	-
Total plastic waste/yr	108 tons	39 tons	69 tons
Tota carbon footprint/yr	184-378 tons	66-137 tons	118-241 tons
Average cost per unit	€160	€10	€150
Total cost/yr	€200 millions	€13 millions	€187 millions

Conclusion(s): The annual carbon footprint of disposable pulse contour sensors is negligible at a population or national level. However, the economic impact is significant. In France, the use of disposable-free cardiac output monitoring techniques could lead to savings up to €187 million/yr or would enable the purchase of other medical devices and/or to hire thousands of nurses.
Acknowledgements: ECO-responsible HDM study group: M Biais (Bordeaux), PG Guinot (Dijon), M Leone (Marseille), MJ Licker (Genève), S Molliex (St Etienne), R Pirracchio (San Francisco), S Provenchère (Paris), P Schoettker (Lausanne).

18AP03-07
The journey of plastics recyclables beyond the hospital: identifying limiting factors unique to a small city

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Background: The Singapore government has been promoting sustainable development under the Singapore Green Plan 2030 targeting the diversion of waste away from landfills into recycling pathways. However, only 6% of plastic waste was recycled in 2021 which has led to increasing interest in recycling healthcare plastic to propel the nationwide agenda.
Goal of Study and Methods: To ensure that improved recycling efforts in the hospital can substantially increase plastic recycling rate, we need to understand the journey of plastic recyclables beyond the hospital. Through a series of field trips and discussions with recycling providers, we identified challenges faced downstream particular to being a small island state, which has allowed us to review our recycling strategies in Singapore General Hospital.
Results and Discussion: Healthcare plastic recyclables are classified as post-consumer plastics which often consist of mixed plastic polymers.
The main challenges cited by recycling providers were as follow:
1. Low quantity of recyclables collected
2. Lack of infrastructure– contributed by the land scarcity and relatively high labour costs for segregation and sorting
3. Heterogeneity of post-consumer plastics.

Economy of scale means recycling providers favour post-industrial plastic, which are often more homogenous in composition, as it demands less resources for sorting.
We also identified emerging alternatives to the traditional recycling processes, such as the use of mixed plastic recyclables in the creation of road construction material (Magorium Pte. Ltd.). These newer options may provide the ultimate solutions to the abovementioned limitations.
Conclusion: We identified a variety of limiting factors in the downstream recycling channels providing greater insight into the plastic recycling industry in Singapore. Our aim is to guide the future mapping and implementation of upstream recycling strategies in all Singapore hospitals concentrating efforts on those sustainable pathways offered to us in a country with inherent geographical and recycling infrastructure limitations.

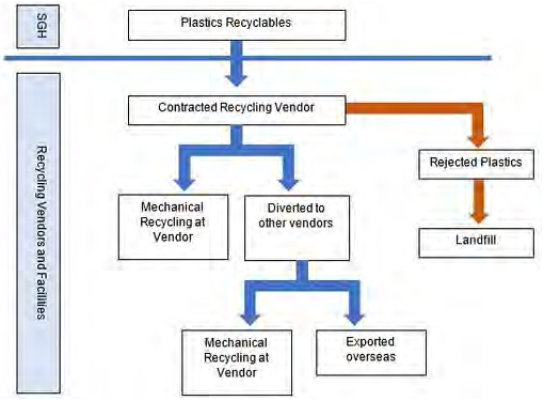

Figure 1. Journey of plastics recyclables generated from Singapore General Hospital beyond the hospital.

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