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The European Anaesthesiology Congress

Abstracts Programme
Barcelona, Spain, June 1–4, 2013

Wolters Kluwer Health | Lippincott Williams & Wilkins

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Abstracts and Programme

EUROANAESTHESIA 2013

The European Anaesthesiology Congress

1 - 4 June 2013
Barcelona, Spain

Wolters Kluwer Health | Lippincott Williams & Wilkins

European Journal of Anaesthesiology

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EUROANAESTHESIA 2013

The European Anaesthesiology Congress

Barcelona, Spain, 1 - 4 June 2013

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 and the Best Abstracts - Runner-up Session 1 & 2). 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 for 45 minutes before and 30 minutes after their session, to address further questions.

Date	Time	Reference	Location	Page
ESA Best Abstract Prize Competition (BAPC)				
02.06.2013	14:00-15:30	ESAPC1	Room 120	1
Best Abstracts - Runner-up Sessions				
02.06.2013	08:30-10:00	ESAAP1	Room 120	3
02.06.2013	10:30-12:00	ESAAP2	Room 120	5
Subcommittee 1 - Evidence-based Practice and Quality Improvement				
01.06.2013	15:00-16:30	01AP1	Poster Area - ROW 1B	7
01.06.2013	15:00-16:30	01AP2	Poster Area - ROW 2B	10
03.06.2013	12:15-13:45	01AP3	Poster Area - ROW 1B	12
03.06.2013	14:00-15:30	01AP4	Poster Area - ROW 10A	15
03.06.2013	14:00-15:30	01AP5	Poster Area - ROW 11A	18
03.06.2013	16:00-17:30	01AP6	Poster Area - ROW 11B	21
03.06.2013	16:00-17:30	01AP7	Poster Area - ROW 12B	24
04.06.2013	08:30-10:00	01AP8	Poster Area - ROW 1A	28
Subcommittee 2 - Ambulatory Anaesthesia				
02.06.2013	08:30-10:00	02AP1	Poster Area - ROW 1A	31
02.06.2013	10:30-12:00	02AP2	Poster Area - ROW 1B	34
Subcommittee 3 - Monitoring: Equipment and Computers				
02.06.2013	14:00-15:30	03AP1	Poster Area - ROW 5B	37
02.06.2013	14:00-15:30	03AP2	Poster Area - ROW 6B	40
03.06.2013	10:30-12:00	03AP3	Poster Area - ROW 1A	43
03.06.2013	12:15-13:45	03AP4	Poster Area - ROW 2B	46
03.06.2013	14:00-15:30	03AP5	Poster Area - ROW 12A	48
04.06.2013	08:30-10:00	03AP6	Poster Area - ROW 2A	51
Subcommittee 4 - Clinical and Experimental Circulation				
02.06.2013	10:30-12:00	04AP1	Poster Area - ROW 2B	54
02.06.2013	10:30-12:00	04AP2	Poster Area - ROW 3B	58
02.06.2013	16:00-17:30	04AP3	Poster Area - ROW 10B	61
02.06.2013	16:00-17:30	04AP4	Poster Area - ROW 11B	63
03.06.2013	10:30-12:00	04AP5	Poster Area - ROW 2A	67
03.06.2013	10:30-12:00	04AP6	Poster Area - ROW 3A	70
03.06.2013	12:15-13:45	04AP7	Poster Area - ROW 3B	73
03.06.2013	14:00-15:30	04AP8	Poster Area - ROW 13B	76

Date	Time	Reference	Location	Page
Subcommittee 5 - Respiration				
03.06.2013	14:00-15:30	05AP1	Poster Area - ROW 14B	80
03.06.2013	14:00-15:30	05AP2	Poster Area - ROW 15B	83
04.06.2013	08:30-10:00	05AP3	Poster Area - ROW 3A	86
04.06.2013	08:30-10:00	05AP4	Poster Area - ROW 4A	89
Subcommittee 6 - Transfusion and Haemostasis				
02.06.2013	14:00-15:30	06AP1	Poster Area - ROW 7B	92
02.06.2013	14:00-15:30	06AP2	Poster Area - ROW 15B	95
02.06.2013	16:00-17:30	06AP3	Poster Area - ROW 12B	98
Subcommittee 7 – Neurosciences				
01.06.2013	15:00-16:30	07AP1	Poster Area - ROW 3B	101
01.06.2013	15:00-16:30	07AP2	Poster Area - ROW 4B	104
02.06.2013	16:00-17:30	07AP3	Poster Area - ROW 13A	107
02.06.2013	16:00-17:30	07AP4	Poster Area - ROW 14A	110
04.06.2013	08:30-10:00	07AP5	Poster Area - ROW 5B	112
Subcommittee 8 - Regional Anaesthesia				
02.06.2013	10:30-12:00	08AP1	Poster Area - ROW 5A	116
02.06.2013	10:30-12:00	08AP2	Poster Area - ROW 6A	119
02.06.2013	14:00-15:30	08AP3	Poster Area - ROW 8B	122
02.06.2013	14:00-15:30	08AP4	Poster Area - ROW 9A	125
03.06.2013	10:30-12:00	08AP5	Poster Area - ROW 4A	128
03.06.2013	10:30-12:00	08AP6	Poster Area - ROW 5B	131
03.06.2013	12:15-13:45	08AP7	Poster Area - ROW 4B	134
03.06.2013	12:15-13:45	08AP8	Poster Area - ROW 5A	136
Subcommittee 9 – Pharmacology				
01.06.2013	15:00-16:30	09AP1	Poster Area - ROW 5A	139
02.06.2013	08:30-10:00	09AP2	Poster Area - ROW 2A	142
02.06.2013	08:30-10:00	09AP3	Poster Area - ROW 3A	145
02.06.2013	16:00-17:30	09AP4	Poster Area - ROW 15A	148
02.06.2013	16:00-17:30	09AP5	Poster Area - ROW 16A	151
03.06.2013	10:30-12:00	09AP6	Poster Area - ROW 6B	154
Subcommittee 10 - Paediatric Anaesthesia and Intensive Care				
02.06.2013	16:00-17:30	10AP1	Poster Area - ROW 17B	157
03.06.2013	14:00-15:30	10AP2	Poster Area - ROW 16B	159
04.06.2013	08:30-10:00	10AP3	Poster Area - ROW 6B	162
Subcommittee 11 - Obstetric Anaesthesia				
01.06.2013	15:00-16:30	11AP1	Poster Area - ROW 6A	165
02.06.2013	16:00-17:30	11AP2	Poster Area - ROW 18B	168
02.06.2013	16:00-17:30	11AP3	Poster Area - ROW 19B	172
03.06.2013	14:00-15:30	11AP4	Poster Area - ROW 17A	175
03.06.2013	14:00-15:30	11AP5	Poster Area - ROW 18A	177

Date	Time	Reference	Location	Page
Subcommittee 12 - Intensive Care Medicine				
02.06.2013	14:00-15:30	12AP1	Poster Area - ROW 10A	181
02.06.2013	14:00-15:30	12AP2	Poster Area - ROW 11A	184
02.06.2013	14:00-15:30	12AP3	Poster Area - ROW 12A	187
03.06.2013	12:15-13:45	12AP4	Poster Area - ROW 6A	190
03.06.2013	12:15-13:45	12AP5	Poster Area - ROW 7A	194
03.06.2013	12:15-13:45	12AP6	Poster Area - ROW 8A	197
Subcommittee 13 - Resuscitation and Emergency Medicine				
02.06.2013	10:30-12:00	13AP1	Poster Area - ROW 7A	200
03.06.2013	10:30-12:00	13AP2	Poster Area - ROW 7B	202
Subcommittee 14 - Acute and Chronic Pain Management				
01.06.2013	15:00-16:30	14AP1	Poster Area - ROW 7A	204
01.06.2013	15:00-16:30	14AP2	Poster Area - ROW 8A	207
02.06.2013	14:00-15:30	14AP3	Poster Area - ROW 13B	210
02.06.2013	14:00-15:30	14AP4	Poster Area - ROW 14B	213
03.06.2013	10:30-12:00	14AP5	Poster Area - ROW 8B	215
03.06.2013	12:15-13:45	14AP6	Poster Area - ROW 9B	217
03.06.2013	16:00-17:30	14AP7	Poster Area - ROW 13A	220
03.06.2013	16:00-17:30	14AP8	Poster Area - ROW 14A	223
Subcommittee 15 - Education, Research and Presentation				
02.06.2013	08:30-10:00	15AP1	Poster Area - ROW 4A	226
03.06.2013	16:00-17:30	15AP2	Poster Area - ROW 15A	228
03.06.2013	16:00-17:30	15AP3	Poster Area - ROW 16A	230
Subcommittee 17 - Patient Safety				
03.06.2013	12:15-13:45	17AP1	Poster Area - ROW 10B	233
04.06.2013	08:30-10:00	17AP2	Poster Area - ROW 7B	236
04.06.2013	08:30-10:00	17AP3	Poster Area - ROW 8B	239
04.06.2013	08:30-10:00	17AP4	Poster Area - ROW 10A	242
Subcommittee 18 - Perioperative Care of the Elderly				
02.06.2013	10:30-12:00	18AP1	Poster Area - ROW 8A	244
03.06.2013	14:00-15:30	18AP2	Poster Area - ROW 19A	246
Subcommittee 19 - Airway Management				
01.06.2013	15:00-16:30	19AP1	Poster Area - ROW 9B	249
02.06.2013	10:30-12:00	19AP2	Poster Area - ROW 9B	252
03.06.2013	10:30-12:00	19AP3	Poster Area - ROW 9A	255
03.06.2013	16:00-17:30	19AP4	Poster Area - ROW 17B	259
03.06.2013	16:00-17:30	19AP5	Poster Area - ROW 18B	262
04.06.2013	08:30-10:00	19AP6	Poster Area - ROW 11A	266
Subject Index				271
Author Index				277

Call for abstracts

The ESA solicits the submission of abstracts for the Euroanaesthesia 2014 Congress
Stockholm, Sweden
May 31 - June 3 2014

All abstracts must be submitted online via the ESA Website
www.euroanaesthesia.org

The submission module will be available to submitters from November to December 2013

Submission Conditions

When submitting your abstract, you will be prompted to accept the submission conditions that will be made available on the ESA website at least one month before the submission starts.

ESA Best Abstract Prize Competition (BAPC)

ESAPC1-1

The neuroprotective effects of oxaloacetate and puruvate in a rat model of subarachnoid hemorrhage is mediated by its blood glutamate scavenging activity

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Soroka University Medical Center, Faculty of Health Sciences, Ben Gurion University of the Negev, Department of Anesthesiology and Critical Care, Beer Sheva, Israel

Background and Goals of Study: Subarachnoid hemorrhage (SAH) is associated with significant morbidity and mortality. Glutamate scavengers have been shown to decrease glutamate concentrations in the blood and improve neurological outcome following ischemic stroke and traumatic brain injury in rats.
This study examines the value of blood glutamate scavengers, pyruvate and oxaloacetate, as a therapeutic neuroprotective strategy in a rat model of SAH. We additionally investigated whether glutamate scavenging was the mechanism responsible for any resulting neuroprotection.
Materials and Methods: SAH was induced in 60 rats by autologous arterial blood injection into the cisterna magnum. 20 additional rats served as the sham group, with a 0.3 ml saline injection into the cisterna magnum. 60 minutes later, rats were treated with isotonic saline, 250 mg/kg oxaloacetate, or 125 mg/kg pyruvate by intravenous infusion for 30 minutes at a rate of 0.1 ml/100g/min. Prior to the induction of SAH (baseline) and 90 minutes after SAH, blood samples were collected. Rats' neurological status was measured 24 hours following SAH. Glutamate concentrations in the CSF of half of the rats were also measured 24 hours following SAH. The blood brain barrier (BBB) permeability in the parieto-occipital and frontal lobes was assessed in the remaining half via histological analysis 48 hours following SAH.
Results and Discussion: Blood glutamate levels were decreased in rats treated with pyruvate or oxaloacetate at 90 minutes following SAH ($p < 0.001$). CSF glutamate was decreased in rats treated with pyruvate ($p < 0.05$). Neurological performance improved significantly in rats treated with pyruvate ($p < 0.01$) or oxaloacetate ($p < 0.05$). There was less BBB breakdown in the parieto-occipital lobes in rats treated with oxaloacetate ($p < 0.01$) or pyruvate ($p < 0.01$), and in the frontal lobe in rats treated with pyruvate ($p < 0.05$).
Conclusions: This study suggests the effectiveness of blood glutamate scavengers, pyruvate and oxaloacetate, in the treatment of SAH in rats. The data suggests that the observed neuroprotection with treatment of pyruvate or oxaloacetate is mediated via their blood glutamate scavenging effect.
Acknowledgements: This work was supported by the grant awarded to Alexander Zlotnik MD, PhD from the European Society of Anesthesiologists in 2010.

ESAPC1-2

Re-evaluation of the effectiveness of ramosetron in preventing post-operative nausea and vomiting: a meta-analysis without Fujii et al.'s RCTs

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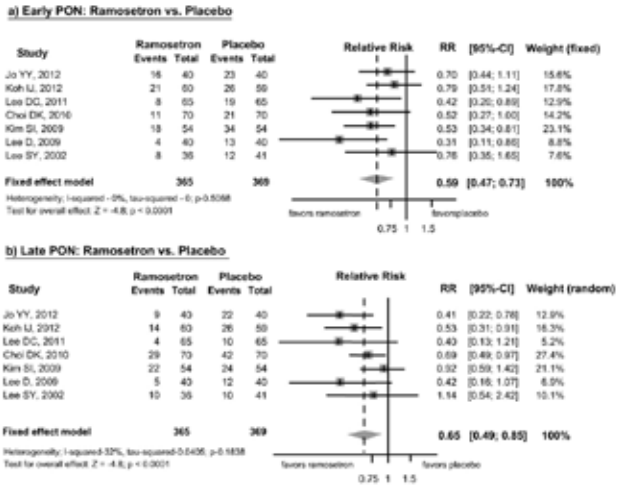
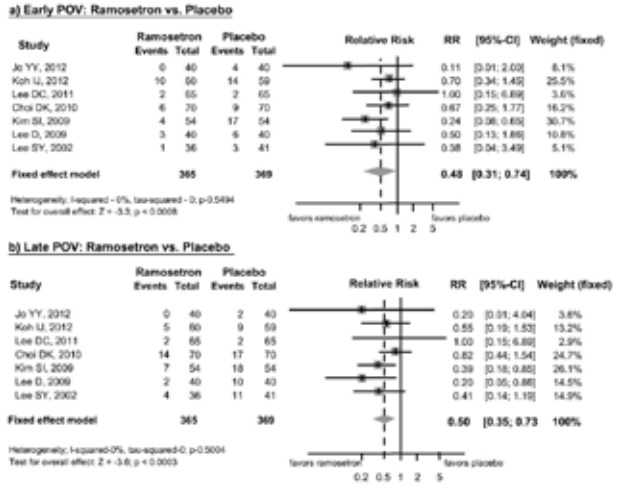
Background: 5-hydroxy-tryptamine receptor 3 antagonists (e.g. ramosetron) are used to prevent post-operative nausea and vomiting (PONV). Ramosetron has been shown to have a very strong effect (Relative Risk = 0.3) in preventing PONV in previous meta-analyses. However, these previous meta-analyses included a number of studies by Fujii et al. which have now been proven to have been fabricated. We believe that the conclusion will change if ramosetron is re-evaluated without Fujii et al.'s studies. The aim of the present meta-analysis was to re-evaluate the effectiveness of ramosetron in preventing PONV after excluding Fujii et al.'s randomized controlled trials (RCTs).
Methods: We searched MEDLINE, CENTRAL, Embase, and Web of Science. All double-blind RCTs that tested the efficacy of ramosetron compared with a placebo in the prophylaxis of PONV were considered to be eligible. Dichotomous data were summarized using risk ratio (RR) with a 95% confidence interval (CI). Heterogeneity was quantified with the I^2 statistic.
Publication bias was assessed using a funnel plot and Egger's regression asymmetry test.
Results: A total of 734 patients were included in the final analysis. In comparison with a placebo, ramosetron reduces the incidence of early PON (RR [95%CI] 0.59 [0.47, 0.73]), late PON (RR 0.65 [0.49, 0.85]; Figure 1), early POV (RR 0.48 [0.31, 0.74]) and late POV (RR 0.50 [0.35, 0.73]; Figure 2). No regression asymmetry test results for the funnel plots were statistically significant.
Conclusions: This meta-analysis excluding Fujii et al.'s RCTs suggests that ramosetron has a significant effect in preventing PON and/or POV compared with a placebo, but less than that reported in previous analyses.



[Figure 1]



[Figure 2]

ESAPC1-3

Drug interaction models are better predictors of tolerance/ response to noxious stimuli compared to individual measured parameters

Hannivoort L.N., Proost J.H., Eleveld D.J., Struys M.M.R.F, Luginbühl M., Vereecke H.E.M.
University of Groningen, University Medical Center Groningen, Dept of Anaesthesiology, Groningen, Netherlands

Background and Goal of Study: This study continues the pursuit of the parameter with the best correlation to the probability of response to noxious stimuli of different intensity. We used data from a previous study by Heyse et al.[1] on the interaction of sevoflurane and remifentanil to compare several parameters.
Materials and Methods: After institutional review board approval, 40 adult patients were randomised to receive different combinations of sevoflurane (Sevo) and remifentanil (Remi) according to a criss-cross design. After reaching pseudo-steady state, the patients were assessed for tolerance of 'shake and shout' (SAS), tetanic stimulation (TET), insertion of laryngeal mask airway

(LMA) and laryngoscopy (LAR). Bispectral index (BIS), state and response entropy (SE, RE), composite variability index (CVI) and surgical pleth index (SPI) were either recorded or computed from raw electroencephalographic and plethysmographic data retrospectively. Sevo and Remi concentrations were recorded. The combined potency of Sevo and Remi according to the fixed $C50_O$ hierarchical interaction model (U) and the noxious stimulation response index (NSRI) were the population-based predictors. We used the prediction probability (P_K) to assess the performance of these parameters on the probability of response. Bootstrapping (n=1000) was used to produce 84%-confidence intervals of the P_Ks, with significance being achieved if the confidence intervals did not overlap ($p < 0.05$).

Results and Discussion: The parameter P_Ks per stimulus are summarised in Table 1.

	U	NSRI	Sevo	Remi	BIS	SE	RE	CVI	SPI
SAS	96%	96%	89% *	60% *	95%	93%	93%	92%	57% *
TET	96%	94%	79% *	69% *	84% *	84% *	84% *	83% *	53% *
LMA	98%	95%	81% *	63% *	83% *	81% *	81% *	79% *	57% *
LAR	98%	95%	76% *	72% *	78% *	78% *	77% *	74% *	58% *

[Table 1. Parameter prediction probabilities]
* $p < 0.05$, compared to U and NSRI

The P_K for U and NSRI were highest for all stimuli. Effect site concentrations of either Sevo or Remi alone were significantly worse predictors. BIS, SE, RE and CVI were significantly worse at predicting tolerance to the three painful stimuli, but similar to U and NSRI for SAS. SPI performed poorly overall.

Conclusion: U and NSRI perform significantly better than EEG-derived parameters and single drug effect site concentrations in predicting tolerance to noxious stimuli. Therefore both U and NSRI could be useful parameters in anaesthetic practice.

References:

1. Heyse B, Proost JH, Schumacher PM, et al. Anesthesiology 2012;116:311-23.

ESAPC1-4

Does total intravenous anesthesia decrease postoperative behavioral changes after adenotonsillectomy in children?

Stojanovic Stipic S., Kardum G., Carev M., Roje Z., Milanovic Litre D., Elezovic N.
University Hospital Split, Dept of Anaesthesiology & Intensive Care, Split, Croatia

Background and Goal of Study: Postoperative behavioral changes (PBC) occur in up to 50% of children undergoing surgery and general anesthesia. They include general anxiety, sleep disorders, enuresis and temper tantrums; if PBC persist, the emotional and cognitive development may be significantly affected (1). Total intravenous anesthesia (TIVA) is increasingly used in routine pediatric anesthesia. The aim of this study was to assess whether the choice of different anesthetic techniques for adenotonsillectomy may impact upon the incidence of PBC in repeated measurements.

Materials and Methods: The children (n=36), age 6-12 yrs, were randomized into 2 groups: TIVA (n=18) and sevoflurane (S) (n=18). After applying EMLA cream, all patients had iv line before the induction and were given midazolam 0.05 μg/kg. In TIVA group anesthesia was induced with propofol, fentanyl and vecuronium,and maintained with continuous infusion of propofol. In S group, after fentanyl 1 μg/kg anesthesia was induced and maintained with sevoflurane in O_2/N_20 (50:50) mixture. BIS monitoring was used and depth of anesthesia accordingly adjusted. All patients were given paracetamol 15 mg/kg and dexamethasone 0.2 mg/kg. PBC were evaluated with Post Hospitalization Behavior Questionnaire (PHBQ), consisting of 27 items describing 6 subscales: General Anxiety, Separation Anxiety, Sleep Anxiety, Eating Disturbances, Aggression Against Authority and Apathy/Withdrawal (2). PHBQ was fulfilled by parents at days 1,3,7 and 15, as well as 6 months after surgery. The data were statistically analyzed with repeated measures ANOVA.

Results and Discussion: Regarding the Separation Anxiety, Eating Disturbances and Aggression Against Authority subscales, there were significant differences between TIVA and S group ($P< 0.05$) in all repeated measurements, with greater mean values of PBC in S group. Regarding the General Anxiety, Sleep Anxiety and Apathy/Withdrawal subscales, there were no significant differences either in repeated measurements within groups, or between TIVA and S group, although higher mean values of PBC were recorded in group S ($P>0.05$).

Conclusion: The choice of anesthetic technique could affect PBC. Children anesthetized with TIVA for adenotonsillectomy had significantly less separation anxiety, eating disturbances and aggression against authority estimated by results of PHBQ.

References:

1. Kain ZN et al. Anesth Analg 2004;99:1648.
2. Karling M et al. Acta Paediatr 2006;95:340.

ESAPC1-5

Genetic factors contribute to enhanced fibrinolytic activity in patients undergoing cardiac surgery

Ozolina A., Strike E., Jaunalksne I., Nikitina Zake L., Harlamovs V., Vanags I.
Pauls Stradins Clinical University Hospital, Dept of Anaesthesiology & Intensive Care, Riga, Latvia

Background and Goal of Study: Low plasma levels of plasminogen activator inhibitor -1 (PAI-1) and tissue plasminogen activator/PAI-1 (t-PA/PAI-1) complex are associated with enhanced fibrinolysis. The Renin Angiotensin Aldosteron system (RAAS) regulates the fibrinolysis. Angiotensin IV and Aldosteron trigger the generation of PAI-1 whereas Bradykinin stimulates secretion of t-PA. Recent studies indicate that genetic factors determine the plasma levels of PAI-1 and t-PA/PAI-1, influencing blood loss after surgery employing cardiopulmonary bypass (CPB).

The goal: To investigate the potential effects of PAI-1 4G/5G and 844 A/G gene polymorphisms and Angiotensin converting enzyme (ACE) intron 16 I/D gene polymorphism on fibrinolytic activity in patients after cardiac surgery with CPB.

Methods: After ethical approval, 90 patients were studied prospectively, whereof 7 were excluded because of surgical bleeding. In 83 patients, PAI-1 gene 4G/5G and 844 A/G, and ACE intron 16 I/D polymorphisms were analyzed. To asses fibrinolysis, PAI-1 and t-PA/PAI-1 complex were determined preoperatively and 24 h postoperatively, respectively, and D-dimer at 0 h, 6 h and 24 h after surgery. Postoperative accumulated 24 h bleeding volume was registered. Associations between 24 h blood loss, genetic polymorphisms, parameters of fibrinolysis were analyzed separately for each polymorphism using SPSS 18.

Results: The following genotypes were detected: PAI-1 gene 4G/5G, 4G/4G, 5G/5G, PAI-1 844 A/A, A/G, G/G and ACE intron16 I/I, I/D, D/D genotypes. The lowest PAI-1 levels preoperatively were associated with PAI-1 5G/5G (17±11 ng/ml), PAI-1 844 G/G (18±12 ng/ml) and ACE intro 16 I/I (18±11 ng/ml) genotype groups. The t-PA/PAI-1 complex reached the lowest level in the ACE intron 16 I/I carriers (2.8±2 ng/ml).

24-hour blood loss differed significantly between PAI-1 4G/4G and 5G/5G (432±168 vs 568±192 ml; $p=0.02$), PAI-1 4G/4G and 4G/5G (432±168 vs 609±321 ml; $p=0.02$) and PAI-1 844 G/G and A/A carriers (601±221 vs 436±266 ml; $p=0.03$). 24-hour blood loss in the ACE intron16 gene genotype groups did not differ significantly.

PAI-1 5G/5G carriers displayed the highest D-dimer levels at 6, 24 h after surgery and PAI-1 844 G/G carriers at 24 h. Within the ACE intron16 I/D groups, D-dimer did not differ significantly.

Conclusions: Enhanced fibrinolysis may be associated with PAI-1 gene 5G/5G, 844 G/G and ACE Intron 16 I/I genotypes which can influence the blood loss.

ESAPC1-6

Safety of epidural and spinal regional anesthesia in over 100,000 consecutive major lower extremity joint replacements - a case series

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Background and Goal of Study: A feared complication of spinal or epidural anesthesia is the development of epi- or intradural hematomas with subsequent neural element compression. Most data available are derived form the obstetric literature. However, little is known on the frequency of its occurrence in the orthopedic joint arthroplasty population, which is usually elderly and suffers from significant comorbid burden. We sought to study the incidence of clinically significant lesions after spinal and epidural anesthesia and further describe their nature.

Materials and Methods: We analyzed charts of all patients who underwent THA or TKA under neuraxial anesthesia at our institution between January 2000 and October 2010. Patients with radiographically confirmed epidural lesions were identified and further analyzed.

Results and Discussion: A total of 100,027 total knee and hip replacements were performed at our institution utilizing either spinal (37,171) or a combination of spinal-epidural anaesthesia with indwelling catheter (62,856). 97 (0.098%) patients underwent imaging studies to evaluate perioperative neurologic deficits. A total of 8 (0.008% or 1:12,500) patients were identified with positive findings for an epidural blood or gas collection (4 female, 4 male, average age 71.6 years (±10), average body mass index 29.1 kg/m2 (±5.2 kg/m2)). On average, the post-operative finding was radiographically diagnosed 3.1 days (±1.5) after surgery. No patients receiving spinal anesthesia only were affected. The International Normalized Ratio (INR) at the time of catheter removal was within normal range in all cases. The presenting complaint was unrelenting, non-positional acute onset back pain in five and major neurologic motor deficits in three patients; two required emergent surgical decompression. All patients diagnosed with hematoma took at least one drug that potentially impaired coagulation (five non-steroidal anti-inflammatory agents, one a selective serotonin reuptake inhibitors, and one an anti-platelet drug). No patient incurred persistent nerve damage.
Conclusion: The incidence of epidural/spinal complications found in this consecutive case series is relatively low, but higher than previously reported in the non-obstetric population[1]. Further research utilizing large datasets could quantify the significance of some of the potentially contributing factors observed in this study.
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Best Abstracts - Runner-up Session 1

ESAAP1-1

Intravenous lipid emulsion entraps amitriptyline in blood and may lower its brain concentration in pigs

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Background and Goal of Study: Amitriptyline has been shown to be entrapped by intravenous lipid emulsion (ILE) in the circulation[1]. However, its toxicological therapeutic potential still remains uncertain despite encouraging case reports[2]. We studied the effect of ILE on amitriptyline concentration in plasma and tissues after its partial distribution in the body, and on haemodynamic recovery.
Materials and Methods: Twenty anaesthetized (2% isoflurane) and monitored pigs, received amitriptyline 10 mg/kg in a central vein in 15 min. After a distribution phase of 30 min the pigs were given ILE (Intralipid® 20%) or Ringer's solution in randomized order in a peripheral vein; a 1.5-ml/kg bolus in 1 min followed by a 0.25-ml·kg^{-1}·min^{-1} infusion for 29 min. Arterial blood samples were taken during treatment, and brain and heart tissue samples were taken at the end. Amitriptyline levels in plasma (total and non-lipid bound) and in tissue samples were measured using HPLC. Statistics: Mann-Whitney test.
Results and Discussion: Twenty min after start of ILE infusion plasma total amitriptyline concentration was significantly higher than in Ringer group (median (IQR) 0.93 (0.82-1.14) vs 0.69 (0.66-0.92) mg/l), and stayed so until the end of the experiment (0.68 (0.61-0.90) vs 0.51 (0.49-0.65) mg/l). Unentrapped (non-lipid bound) concentrations in ILE group did not differ from total concentrations in Ringer group. Brain and heart amitriptyline concentrations were about 20 and 8 times higher, respectively, than those in plasma. Brain amitriptyline concentration was lower after ILE vs Ringer (10.8 (9.2-13.1) vs 15.3 (11.4-19.1) mg/kg); in heart there was no difference. Amitriptyline caused a 20-30% drop in mean arterial pressure (MAP) which returned to near baseline in 30 min. During ILE/Ringer infusion MAP was stable except in two ILE group pigs that developed severe hypotension (MAP< 25 mmHg) and were given adrenaline. Cardiac conduction times did not differ between groups.
Conclusions: ILE entrapped amitriptyline in the circulation after its distribution into tissues. This entrapment possibly drew amitriptyline from brain. However, ILE did not promote haemodynamic recovery from the intoxication; rather the contrary as during ILE infusion 2/10 pigs were near cardiac arrest.
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ESAAP1-2

Red blood cells storage duration does not influence morbidity and mortality in children transfused during the perioperative period of cardiac surgery

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Background: Red blood cells (RBCs) storage duration is associated with alterations in RBC properties that are suspected to have an effect on postoperative morbidity and mortality. This retrospective trial aimed at evaluating the effect of storage duration on postoperative morbidity and mortality in children undergoing cardiac surgery.
Material and methods: We retrospectively reviewed our pediatric cardiac surgery database including curative and palliative surgeries performed with cardiopulmonary bypass (CPB) between January 2006 and December 2010. Children transfused with 1 or 2 units of RBCs in the perioperative period were included and analyzed. Jehovah's witnesses, emergent procedures, American Society Anesthesiology score > 4, non-transfused patients and children exposed to more than 2 RBC units were excluded. Storage duration (Age of blood: AOB) was calculated and used to allocate children to the Group "YOUNG" (AOB ≤ 7 days) or the Group "OLD" (AOB > 7 days). Children transfused with 2 RBC units belonging to the two different subgroups were subsequently excluded. Our primary endpoint was defined as a composite outcome measure based on the incidence of hospital mortality and/or the incidence of at least one organ failure in the postoperative period. Univariate and Multivariate logistic regression analyses were used to determine factors independently associated with our primary endpoint. In these analyses, AOB was entered as a continuous variable. A P value < 0.05 was considered as statistically significant.
Results: From the 570 children included in our analysis, 118 patients were included in the group "YOUNG" (median for AOB: 6.5 days [5-7]), and 452 in the group "OLD" (median for AOB: 14 days [11-19]). Demographic data did not differ significantly between groups, with an exception for aortic clamping and CPB duration that were longer in the group "OLD". No difference was found in term of mortality, length of intensive care unit (ICU) stay, mechanical ventilation (MV) duration, postoperative infection, and major organ dysfunction. In addition, AOB did not influence the incidence of our primary endpoint when evaluated by Univariate or Multivariate logistic regression analyses.
Conclusion: In our retrospective study, RBC storage duration did not influence postoperative morbidity and mortality in children transfused with 1 or 2 RBC units undergoing cardiac surgery.

ESAAP1-3

Contribution of TRPA1 to arousal and respiratory activation to hypoxia

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Background and Goal of Study: TRPA1 (Transient receptor potential cation chanel, subfamilyA, member1), located in distal terminal of sensory neurons, is known to detect irritants and elicit airway defense response (pain, cough, respiratory arrest). In vagal nerve, TRPA1 detects O2 concentration and induces respiratory slowing. We hypothesized that TRPA1 also contributes to arousal from sleep and respiratory activation, as a defense response for hypoxia. To test our hypothesis, we measured arousal time and respiratory parameters around arousal response to hypoxia in mice indwelling EEG and EMG electrodes.
Materials and Methods: We used male TRPA1 knock out mice (TRPA1-KO) and wild-type mice (WT) (n=6, each). During natural sleeping, the continuous flushing air into the recording chamber was switched to hypoxic gas mixture (10% O2 balance with N2). 3minute of hypoxic challenge was repeated for 3times with an interval of at least 5min. The time to arousal was defined by change of EEG and EMG for over 5sec. Respiratory frequency and tidal volume was recorded using pneumotachograph, then minutes ventilation (MV) was calculated at every 5sec bins. Chamber O2 concentration was continuously monitored at the inlet of the chamber. The averaged data of 3 trials was considered as each mouse's data.

Results and Discussion: The time to arousal from natural sleep in response to hypoxia in TRPA1-KO was longerder than WT (114.2±20.1 vs. 30.0±10.1 sec). The increase of MV, just after arousal from sleep, was attenuated in TRPA1-KO than WT (0.38±0.18 vs. 1.2±0.35 ml/min/g).
Conclusion: TRPA1 contributes to arousal from natural sleep and respiratory activation for hypoxia. TRPA1 may, therefore, participate in pathophysiology of sleep apnea syndrome and sudden infant death syndrome since these syndromes are characterized as arousal deficient and breathing disorder around sleep.

ESAAP1-4

How does tranexamic acid induce seizures? Impaired inhibitory but unaffected excitatory synaptic transmission in the mouse amygdala as potential mechanism

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Background and Goal of Study: Tranexamic acid (TXA) is commonly used to reduce blood loss in cardiac surgery and in trauma patients[1]. High-dose application of TXA turned out to be a risk factor of postoperative seizures[2]. The neuronal mechanisms of TXA's proconvuslant action are unclear. We investigated the effects of TXA on synaptic transmission in the basolateral amygdala.
Materials and Methods: Coronar brain slices (350 μm) were obtained from male mice (Bl6; d 28-35). Neurones in the amygdala were identified by infrared videomicroscopy. The effect of TXA on passive electrical membrane properties was investigated in patch clamp experiments. In a next step, compound currents, and AMPA and NMDA receptor-mediated currents were recorded upon electrical stimulation applied to the external capsule. $GABA_A$ receptor mediated currents were either evoked by electrical stimulation ($GABA_A$-eIPSCs) or by photolytic UV-laser-induced uncaging of caged-GABA ($GABA_A$-pCs). Under control conditions, the slices were kept in carbogenated artificial cerebro-spinal fluid. After stable baseline recordings, TXA was added with a final concentration of 1 mM.
Results: In the presence of TXA (1 mM), resting membrane potential and input resistance remained unchanged. Action potentials (AP) were evoked by injection of a depolarizing current. TXA did neither affect AP frequency nor AP amplitude. Amplitudes of compound currents reflecting basal synaptic transmission remained unaffected (91.5 ± 7.2 % of control; n=6; p=0.481) but charge transfer was increased (118.7 ± 5.3 %; n=6; p=0.023) by a TXA-mediated prolongation of current deactivation kinetics. TXA did not impact excitatory AMPA (96.5 ± 4.9 %; n=5; p=0.511) or NMDA (102.5 ± 9.3 %l; n=5; p=0.706) receptor-mediated synaptic transmission. In contrast, TXA reduced $GABA_A$-eIPSCs (35.9 ± 3.2 % n=9; p< 0.001) and $GABA_A$-pCs (40.7 ± 5.4 %; n=5; p< 0.001) to the same extent.
Conclusions: We could demonstrate that TXA reduces $GABA_A$ receptor-mediated inhibitory synaptic transmission via postsynaptic mechanisms. High-dose administration TXA leads to concentrations of 0.64-1.27 mM in the cerebrospinal fluid[2]. Thus the observed inhibition of GABAergic inhibitory synaptic transmission was produced by TXA at a clinically relevant concentration and might explain how TXA promotes epileptiform activity in the CNS.
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ESAAP1-5

Use of low fresh gas flow in a circle breathing system does not provide adequate levels of humidity of the inhaled gas during paediatric anaesthesia

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Background and Goal of Study: When a patient's trachea is intubated, the normal warming and humidifying functions of the upper airways are bypassed. Hence, gas delivered to the patient needs to be artificially conditioned in order to preserve the mucociliary function of the respiratory tract. A circle breathing system can increase the humidity of inhaled gas, especially with the use of a low fresh gas flow (FGF). A heat and moisture exchanger (HME) can be used to further humidify the inhaled gas. The Dräger Primus anaesthesia workstation has a built-in hotplate to heat exhaled and inspiratory gases in the breathing circuit. The temperature and humidity of the inhaled gas of this anaesthesia machine have not yet been investigated in paediatric patients. The aim of this study was to compare the humidity of inhaled gas from a low-flow paediatric breathing system of the Primus workstation with or without a HME.
Materials and Methods: Twenty ASA I-II children (mean age: 4.5±2.3 years; mean weight: 19.1±6.2 kg) scheduled for general anaesthesia with tracheal intubation were randomized in two groups: without (Group I) or with (Group II) a HME into the breathing circuit. The children were ventilated using a paediatric circle system with CO_2 absorber with a low FGF (1 L/min) of the Dräger Primus workstation. Temperature and relative and absolute humidity of the inhaled gas were determined close to the tracheal tube using a thermo-hygrometer. The measurements were made at 10, 20, 40, 60 and 80 min after tracheal intubation.
Results and Discussion: The use of an HME (Group II) provided significant higher mean temperature (30.3±1.1ºC vs 27.0±1.2ºC in the Group I) and mean relative (80±2% vs 65±4% in the Group I) and absolute humidity (25±1.5 mg H_2O/L vs 17±1 mg H_2O/L in the Group I) of the inhaled gas (P< 0.0001). During anaesthesia, a minimum moisture target of 23 mg H_2O/L is recommended to reduce the risk of dehydration of the respiratory tract. Dry gases can also result in thickened mucous and obstruction of a small tracheal tube.
Conclusion(s): The low-flow paediatric breathing system of the Primus workstation does not meet the minimum requirements for humidity of inhaled gas during anaesthesia in children. The insertion of an HME increases the humidity of the inhaled gas, bringing it close to physiological values.
Acknowledgements: FAPESP (grant number 2011/13545-0).

ESAAP1-6

High mortality following emergency gastrointestinal surgery: a cohort study

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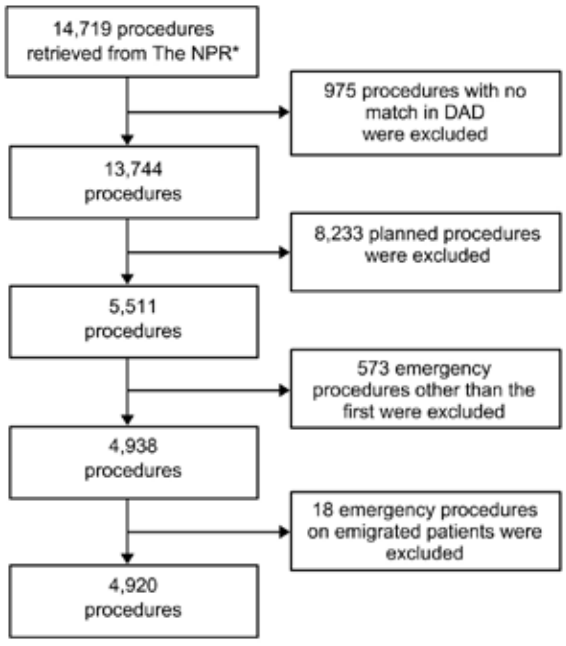
Background: Emergency gastrointestinal surgery is common, but with few outcome data. We aimed to determine the 30-day mortality rate in a consecutive Danish cohort.
Methods: A total of 4920 adult patients undergoing emergency laparotomy or laparoscopic surgery, from January 1, 2009, to December 31, 2010, in 13 Danish gastrointestinal surgery departments were included. Patients undergoing appendectomy or negative diagnostic laparoscopy were excluded. The appropriate surgical procedure codes were retrieved from The National Patient Register (NPR) and matched to data from the Danish Anaesthesia Database (DAD) by The Civil Registry Number. If a patient was registered with more than one emergency procedure, only the first procedure was included in the analysis. Surgical priority (emergency or planned) and ASA score were registered in the Danish Anaesthesia Database perioperatively. The primary outcome measure, 30-day mortality, was retrieved from The Danish Civil Registration system.



[Table 1: Flow-chart of study cohort selection]

	Baseline N (percent)	30-day mortality N (percent)	Confidence intervals Percent
Age (n4920)			
< 59 years	1677 (34.1)	100 (6.0)	4.9 - 7.1
≥ 60 years	3243 (65.9)	788 (24.3)	22.8 - 25.8
ASA score[1] (n4882)			
1	746 (15.3)	13 (1.7)	0.8 - 2.6
2	1819 (37.3)	120 (6.6)	5.5 - 7.7
3	1720 (35.2)	409 (23.8)	21.8 - 25.8
4	533 (10.9)	273 (51.2)	47.0 - 55.4
5	64 (1.3)	53 (82.8)	73.6 - 92.1

[Table 2: 30-day mortality data - subgroups]

Results: We retrieved 14.719 procedures from The NPR of which 93.4 % were matched to DAD perioperative data. Altogether 4.920 eligible patients were undergoing emergency procedures in the period (table 1). The all-cause 30-day mortality was 18.0 % (C.I. 16.9 - 19.1). A total of 65.9 % of the patients were above 60 years. Furthermore 47.5 % of the patients had a severe systemic disease pre-operatively (ASA score 3 or above) with a 30-day mortality rate of 31.7 % (C.I. 29.8 - 33.6).
Conclusion: Emergency gastrointestinal surgery has a high 30-day mortality rate. This high-risk group comprises patients of advanced age and with significant co-existent diseases.
Acknowledgements: Jacob Rosenberg

Best Abstracts - Runner-up Session 2

ESAAP2-1

Magnetic imaging study of the volume of the abdominal aorta and inferior vena cava at different angles of lateral-tilt in pregnant and non-pregnant women

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Background: Although the left-lateral tilt position following spinal anesthesia is often promoted to reduce aortocaval compression by the pregnant uterus, the assumption that this position leads to decreased compression of the abdominal aorta and inferior vena cava has not been validated. Here, we examined whether the left-lateral tilt position reduces aortocaval compression in pregnant women by measuring the volume of the abdominal aorta and inferior vena cava, using magnetic resonance (MR) imaging.
Methods: MR images of 4 singleton parturients (39 weeks gestation) and 4 healthy women were obtained for observation of the abdominal aorta and inferior vena cava in both the supine and left-lateral tilt positions (15°, 30°, and 45°) with insertion of a 1.5-m long hard V-block constructed of closed-cell polyethylene foam placed under the right side of the parturient's body from head to toe. The volumes of the aorta and inferior vena cava were measured between the L1/2 disk and L3/4 disk level. Mean arterial pressure and cardiac output were also measured in each position using the thoracic bioimpedance technique.
Results: The volume of the aorta did not differ significantly between parturient and non-pregnant women in the supine position (12±5, and 12±4ml, respectively).
On the other hand, the volume of the inferior vena cava was significantly lower in parturients than in non-pregnant women in the supine position (1±5 ml vs 16±4ml; P< 0.01). The volume of the aorta in parturients did not change in any of the left-lateral tilt positions. The volume of the inferior vena cava in the parturients was not increased at 15° (1±1 ml), whereas the corresponding values at 30°and 45°were significantly increased (6±6 and 14±4 ml, respectively; P< 0.05).
The volume of the aorta and inferior vena cava in non-pregnant women did not change in any of the left-lateral tilt positions. Mean arterial pressure and cardiac output did not differ significantly among the parturient or non-pregnant women in any of the positions.
Conclusions: These findings indicate that the abdominal aorta in parturients was not compressed and that a left-lateral tilt position of 15° was not effective for reducing compression of the inferior vena cava.

ESAAP2-2

Postoperative morbidity in diabetics after fast-track primary total hip and knee arthroplasty

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Background and Goal of Study: Diabetes is a risk factor for postoperative mortality and morbidity in many types of surgery, including major joint arthroplasty[1], with thresholds for perioperative blood glucoses being debatable[2]. No previous studies have been done in a standardized fast-track setting with optimized perioperative care including spinal anesthesia, opioid sparing multimodal analgesia and early mobilization, which has improved outcome after surgery[3]. We did a prospective study on the influence of diabetes on length of hospital stay (LOS), 90-days readmissions and mortality after primary elective total hip (THA) and knee arthroplasty (TKA) with a standardized fast-track setup.
Materials and Methods: A prospective multicenter study in consecutive unselected patients with detailed information on LOS, readmissions and mortality through patients medical files, and 100% follow-up using the Danish National Health register. Information on antidiabetic treatment was found using The Danish National Database of Reimbursed Prescriptions. Multiple logistic regression analysis on LOS and readmissions was used to adjust for demographics and comorbidity.
Results and Discussion: In 5168 patients 20 (0.4%) had type 1 diabetes (T1D), 566 (11.0%) had type 2 diabetes (T2D) and 4582 (88.7%) were non-diabetics. Of diabetics, 9% used insulin only, 12% had combination treatment, 60% used oral antidiabetica only and 19% received diet treatment.
Median LOS was 2 days (interquartile range 1) and 30 and 90 days readmission rate and mortality was 6.2%, 8.4% and 0.33% respectively. There was no increase in LOS >5days (OR:0.90 95%CI:0.60-1.37; p=0.413) 30 (1.16:0.80-1.69; 0.427) and 90 days readmissions (1.25:0.91-1.71; 0.169) or "diabetes related" readmissions (infections etc) (1.25:0.73-2.14; 0.407) with T2D. This did not change when stratifying according to medical treatment. No specific analysis was made on T1D due to low numbers.
Our results are in contrast to prior studies without a fast-track setup[1] and are likely due to decreased surgical stress when using the fast-track approach[3], thereby reducing the influence of diabetes.
Conclusion(s): Diabetes *per se* does not seem to impair outcome with regard to LOS, readmissions and morbidity after fast-track THA/TKA
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Acknowledgements: We thank Professor Lars Pedersen at The Danish National Database of Reimbursed Prescriptions.

ESAAP2-3

Cyclooxygenase-2 inhibitor celecoxib inhibits glutamate release in rat cerebrocortical nerve terminals by suppression of presynaptic voltage-dependent calcium influx

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Background and Goal of Study: Cyclooxygenase-2 (COX-2) inhibitors have been widely utilized for the treatment of various inflammatory conditions to reduce pain and inflammation. In addition, COX-2 inhibitors have demonstrated a potential neuroprotective effect in recent studies. Considering the fact that excessive glutamatergic synaptic transmission can cause neuronal excitotoxicity, we investigated whether COX-2 inhibitors could influence glutamate release from isolated nerve terminals (synaptosomes).
Materials and Methods: Truncated nerve terminals purified from Sprague-Dawley rat cerebral cortex were used to examine the effect of a COX-2 inhibitor celecoxib on glutamate release evoked by 4-aminopyridine (4-AP). The effects of celecoxib on the membrane potential and calcium ions influx were also examined by $DiSC_3(5)$ and Fura-2, respectively. Furthermore, different calcium channel blockers were used to investigate which part of the calcium source was involved in the effect of celecoxib.

Results and Discussion: Results showed that celecoxib inhibited 4-AP-evoked release of glutamate from rat cerebrocortical nerve terminals. The effect of celecoxib was prevented by chelating the intracellular calcium ions and by the vesicular transporter inhibitor bafilomycin A1, but was insensitive to the glutamate transporter inhibitor. Celecoxib reduced the depolarization-induced increase in cytosolic free calcium ions concentration, but did not alter 4-AP-mediated depolarization.
Furthermore, the inhibitory effect of celecoxib on evoked glutamate release were abolished by blocking the N-type and P/Q-type channels, but not by blocking ryanodine receptors or mitochondrial Na^+/Ca^{2+} exchange.
Conclusion(s): Our results suggest that celecoxib inhibits glutamate release from rat cortical nerve terminals through the suppression of presynaptic voltage-dependent calcium entry which may delineate the possible neuroprotective mechanism of COX-2 inhibitors.
Acknowledgements: This work was supported by grant from the National Science Council of Taiwan, Republic of China (NSC 101-2314-B-418-001)

ESAAP2-4

Use of CUSUM learning curves to evaluate how residents of anaesthesia learn ultrasound guided femoral perinervous blocks for postoperative pain after total knee replacement

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Background and Goal of Study: Few data are available about training in ultrasound-guided (US) regional anaesthesia (RA). Until now, the number of blocks necessary before considering that a trainee reaches sufficiency for this technique has not been determined. This prospective observational study aimed to observe the formation of residents for US-guided femoral nerve blocks with insertion of peri-nervous catheter (FNB-PNC), using the cumulative sum (CUSUM) curve method.
Methods: Twelve 1st year residents with no previous experience in US or RA were recruited to learn US FNB-PNC technique for pain management after total knee replacement, following a standardized protocol. After a theorical session on US FNB-PNC, they performed 2 blocks with instructor's assistance and then under visual supervision.
We recorded patient's demographic parameters (weight, height and age), time to perform the block (TPB), number of procedures, efficacy of the block (variation of pain (VOP) >3/10 in a numeric scale (NS)) and immediate complications. Variables were compared using ANOVA, $p < 0,05$ was considered significant. CUSUM curves were built for TPB (success fixed as realization in < 12min) and efficacy of the block.
Results and Discussion: Three residents (group 1) performed at least 20 blocks, four residents (group 2) performed between 10 and 20 blocks and the five last residents (group 3) performed 5 to 10 blocks. There were no differences in patient's demographic parameters among residents. No immediate complications were reported during the period of the study. Evaluating the CUSUM curves, all residents in group 1 reached sufficiency for efficacy after 4[4,5] blocks. Only 2/3 reached sufficiency for time of realization (after 5 and 12 blocks). In group 2 and 3, 1/4 and 3/5 reached sufficiency for efficacy respectively. Considering time of realization, 2/4 y 3/5 residents of groups 2 and 3 reached sufficiency.
Conclusions: The number of procedures advisable to achieve training in US FNB-PNC seems to acount between 10 and 20 procedures.
However, to reach a 100% success rate, ≥ 20 blocks might be needed. TPB is probably not the optimal tool to monitor training for our purpose (initial training), while a decrease in pain could more appropiate. CUSUM methodology is an interesting systematic monitoring instrument and its application in US regional anaesthesia provides the opportunity for early intervention in case of repeated failures with minimal complications.

ESAAP2-5

Qualities of the anaesthetist: a multidisciplinary survey

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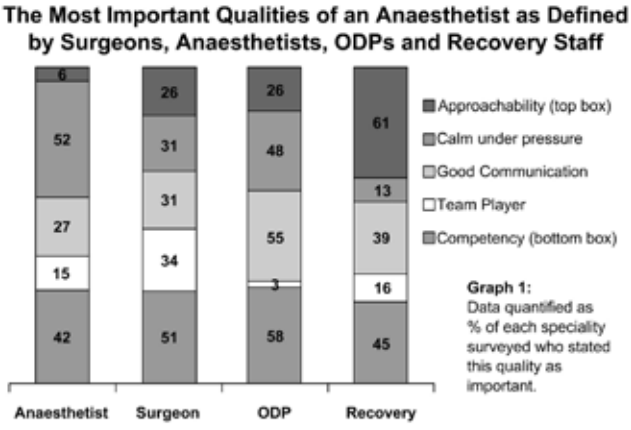
Background and Goal of Study: The pioneering UK revalidation process aims to maintain high standards amongst doctors[1]. To understand the key qualities of an anaesthetist, we must appreciate our colleagues' needs, yet prior studies only surveyed anaesthetists [2]. This is the first study to survey other specialities. Our aims were to determine key qualities of the anaesthetist, identify differences between specialities and how these qualities relate to professional regulatory frameworks.
Materials and Methods: We surveyed anaesthetists, ODPs, surgeons and recovery nurses in 2 hospitals. The anonymous survey documented speciality/grade and asked the open question "What are the 3 most important qualities of an anaesthetist". Results were grouped by role, categorised under the domains in the regulatory frameworks and ranked by frequency.
Results and Discussion: A total of 378 responses from 129 participants were collected reporting 43 different qualities [anaesthetists(33) surgeons(35) recovery nurses(31) ODPs(31)]. The top four qualities were: competency (50%), communication skills (40%) "calm under pressure" (36%) and approachability (29%). Pain management only featured for recovery nurses (26%). Bedside manner featured modestly throughout (anaesthetists 9%, surgeons 0%).



[Qualities Defined by Speciality]

The majority of the qualities identified fit under the regulatory framework domains: "knowledge, skills and performance" (57%) and "communication, partnership and teamwork" (37%).
Conclusion: Understanding our colleagues' needs can improve patient care by providing a more cohesive and focused multidisciplinary team. Whilst a good anaesthetist could be summed up as being competent, calm under pressure and a good communicator a future survey is planned to question anaesthetists on the qualities they seek from their team members, bringing this survey full circle.
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Acknowledgments: We would like to thank our colleagues at SMH, Stoke Mandeville and RBH, Reading.

ESAAP2-6

Which lung suffers more during pulmonary resection surgery? The dependent or the non-dependent lung?

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Background and goal of the study: Lung resection surgery causes an increase in pulmonary inflammatory response that has been attributed to one-lung ventilation (OLV) from the dependent lung and to surgical manipulation and ischemia-reperfusion mechanisms from the non-dependent lung.
The goal of the study is to compare lung inflammatory response from the dependent and non-dependent lung after OLV in lung resection surgery.

Material and methods: A prospective study was designed. Local Ethics Committee approved the study. Patients scheduled for lung resection surgery were recruited. After intubation with double-lumen tube, patients were managed with volume controlled ventilation (VCV): tidal volume (TV) 8 ml/Kg, PEEP 3-5 cmH2O, FiO2 0.4-0.5 and respiratory frequency to maintain ETCO2 30-35 mmHg. In OLV, VCV was continued: TV 6ml/kg, PEEP 5 cmH2O, permissive hipercapnia and FiO2 0.6-1 in order to maintain SatO2>90%. Fiberoptic bronchoalveolar lavage (BAL) were carried out in the dependent and non-dependent lung before and after OLV for the analysis of lung inflammatory markers. The expression of cytokines (IL-1, IL-2, IL-6, IL-10, TNFa), nitric oxide and Metalloproteinase-2 (MMP2) was analyzed with Western Blot. Carbon monoxide (CO) was analyzed by Omura and Sato test. For statistical analysis we used Mann Whitney U test and Chi^2 test.
Results: 46 patients enrolled in the study. All of them completed the study successfully. The analysis showed an increase of IL-1 and MMP2 with $p < 0.05$ in both lungs after OLV. In addition, CO was increased in the non-dependent lung with $p < 0.05$, which did not occur in the dependent lung. Values of IL-1 in the dependent lung were 138.08 ± 31.93 ng/ml before OLV and 205.94 ± 39.14 ng/ml after OLV. The values in the non-dependent lung were 140.28 ± 24.56 ng/ml before OLV and 200.21 ± 50.40 ng/ml after OLV. The value of MMP2 in the dependent lung was 4.32 ± 1.18 ng/ml before OLV and 8.79 ± 2.07 ng/ml after OLV whereas in the non-dependent lung was 4.67 ± 2.39 ng/ml before OLV and 8.50 ± 1.73 ng/ml after OLV. The value of CO in the non-dependent lung was 6.80 ± 1.32 ng/ml before OLV and 7.20 ± 1.44 ng/ml after OLV. In all other markers analyzed, differences were not statistically significant.
Conclusions: Lung resection surgery increases pulmonary inflammatory response in a similar manner in the dependent and the non-dependent lung.

Evidence-based Practice and Quality Improvement

1AP1-2

Use of antiemetic drugs for postoperative nausea and vomiting control following laparoscopic gynecological surgery

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Background and Goal of Study: Patients who undergo gynecologic laparoscopic surgery have a high risk for postoperative nausea and vomiting (PONV), the incidence of which has been reported to range from 50-100%. Although metoclopramide (Mt) is considered to be rather ineffective for PONV prevention, dexamethasone (Dx) drooperidol (Dr), and noloxone (Nx) are known to be effective.
Furthermore, combinations of drugs with varying action mechanisms can be more effective that single administration. In the present study, we examined the PONV-reducing effect of these 3 drugs and their combination in a randomized prospective trial.
Materials and Methods: The present patients underwent elective laparoscopic surgery for benign gynecological diseases in the 5-month period from November 2011 to March 2012. Propofol, remifentanil, and fentanyl were used for general anesthesia. For postoperative pain relief, intravenous patient-controlled analgesia (PCA) with a balloon injector was employed.
The patients were randomly divided into 4 groups. In each, PCA was given for 20 hours with fentanyl and the investigated drugs. In the Dx group, 8 mg of Dx was intravenously injected at the time of anesthesia induction, while 1 mg of Dr was intravenously injected and 2 mg of Dr was added to the PCA pump in the Dr group, and 0.1 mg Nx was added to the PCA pump in the Nx group. In the combined medication (Cm) group, all 3 drugs were administered.
We evaluated pain relief and nausea (11-NRS score), frequency of vomiting, amount of food intake for breakfast the day after surgery, and number of postoperative administrations in the first 24 hours after surgery.
Results and Discussion: One hundred twenty patients in 4 groups of 30 patients each were examined. No significant differences were observed regarding the severity of pain among the groups. The frequency of vomiting was 20.7% in the Dx group, 34.5% in the Dr group, 55.2% in the Nx group, and 6.9% in the Cm group. There were no significant differences regarding vomiting frequency among the 3 groups that received a single drug, while it was significantly lower in the Cm group as compared to the Nx group. The frequency of Mt use was also significantly lower in the Cm group than in the Nx group, while breakfast intake the next morning was significantly greater in the Cm group as compared to the Nx group.
Conclusion: Following laparoscopic Gynecological surgery, combined medication with Dx, Dr, and Nx was most effective for reducing PONV.

1AP1-1

A history of migraine as a significant risk factor for PONV in patients undergoing combined general-epidural anesthesia

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Introduction: Patients undergoing extended abdominal hysterectomy have a high risk of developing postoperative nausea and vomiting (PONV). A number of investigators have identified a history of migraine as an independent PONV risk factor.
Objectives: We aimed to evaluate the impact of combined general-epidural anesthesia on the frequency of PONV in patients with a history of migraine and in migraine -free patients.
Methods: 83 adult women undergoing extended abdominal hysterectomy, were divided into two groups:
1) general anesthesia (GA) n=43 (midazolam, propofol, fentanyl),
2) combined general-epidural anesthesia (GEA) n=40 (ropivacaine).
The incidence of PONV and rescue antiemetic were assessed for 24 hour postoperatively.
Results: The overall incidence of PONV did not differ between the groups (34,9% vs. 25%, in groups GA and GEA, respectively (p=0,47)). In group GA the overall incidence of PONV did not differ between patients with a history of migraine and migraine -free patients (44,4% vs. 36,0%, respectively (p=0,53). In group GEA patients with a history of migraine suffered from PONV in 41,1% of cases and migraine -free patients in 9,5% of cases (□=0,02). In group GEA in migraine -free patients the frequency of PONV was significantly reduced versus GA group (p=0,036).
Conclusions: The history of migraine is a significant independent risk factor for PONV in patients undergoing combined general-epidural anesthesia versus patients undergoing general anesthesia. Combined general-epidural anesthesia significantly decreases the frequency of PONV in migraine -free patients undergoing extended abdominal hysterectomy.

1AP1-3

Prophylatic intravenous ondansetron and palonosetron in intrathecal morphine induced pruritis: a prospective, randomized, double-blind, placebo-controlled study

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Background and Goal of Study: Pruritus is the most common side effect of intrathecal morphine for postoperative pain relief. Activation of central 5-hydroxytryptamine subtype 3 (5-HT3) receptors is one of its possible mechanisms.[1] Consequently, specific 5-HT3 receptor antagonists could be an effective prophylactic treatment of neuraxial opioid-induced pruritus. Palonosetron is a new potent 5-hydroxytryptamine 3 antagonist. It was reported that palonosetron is more effective than ondansetron for prevention of postoperative nausea and vomiting.[2]
In a prospective, randomized, double-blind, placebo-controlled study, we evaluated the efficacy of prophylactic administration of ondansetron and palonosetron for the prevention of intrathecal morphine-induced pruritus.

Materials and Methods: The patients were randomized into 3 groups to receive either 8 mg ondansetron IV (group O, n=35), 0.075 mg palonosetron IV (group A, n=35) or normal saline (group P, n=35) 15 min before administration of spinal anesthesia with 8 to 12.5 mg of 0.5% hyperbaric bupivacaine and 0.25 mg of morphine for urologic surgery. Patients were evaluated for incidence and severity of pruritus at 15 min. 30 min, 1, 2, 4, 8, and 24 h after intrathecal morphine administration.
Results and Discussion: The incidence and severity of pruritus was significantly less frequent in the ondansetron and palonosetron groups compared with placebo (52.3%, 47.8%%, and 89.1% respectively, P< 0.01).
Conclusion(s): We conclude that the prophylactic use of ondansetron and palonosetron helps to reduce the incidence and severity of intrathecal morphine-induced pruritus.
References:
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2. Moon YE, Joo J, Kim JE, Lee Y. Antiemetic effect of ondansetron and palonosetron in thyroidectomy: a prospective, randomized, double blind study. Br J Anaesth 2012; 108: 417-22.

1AP1-4

Multimodal approach and TIVA anesthesia management decreases clinically important PONV in high risk patients undergoing laparoscopic cholecystectomy

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Background and Goal of Study: Clinically important PONV is associated with a poor quality of recovery and can delay discharge of patients, too. This study evaluates effectiveness of a multimodal approach and anesthesia management to reduce the incidence of clinically important PONV in high risk patients scheduled for laparoscopic cholecystectomy (LC).
Materials and Methods: After written informed consent, 120 adult patients, age 24-68, ASA physical status I-II, BMI 25-35, with three and more Apfel's risk factors for PONV (femal gender, smoker, history of previous PONV and/or motion sickness, duration of surgery up to 1 hour) scheduled for elective LC. Patients were allocated to one of four groups, 30 patients each: Group 1(GBA+placebo), Group 2 (GBA+multimodal), Group 3 (TIVA+placebo) and Group 4 (TIVA+multimodal). In groups 1 and 2 was performed general balanced anesthesia (GBA). Groups 3 and 4 was received TIVA-TCI. Groups 1 and 3 was received placebo and groups 2 and 4 was received multimodal antiemetic prophylaxis before induction of anaesthesia (dexamethason 4 mg, metoklopramid 10 mg and granisetron 1 mg). The patients were followed up for emetic symptoms for 24 h after surgery and PONV were recorded as early (0-4h) and late (4-24h). Clinically important PONV were measure using PONV Intensity Scale, and data were analyzed using chi-square test.
Results and Discussion: We found there was no significantly difference between group 2 and 3 (23,3% vs 26,6%). The highest incidence of PONV were is group 1 (53,3%) and lower in group 4 (6,7%). About PONV Intensity Scale, a score >50 defined clinically important PONV, used formula: severity of nausea (1=mild, 2=moderate, 3=severe) x pattern of nausea (1=varying, 2=constant) x duration of nausea (in hours). Patients with clinically important PONV needed twice as many doses of antiemetic.
Conclusion(s): Our results suggest that combination of multimodal antiemetic approach and TIVA anaesthesia management is a best choice and significantly reduces incidence of clinically important PONV after laparoscopic cholecystectomy in high risk patients.
References:
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1AP1-5

Effects of preoperative oral rehydration therapy on postoperative nausea and vomiting after mastectomy

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Background: In Euroanaesthesia 2012, we reported that postoperative nausea vomiting (PONV) was significantly reduced in a group ingested high carbohydrate-rich drink (CHO group) compared with intravenous infusion group as preoperative oral rehydration therapy. We hypothesized that glucose metabolism due to carbohydrate load was involved in significant PONV reductions. We compared electrolyte ingest (EL group) and CHO group as preoperative oral rehydration therapy.
Methods: Subjects were 80 females with ASA/PS1-2 who were underwent mastectomies over the period from April, 2012 to November, 2012. CHO (250mL, 200Cal, carbohydrate 45g, protein 5g, phosphorus 450mg, zinc 20mg, copper 2mg)group (n=40) ingested up to CHO 250mL no later than 2 hours before the surgery. EL (500mL, 50Cal, carbohydrate 12.5g, sodium 575mg, potassium 390mg, magnesium 12mg, phosphorus 31mg) group (n=40) ingested up to EL 500mL no later than 2 hours before surgery. Both groups abstained from eating from 21 o'clock on previous day. Subjects can drink pure water freely by 2 hours before surgery. Both groups were managed by anesthesia using oxygen, air, sevoflurane, remifentanil and fentanyl. PONV was assessed for 24 hours following the operation based on subjective medical reports from the two groups. Statistical analyses were performed using the *t* test for the patient groups and the x^2 test for PONV.
Results: There was no significant difference of age, BMI, operative duration, anesthesia duration, opioids, history of smoking and amount of pure water ingested before surgery. PONV occurred in 8 patients in CHO group and 14 patients in EL group indicating a tendency of lesser PONV in CHO group, but not reaching statistically-significant difference (p=0.13).
Discussion: Mechanism to improve PONV by preoperative oral rehydration therapy may include improvement of glucose metabolism and insulin resistance arising from carbohydrate load, normalization of digestive tract function and alleviation of psychological stress. This study on carbohydrate loads did arrive at no significant difference. However, further studies on increased number of cases are called for in reaching final conclusion.

1AP1-6

Is PONV still a problem?

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Background and Goal of Study: It is fairly known how evidence-based PONV-prophylactic regimes are implemented in routine clinical settings (1). With active prohylaxic regimes PONV-rates are expected to be reduced (2). The aim of the study was to evaluate how PONV-prophylaxis are used in a clinical setting were the departmental routine is to give prophylaxis according to PONV-risk.
Materials and Methods: As a first part of a larger observational study regarding PONV at a County Hospital in Sweden, we studied 110 adult patients undergoing day-case procedures (orthopedic or general surgery). Independent of the anesthesiologists preoperative assessment we evaluated riskfactors for PONV and retrieved an Apfel-score (3) for each patient. We regarded the PONV-prophylaxis as suboptimal when Apfel-score was higher than 1 + the number of given prophylactic drugs. Events of nausea and vomiting were evaluated postoperatively through questionaries at 2, 4 and 6 hours after surgery and once daily up to the third postoperative day.
Results and Discussion: 29 % (n=32) of the patients received suboptimal prophylax. The rate of patients with events of nausea and/or vomiting related to prophylaxis are presented in the table.

	Suboptimal PONV prophylax (n=32)	Optimal PONV prophylax (n=78)	Fisher's exact test
0-2 h	28% (n=9)	10% (n=8)	p<0.05
2-24 h	44% (n=14)	22% (n=17)	p<0.05
24-72h	9 % (n=3)	10% (n=8)	NS

[Event rates of nausea or vomiting]

Conclusions: Even with active prophylactic regimes, 29% of the patients did not receive optimal prophylaxis and the PONV-rate was high in this group. To further reduce PONV in routine clinical settings, more efforts must be made to implement and follow evidence-based guidelines.
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3. Apfel et al, Anesthesiology 1999:91:693-700

1AP1-7

Cost-effectiveness of different combinations of ondansetron and dexamethasone in postoperative nausea and vomiting profilaxis

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Background and Goal of Study: In a public based health system, the rational use of economic resources is mandatory. In addition to that, the XXI Century Ethic Code includes in one of its articles, that the excellence of medical attention involves the rationalization of economic resources.
The aim of this study was to compare the cost-effectiveness relationship of three different associations of iv Ondansetron and Dexamethasone, in the prevention of postoperative nausea and vomiting (PONV) after Laparoscopic Colecistectomy (LC).
Materials and Methods: Clinical controlled trial (prospective, randomized, double blind and without group placebo). Local Ethics and Clinical Investigation Committee approval and informed consent in all cases.
74 ASA I-III women, between 22 and 72 years old and schedulled for LC were included in the study.
General balanced anaesthesia and postoperative analgesia with iv Paracetamol +Tramadol in all patients. Patients were randomized in three prevention PONV groups: GpA (Ondansetron 4mg+Dexamethasone 8mg), GpB (Ondansetron 4mg+Dexamethasone 4mg) and GpC (Ondansetron 2mg+Dexamethasone 8mg). PONV rescue with iv Dehidrobenzoperidol 0,625mg in all groups.
To analyze the results, we divided each group in three mutually excluding subgroups depending on PONV, nurse attention and rescue treatment needs. Direct cost and probabilities for each subgroup were calculated, and with those results we performed a hospital cost-effectiveness analysis (CI 95%)*****.
Results and Discussion: The three selected drug combinations showed similar effectiveness in the prevention of PONV in LC although with different economical costs, being GpC (4,20 euros) the most economic option.
We also calculated the cost increment for each group in order to obtain a new patient with No NVPO when compared to GpC: Cost was then for GpA (+11,39 euros) and for GpB (+172 euros).
Conclusion(s): Ondansetron 2mg+Dexamethasone 8mg was the cheapest of the studied profilactic alternatives, and it also showed itself as the more economic option when focusing in the prevention of PONV in LC.
References: (*) BJA 2002; 91 (4):589-92.

1AP1-8

Genetic association of 5-hydroxytryptamine receptor 3A gene with postoperative nausea in Taiwan

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Background and Goal of Study: Postoperative nausea (PON) is one of the most common complications after surgery. Clarifying genetic factors that affect PON is important for PON-related research. Several previous evidences suggested 5-hydroxytryptamine 3A receptor (*HTR3A*) may play an important role in the etiology of PON. And current studies suggest using the candidate gene association study to investigate candidate genes that might be related to pathogenesis of complicated symptom like PON. This study was designed to illustrate the role of *HTR3A* gene in the etiology of postoperative nausea in Taiwan.
Materials and Methods: Three single nucleoside polymorphisms (SNPs) of *HTR3A* gene were selected to study the genetic association in 171 prospective Taiwanese patients undergoing general anesthesia. Those patients are collected by our anesthesia relative outcomes cohort with complete report of PON symptom in postoperative 24 hours. The allelic and genotypic distributions of each selected SNPs of *HTR3A* were analyzed by the chi-square test to study the genetic association of *HTR3A* and PON.
Results and Discussion: Three selected SNPs were genotyped with all individuals. General population-based distributions are similar to the data of public databases. Hardy-Weinberg equilibrium (HWE) was tested on all three polymorphisms, and the genotype distributions of all polymorphic markers do not deviate from HWE in all participants. Significant allelic and genotype difference were identified between all three *HTR3A* SNPs and PON. Furthermore, the association remained significant even after bonferroni correction.
Conclusion(s): Our preliminary data strongly suggest the involvements of *HTR3A* gene in etiology of PON in Taiwan. Due to the moderate sample size, results from this study still need to be confirmed in replicates, and should be contribute to the understanding of PON etiology and improving the management.
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1AP1-9

The effect of combining aprepitant with ondansetron in high-risk patients for postoperative nausea and vomiting; preliminary study

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is one of the most common complications after general anesthesia. Aprepitant (NK1 receptor antagonist) has been used to prevent chemotherapy induced nausea and vomiting. This study investigated the effects of combining aprepitant and ondansetron on PONV in patients at high risk for PONV.
Materials and Methods: In this prospective randomized double-blind controlled study, 45 female patients with fentanyl based patient-controlled analgesia (PCA) given intravenously after laparoscopic gynecologic surgery were randomly allocated to receive aprepitant 80 mg (group EO) or placebo (group O) orally 1h before anesthesia. In all patients, ondansetron 4 mg was administered at the end of surgery and 12 mg was added to the PCA solution. After induction with propofol, anesthesia was maintained with sevoflurane and remifentanil infusion, and PCA was provided for 48 h after surgery. The primary outcome was the incidence of PONV upto 48 h after surgery. The outcomes measured were the use of rescue anti-emetics, the incidence of side effects, and the impact of PONV on daily life by Functional Living Index-Emesis (FLIE). The complete response was defined as no PONV and no rescue antiemetics. Patients with FLIE score 6, 7 and 8 for all questions were classified as 'no impact on daily life'.
Results and Discussion: The incidence of PONV within 1 h after surgery was significantly lower in group EO than group O. There were no differences in the use of rescue antiemetics (Table 1) and the incidence of side effects. Complete response rate was 38% in group EO and 29% in group O. There were no differences in the number of patients without the impact of PONV on daily life [12 (50%) in group EO and 12 (57%) in group O].
Conclusion(s): The addition of aprepitant (80 mg orally) to ondansetron is effective in reducing PONV within 1 h after surgery in patients with fentanyl based PCA after laparoscopic gynecologic surgery.

	Group EO (n=24)	Group O (n=21)	P value
PONV (0-1 hr after surgery)	4 (17%)	10 (48%)*	0.0253*
PONV (1-48 hr after surgery)	8 (33%)	9 (38%)	0.8604
PONV (overall)	15 (63%)	15 (71%)	0.3955
Use of rescue antiemetics (0-1 hr after surgery)	2 (8%)	2 (10%)	0.8887
Use of rescue antiemetics (1-48 hr after surgery)	2 (8%)	4 (19%)	0.2915
Use of rescue antiemetics (overall)	4 (17%)	4 (19%)	0.5501

[Incidence of PONV and use of rescue antiemetics]

1AP2-1

Risk factors for postoperative delirium: a literature review

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Background and Goal of Study: Postoperative delirium (PD) relates to increased length of hospital stay and poor outcome including institutionalization, persistent functional and cognitive decline and higher rates of morbidity and mortality. The accurate identification of perioperative risk factors can contribute to design a dedicated work up and to reduce the prevalence of PD. Aim of this literature review is to identify risk factors for PD and to categorize them

according timing of occurrence (pre, intra and post operative), susceptibility of correction (modifiable/non-modifiable) and clinical impact (Odds ratio [OR], % increase in incidence of PD).

Materials and Methods:

Preoperative non-modifiable: age >70 years: OR 3.3. Type of surgery: cardiac: OR 3.5; aortic aneurysm: OR 8.3; orthopedic, hip replacement: 16-62%; intra abdominal and intra thoracic: 9.6%. Genetic profile: phenotype Apoe4: 28.3%. Education. Comorbidities. Psychiatric and neurological disorders: presence of dementia: OR 4.2; illicit drug abuse or alcoholism: OR 3.3.

Preoperative modifiable: fluid fasting time >6 hours: OR 10.5. Blood biochemistry abnormalities (sodium, potassium, glycemia, urea nitrogen, serum albumin): OR 4.2. Preoperative premedication with benzodiazepines (each additional mg leads to 7% increase).

Intra operative non-modifiable risk factors: blood loss: hemoglobin < 10 g/L: OR 0.2; whole blood transfusion >800 ml: OR 2.5.

Intra operative modifiable risk factors: opioid: fentanyl 20% (VS remifentanil). BIS-guided anesthesia reduces anesthetics consumption and is associated with lower incidence of PD (24.1% in the control group VS 15.6% in BIS-guided group; P=0.01).

Post operative non-modifiable risk factors: low cardiac output requiring inotropes, new onset atrial fibrillation, persistent hypoxia or hypercarbia.

Post operative modifiable risk factors: use of narcotic analgesics: OR 2.3; benzodiazepine: OR 1.8; cholinergic drugs: OR 1.3. Delayed ambulation, inadequate nutritional status.

Post operative precipitating factors: sensory deprivation (after cataract extraction: 1.7%).

Results and Discussion: The effective identification, prevention and treatment of pre, intra and postoperative risk factors for PD can contribute to select patients that need a dedicated perioperative care path.

Conclusion: Tailored use of anesthetics, anesthesia techniques, nursing surveillance and accurate staff communication can contribute to reduce the incidence and clinical impact of PD.

1AP2-2

The incidence of recalled dreams after general anaesthesia with reference to patient factors and type of anaesthetic agents administered

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Background and Goal of Study: There are few consistent associations between patient/anaesthetic factors and the recall of dreams following general anaesthesia. We aimed to gather more information with regard to these associations.

Materials and Methods: Participation in this prospective, observational study was voluntary. Patients completed a questionnaire following emergence from anaesthesia and on postoperative day one. Peri-operative medications received were recorded with permission.

Results and Discussion: Of 200 participants, 35 recalled dreaming under general anaesthesia (17.5%). The documented incidence of recalled dreams varies greatly, depending particularly on length of time elapsed from emergence from anaesthesia.

Drug	Total number of participants receiving drug	Number of participants receiving drug who recalled dreaming (%)
All inhalational agents	155	26 (16.8%)
Desflurane	29	5 (17.2%)
Sevoflurane	107	19 (17.8%)
Isoflurane	19	2 (10.5%)
Propofol maintenance	45	9 (20%)
Rapid opioid only	144	29 (20.1%)
Longer acting opioid	52	5 (9.6%)

[Pharmacological agent received and dream recall]

These results might be explained by evidence suggesting dreams tend to occur close to emergence from anaesthesia[2], and that the incidence of dreaming under anaesthesia is higher when emergence is more rapid[1]. As in previous studies[1], recall of dreams seems most common in those receiving propofol based anaesthesia.

Usual recalled dream frequency following sleep	Total number of participants in category	Number of participants in category who recalled dreaming under general anaesthesia (%)
4 - 7 times per week	74	15 (20.3%)
1 - 3 times per week	83	16 (19.3%)
1 - 3 times per month	16	2 (12.5%)
Less than once a month	27	2 (7.4%)

[Usual dream recall and dreaming under anaesthesia]

These results are concordant with a previous study in which dreams under anaesthesia were linked to a tendency to recall dreams in general[1].

Conclusion(s): Dreams under general anaesthesia were recalled by 17.5% of patients in this study. Dreams were more commonly recalled by those who more often recall dreams after sleep, those receiving shorter acting anaesthetics / analgesics and those receiving propofol based anaesthesia.

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1AP2-3

The assessment of early cognitive recovery after surgery and anaesthesia using the Postoperative Quality of Recovery Scale

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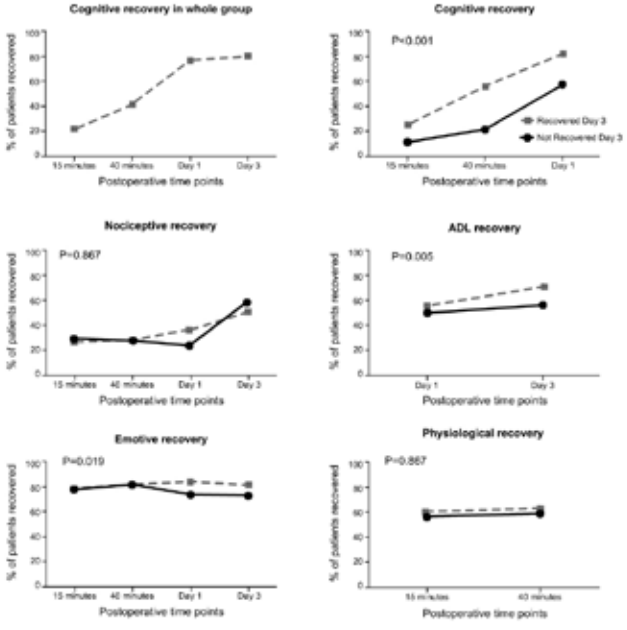
Background and Goal of Study: Cognitive problems early after surgery are often considered transient in nature. The relation of cognitive performance to other recovery parameters has rarely been systematically assessed early after surgery.

Materials and Methods: The PQRS was performed prior to surgery, 15 mins, 40mins, 1 and 3 days after anaesthesia. Recovery was measured in multiple domains: physiological, nociceptive (pain and nausea), emotive (anxiety and depression), cognitive, and activities of daily living (ADL). Recovery was defined as "return to baseline values or better". Cognitive recovery included a tolerance factor to account for normal performance variability. A sub-analysis of the PQRS feasibility data compared patients who at day 3 were categorised as recovered or not recovered in the cognitive domain. Data are presented as the proportion of patients recovered. Analysis tested the global hypothesis of group differences in recovery over time using the Cochran Mantel Haenzel test.



[Figure 1]

Results and Discussion: 565 of 701 patients were included; 423 (80.2%) recovered in the cognitive domain at day 3, and 112 (19.8%) did not. The recovery by domains is shown in Figure 1.
Cognitive recovery from 15 minutes to Day 1 was significantly lower in patients who had not recovered at day 3 (P< 0.001). Of these, 48% had recovered on Day 1, but lapsed to non-recovery on Day 3.
Emotional (P=0.019) and ADL (P=0.005) recovery were less likely to occur in the group who had not shown cognitive recovery at Day 3. They were also older, consumed more alcohol, had a longer anesthetic, and were more likely to be inpatients, and have moderate or major surgery.
No difference was found for the physiological and nociceptive domains.
Conclusion(s): Failure of cognitive recovery is common 3 days after surgery, and is associated with poorer recovery in the ADL and emotive domains, but not in nociceptive or physiological domains.
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Acknowledgements: Baxter Healthcare funded the study.

1AP2-4

Risk factors for postoperative delirium in a post anesthesia care unit

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Background and Goal of Study: Postoperative delirium (POD) is a complex clinical syndrome frequent after surgery. It has been associated with multiple risk factors such as comorbidities and other perioperative conditions. The aim of this study was to assess the incidence of delirium and identify risk factors for its development.
Materials and Methods: Observational prospective study approved by the Centro Hospitalar São João Ethics Committee and written informed consent was obtained. It was conducted in a Post Anesthesia Care Unit (PACU) during a 6-week period. Inclusion criteria were as follows: all consecutive adult Portuguese-speaking patients submitted to elective non-cardiac, non-obstetrics and non-neurological surgery admitted to the PACU; a total of 221 patients were enrolled to the study. Each patient included was evaluated for diagnosis of POD using the *Nursing Delirium Screening Scale* (NUDESC) in the PACU and on the first postoperative day in the ward at Hospital de São João. Demographic data and perioperative variables were recorded. Descriptive analysis of variables was used to summarize data and the Mann-Whitney U test, Fisher's exact test or Chi-square test were used. Multivariate analyses was done with logistic binary regression with calculation of Odds Ratio (OR) and its 95% confidence interval (95% CI).
Results and Discussion: The incidence of POD was 11%. Patients with POD were older (median age 69 versus 57 years, p< 0.001), were more likely to have higher ASA physical status (60% versus 19% for ASA physical status III/IV, p< 0.001), had more frequently ischemic heart disease (24% versus 6%, p=0.001), hypertension (80% versus 45%, p=0.001), renal insufficiency (20% versus 5%, p=0.005), pulmonary chronic obstructive disease (20% versus 5.6%, p=0.009) and were more frequently on benzodiazepines medication (44% versus 25%, p=0.044). In multivariate analyses, age (OR 1.1, 95% CI 1.0-1.1, p=0.003) and ASA physical status III/IV (OR 4.7, 95% CI 1.9-11.5, p=0.001) were considered independent risk factors for delirium development after surgery.
Conclusion(s): Delirium was common in the post-anesthesia care after surgery. In this study, age and ASA physical status were considered independent risk factors for POD.

1AP2-5

Complications in postoperative delirium patients in a post anesthesia care unit

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Background and Goal of Study: Postoperative delirium (POD) is the most commonly encountered serious mental disturbance in the postoperative period. Adverse respiratory events (ARE) remain one of the most important major causes of morbidity and mortality during the postoperative period. The purpose of this study was to assess the incidence of critical respiratory events amongst patients who developed POD.
Materials and Methods: Observational prospective study approved by the Centro Hospitalar São João Ethics Committee and written informed consent was obtained. It was conducted in a Post Anesthesia Care Unit (PACU) during a 6-week period. Inclusion criteria were as follows: all consecutive adult Portuguese-speaking patients submitted to elective non-cardiac, non-obstetrics and non-neurological surgery admitted to the PACU; a total of 221 patients were enrolled to the study. Demographics data and perioperative variables were recorded. Acute respiratory events were defined as upper-airway obstruction, hypoxia (mild/moderate and severe), respiratory failure, inability to breathe deeply, respiratory muscle weakness, reintubation and pulmonary aspiration after tracheal extubation. Descriptive statistics was used to summarize data and the Mann-Whitney U test, Fisher's exact test or Chi-square test were used. Each patient included was evaluated for diagnosis of POD using the *Nursing Delirium Screening Scale* (NUDESC) in the PACU and on the first postoperative day.
Results and Discussion: Postoperative delirium incidence in the PACU was 11.3% (95% Confidence Interval 7.1-15.5). Postoperative ARE occurred in 37 patients (17%). Patients with POD had more frequently overall critical respiratory events (32% versus 15%, p=0.030), mild-moderate hypoxemia (24% versus 10%, p=0.033) and respiratory muscle weakness (24% versus 10%, p=0.033). There were no significant differences for the other considered ARE: upper-airway obstruction (p=0.696), severe hypoxemia (p=0.617), respiratory failure (p=0.617) and inability to breathe deeply (p=0.730). There were no reintubations and pulmonary aspiration after tracheal extubation.
Conclusion(s): This study suggests that POD is common in the Post Anesthesia Care Unit and was associated more frequently with critical respiratory events.

1AP2-6

Quality of life in patients with postoperative delirium

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Background and Goal of Study: Delirium is a transient global disorder of cognition. Patients who develop this condition represent a subgroup at risk for prolonged and even permanent cognitive disorder that may negatively affect health-related quality of life (HRQOL). The aim of our study was to evaluate quality of life in patients that developed postoperative delirium (POD).
Materials and Methods: Observational prospective study approved by the Centro Hospitalar São João Ethics Committee and written informed consent was obtained. All consecutive adult Portuguese-speaking patients submitted to elective non-cardiac, non-obstetric and non-neurological surgery were eligible to the study, during a 6-week period of time. Each patient included was evaluated for diagnosis of POD using the *Nursing Delirium Screening Scale* (NUDESC) in the recovery room and on the first postoperative day. HRQOL was assessed by SF-36 Health Survey (SF-36) before surgery and 3 months after surgery. Descriptive analyses of variables were used to summarize data and non-parametric tests were performed.
Results and Discussion: From the 221 patients, 25 (11%) developed POD. Three months after surgery and compared with patients without POD, patients that developed POD had worse values in 2 of the SF-36 domains: general perception of health (median 65 versus 50, p=0.016) and social functioning (median 100 versus 75, p=0.043).
In patients with POD and comparing each of SF-36 domains before and 3 months after surgery, similar scores for every 8 SF-36 domains were obtained except for physical functioning (median 80 versus 85, p=0.027) and vitality (median 46 versus 50, p=0.007). Patients without POD had better scores for 7 domains: physical functioning (median 80 versus 85, p=0.030), role limitations caused by physical problems (median 56 versus 75, p=0.001), bodily pain (median 61 versus 84, p< 0.001), vitality (median 46 versus 50, p< 0.001), social functioning (median 88 versus 100, p=0.035), role limitations caused by emotional problems (median 75 versus 100, p< 0.001) and mental health (median 56 versus 68, p< 0.001); they had similar scores for general health perception.
Conclusion(s): The health-related quality of life after surgery improved in patients without POD, while patients that developed POD did not have improvement in their quality of life after surgery. Three months after surgery, development of POD was associated with worse general perception of health and social functioning.

1AP2-7

Postoperative cognitive decline and its impact in daily life activities

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Background and Goal of Study: Postoperative cognitive decline (PCD) has been described as a deterioration of cognitive function from preoperative levels that may influence many domains of cognition, with a negative impact in quality of life. The aim of this study was to evaluate the incidence of PCD in surgical patients admitted in the Post-Anesthesia Care Unit (PACU) 3 months after surgery and its influence in daily life activities.
Materials and Methods: Observational, prospective study conducted in patients aged above 45 years, admitted in the PACU (from June to July 2012) after elective surgery. Patients submitted to cardiothoracic and neurosurgeries and those incapable to give informed consent were excluded.
41 patients were included. Cognitive function was assessed using the Montreal Cognitive Assessment (MOCA) performed preoperatively (T0) and 3 months after surgery (T3). A decline of at least 2 points in MOCA test at T3 was considered as clinically significant and qualified as postoperative cognitive decline (PCD). Instrumental Activities of Daily Life (I-ADL) and Personal Activities of Daily Life (P-ADL) were assessed using Lawton Instrumental Activities of Daily Life and Katz Index respectively. Descriptive analyses of variables were used to summarize data and non-parametric tests were performed for comparisons.
Results and Discussion: Three months after surgery 10 patients had PCD (24%). At T0 no significant differences were found for the MOCA scores between patients with and without PCD (median 25 vs.21, p=0.139) and at T3 patients with PCD had lower median MOCA scores (20 vs. 25, p=0.009). In patients with PCD the percentage of patients with dependency in I-ADL were higher comparing T0 and T3 evaluations (10% vs. 50%, p=0.037) and there were no differences observed in P-ADL comparing T0 and T3 in PCD patients. In patients without PCD there were no differences in percentage of dependency for P-ADL and I-ADL comparing evaluations in T0 and T3.
Conclusion: In this study, the incidence of PCD was 24,4%. Patients with PCD had a higher dependence in I-ADL 3 months after surgery.
References:
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Ackowlegments: The authors have nothing to disclosure.

1AP3-2

The incidence and risk factors of perioperative acute kidney injury

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Background and Goal of Study: Acute kidney injury (AKI) is a common complication in the perioperative setting and is associated with a high morbidity and mortality rate. Our aim was to evaluate the incidence and predictors of perioperative AKI after major surgery and to identify those patients at risk of AKI. We included patients with previously normal renal function as well as patients with underlying chronic kidney disease (CKD).
Materials and Methods: This is a single-center retrospective study of all patients (n=1141) who underwent major surgery in 2010 in our center, a tertiary university teaching hospital. Major surgery was defined as any surgery opening a body cavity or a mesenchymal barrier, or major joint/bone or vascular surgery.
The primary outcome was AKI incidence within 48 hours after surgery, using the Acute Kidney Injury Network definition[1]. We evaluated associations between preoperative patient characteristics and AKI using T-tests, Chi square tests and binary logistic regression.
Results and Discussion: 74 patients (6,5%) met the AKIN criteria. Univariate analysis identified 13 determinants of AKI: age, gender, ASA physical status, arterial hypertension, diabetes mellitus, congestive heart failure, ischaemic cardiomyopathy, peripheral vascular disease, smoking, CKD, CKD stage, type of surgery and hypercholesterolemia. Three independent preoperative predictors were identified using logistic regression: peripheral vascular disease, ASA physical status and CKD stage.

	Odds ratio	P	95% confidence interval
ASA physical status	2,619	< 0,001	1,794 ; 3,824
Peripheral vascular disease	2,202	0,020	1,131 ; 4,287
CKD stage	1,266	0,010	1,057 ; 1,516

[Binary logistic regression analysis]

Conclusion: From the 13 preoperative predictors associated with perioperative AKI, peripheral vascular disease, ASA physical status and CKD stage were found to be independent predictors. In 6,5% of our patients, the postoperative period was complicated by an episode of AKI. Those subgroups and especially CKD patients should deserve dedicated perioperative measures in order to further prevent AKI occurence during the postoperative period.
References:
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1AP3-3

Effect of thoracic epidural analgesia on the perioperative period in patients undergoing colonic and rectal cancer surgery: a retrospective analysis

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Background and Goal of Study: Thoracic epidural analgesia (TEA) is commonly used intraoperatively and for the management of postoperative pain. The afferent neural blockade induced by epidural analgesia can decrease intra- and postoperative neuroendocrine stress responses. TEA can protect patients from the postoperative development of infectious complications. Aim of study - to evaluate the influence of the modes of anesthesia on perioperative period in patients undergoing colonic and rectal cancer surgery.
Materials and Methods: 610 patients were underwent colorectal surgery between January 2008 and December 2010. The following exclusion criteria were used: emergency operations, stage 4 cancer and laparoscopic-assisted technique. Patients were divided into two groups by the mode of anesthesia. Group 1(n=325) — thoracic epidural analgesia (TEA) + general anesthesia. Group 2 (n=285) — general anesthesia (GA). Date were processed using the AtteStat 12.5 software. Mann-Whitney test, Fisher's exact test and χ^2 test were calculated.
Results and Discussion: Patients in both groups were similar in gender, age (62.82±11.01 vs.64.27±10.11), ASA score (1.95±0.63 vs. 1.97±0.56), duration of the surgery (143.49±43.09 vs. 145.64±49.27 min.). Essential hypertension was in 62% patients in Group 1 and in 55% in Group 2, ischemic heart disease in 22 and 18% respectively. In both groups the diabetes mellitus and COPD patients accounted 7 and 8%, respectively.
The use of TEA during and after surgery did not require more fluids than the combined general anesthesia and opioid analgesia in the postoperative period. LOS in the ICU did not differ between groups. However, LOS in the hospital was significantly lower in Group 1 (10.63±2.64 vs. 11.48±4.27 days, p=0.05).
There were no significant differences in the complications between groups 33 (10.2%) and 41 (14.4%).Complications associated with operation area were happened in 20 patients group 1 and 30 patients group 2. In Group 1 patients we did not observe cardiac arrhythmia and decompensation of diabetes mellitus. 92% of complications were developed at the second day after surgery and later. Mortality was 1.84 and 1.75% (p>0.05) in Group 1 and Group 2, respectively.
Conclusion(s): Using TEA in the perioperative period reduces the hospital LOS in patients undergoing colonic and rectal cancer surgery, but does not reduce the number of complications.

1AP3-4

Effect of enhanced recovery after surgery (ERAS) on secretion of pro-inflammatory cytokines and C-reactive protein after hysterectomy

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Background and Goal of Study: Several studies have demonstrated that ERAS protocol implementation may reduce complication rates and enhance functional recovery in abdominal surgery.
The aim of our study was to determine effects of ERAS protocol on inflammatory response after hysterectomy.
Materials and Methods: 48 patients were randomized into two groups: the ERAS group (n = 23) and the control group (CG) with traditional perioperative management (n = 25). In all patients, combined spinal and epidural anesthesia technique was used. Patient-controlled epidural analgesia in the ERAS group and multimodal analgesia with combination of paracetamol, tramadol and ketoprofen in the control group were used postoperatively. We measured plasma concentrations of interleukin-6 (IL-6), interleukin (IL-1β) and C-reactive protein (CRP) preoperatively and at 24 hours and 7 days after surgery. Data were analyzed by Mann-Whitney U test and presented as median (25^{th}-75^{th} percentiles).
Results and Discussion: There were no significant differences between the groups in values of IL-1β and IL-6, which were in a normal range both at baseline and throughout the study. The plasma concentration of CRP in the control group was higher than in the ERAS group at 24 hours: 7.015 mg/l (5.007 -14.960 mg/l) vs. 2,792 mg/l (1,555-3,512 mg/l) (P = 0,007), and at 7 days after surgery: 14.360 mg/l (7.942 - 14.770 mg/l) vs. 2.266 mg/L (0.900 - 5.614) (P< 0.001). Level of CRP in the control group tended to increase during the observation period.
Conclusion(s): In our study, the plasma concentration of IL-6 and IL-1β did not depend on the method of postoperative pain management. Using the ERAS protocol reduced postoperative plasma concentration of CRP. The increased level of CRP in the control group may be related with autoimmune reaction in wound due to delayed mobilization of patients.

1AP3-5

POSSUM Operative Score is useful for predicting postoperative serious adverse events rather than other scores

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Background and Goal of Study: Even after recent advances of modern anaesthetic managements, incidence of postoperative adverse events (SAEs) have been still reported to be 10-15%. To decrease hospital mortality, not only early detection and treatment of SAEs, but also prediction of SAEs is clearly needed.
However, prediction of SAEs is difficult. We normally used American society of anesthesiologists physical status (ASA-PS) for preoperative patients' assessment, but its ability to predict postoperative SAEs is not clear. Accordingly, we compared POSSUM and Charlson scoring systems and ASA-PS to predict postoperative SAEs.
Materials and Methods: We prospectively studied 200 patients underwent major surgery in a teaching hospital from March to June 2012. Major surgery was defined as craniotomy, neck surgery, thoracotomy, laparotomy, hip or pelvic surgery, and spinal surgery. We excluded patients < 20 years old age and operation < 2 hrs.
We calculated ASA-PS, POSSUM score and Charlson score, and checked the actual occurrence of SAEs by patients' follow-up during their hospital stay.
We prospectively defined the 13 SAEs such as severe sepsis, ICU readmission, respiratory failure, cardiac arrest, unexpected tracheostomy, cerebrovascular accident, deep venous thromboembolism and ICU stay over 2 weeks etc.
We calculated discriminational abilities of the scores using receiver operating characterisctics (ROC) curve methods describing their area under the curves (AUROC). Data were expressed as means with 95% confidence intervals (CI). A p value < 0.05 was considered statistically significant.
Results and Discussion: Among 200 patients studied, 25 patients suffered from SAEs postoperatively. The incidence of SAEs was 12.5%. Compared to the non SAEs patients, the SAEs patients had higher POSSUM operative score (OS) (16.76 vs 13.69; p=0.0002) and Charson score (4.16 vs 2.70; p=0.0026), but ASA-PS were not significantly different (2.16 vs 1.99; p=0.2443) between the groups. The AUROCs of three scores were ASA PS 0.57, POSSUM OS 0.71, and Charlson score 0.66, respectively. No combinations increase predictability of SAEs compared to POSSUM OS only.
Conclusion(s): Substantial numbers of SAEs occurred postoperatively as high as 12.5%.
POSSUM Operative Score is useful for predicting postoperative serious adverse events rather than other scores.

1AP3-6

Leiden Perioperative care Patient Satisfaction questionnaire (LPPSq) - is it suitable for our patient population?

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Aims: Measuring patient satisfaction in anaesthesia is a difficult process. As part of a project to improve the patient journey through theatre, our aim was to assess patient satisfaction and analyse patients' pre-op fears and concerns.
Methods: Our audit included adult patients undergoing elective or trauma (orthopaedic) surgery in main theatres. We used the LPPSq (max score 105) which is divided into: pre-op information (20), pre-op fears and concerns (20) and staff-patient relationship (65). After pre-op consent, patients were seen on the ward within 1 day of surgery.
Results: We collected data on 188 patients, 48.4% females and 51.6% males. The median age was 54 years (17-92). The mean score for information was 17.4/20 (87.1%), for staff-patient relationship 56.4/65 (86.8%) but for fears and concerns it was only 8.4/20 (40.5%). This gave a mean overall score of 80.1/105 (78%).
98.4% patients stated staff were "attentive to their needs", 97.3% said staff acted "according to their needs", 97.3% experienced "professional competence" and 92.6% were satisfied with the overall anaesthetic experience. There was no statistically significant difference in subgroup analysis based on sex or age. The highest satisfaction scores were in orthopaedic trauma patients (80.4%) and least in the colorectal group (74.8%).
Discussion: Our patients scored their anaesthetic experience highly with regard to staff-patient relationship, professional competence, attention to patients' needs and overall satisfaction. The main determinant of patient satisfaction in overall anaesthetic care is how staff act on problems (staff-patient relationship), in which we scored highly. However our patients scored lower than other studies in "fears and concerns", significantly lowering the overall LPPSq score. We postulated lack of information and therefore lack of insight as possible cause. But, conversely our patients scored highly in "pre-operative information" questions, indicating satisfaction with the quality and quantity of information received.
Our high scores in stand-alone questions covering overall anaesthetic and theatre experience were directly comparable with previous years audit scores. However, we have shown the LPPSq may not be the best assessment tool for our patient population with regards to "fears and concerns". A low score in this section skews the final rating. We are undertaking work to establish whether other patient satisfaction questionnaires are more suitable.

1AP3-7

Overweight can be a protective factor during retroperitoneal laparoscopy

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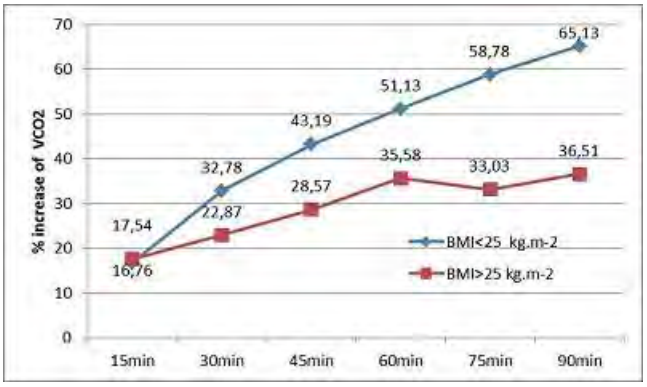
Background and Goal of Study: Retroperitoneoscopy (RP) is a well-adapted technique for urologic surgery, as it allows a direct approach to renal and adrenal vessels. Overweight can influence the incidence of hypercapnia through difficult ventilation or by affecting CO_2 absorption.
The aim of this study was to evaluate the effect of body mass index (BMI) on CO_2 absorption during RP.
Materials and Methods: 60 consecutive patients undergoing adrenalectomy or nephrectomy by RP approach were studied. General anesthesia was done with propofol, sufentanil, cisatracurium and sevoflurane. Ventilation was controlled with a tidal volume of 8 ml/kg and a respiratory rate of 12/min. Minute volume (Vm) was adapted to maintain $PetCO_2$ between 30 and 40 mm Hg. Production and elimination of CO_2 (VCO_2) were calculated every 15 min using the formula: [1]
VCO_2 (ml/kg/min) = Pet CO_2 (mmHg) X Vm (ml) / (Barometric P - Partial P of water vapour) mmHg X Weight (kg).
The value of VCO_2 before insufflation was considered as baseline. Results are presented as % of VCO_2 changes from this baseline value.

F- test (comparison of ratio of the variances) was used for statistical analysis.
Results and Discussion: Mean age was 47.4 ± 17.2 years, and mean BMI was 25,2 ± 5.2 kg.m^2.
Patients having BMI>25 kg.m^{-2} showed significantly less VCO_2 increase ($p< 0.05$) .

	n=	15min	30min	45min	60min	75min	90min
BMI<25	31	16.76	32.78	43.19	51.13	58.78	65.13
BMI>25	29	17.54	22.87	28.57	35.58	33.03	36.51
p		0.522	0.029*	0.019*	0.018	0.002*	0.003*

[% increase of VCO2 during retroperitoneoscopy.]



[%increase of VCO2 according to BMI]

This can be probably explained by two mechanisms secondary to increased retroperitoneal fat tissue in overweight patients. Fat tissue is poorly vascularised with a lower potential of CO_2 absorption. The presence of more retroperitoneal fat tissue might limit, through a mechanical effect, progressive retroperitoneal space dissection and expansion all through the surgery, caused by continuous insufflation, producing larger areas of CO_2 absorption.
Conclusion: Increased BMI seems to be a protective factor for CO_2 absorption during retroperitoneoscopic procedures.
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1AP3-8

Using the post-operative quality recovery scale to evaluate recovery with different neuromuscular blocking reversal agents in the Portuguese population - interim analysis results

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Background and Goal of Study: Post-operative Quality Recovery Scale (PQRS), is the first scale evaluating several domains of postoperative recovery. The objectives of this study were to compare overal and physiologic, cognitive, and functional domains of post-operative recovery after elective surgical procedures using neostigmine or sugammadex as neuromuscular blocking (NMB) reversal agents, to validate the use of PQRS in the Portuguese population and to objectively assess muscular strength recovery.
Materials and Methods: Prospective multicenter observational study comparing postoperative recovery between 2 cohorts of 50 adult patients submitted to elective surgical procedures with general anesthesia using Nondepolarizing Muscle Relaxants and NMB reversal with neostigmine or sugammadex. Measurements obtained using Portuguese version of PQRS at different timepoint: baseline,15 minutes (T15), 40 minutes (T40), one and three days after surgery. Full recovery defined as return to values identical or higher than those measured at baseline, prior to surgery. Muscular strength measured with KERN- MAP® Dynamometer. Ethics Committees approval was obtained. Statistics used linear T-Test, Qui Square and Fisher exact test, data presented as mean±SD for continuous variables. Interim analysis results presented
Results and Discussion: Thirty patients received neostigmine and 21 sugammadex. Age and BMI 50.4±11.8 and 28.6±5.6 in the neostigmine group and 38.2±12.7 and 24.7± 4.5 in the sugammadex group ($p< 0,001$). Overall response rate at T15 was 86% for neostigmine and 95% for sugammadex ($p= 0.22$). Differences in favor of sugammadex group noted in nociceptive and emotional domains, 80 vs 100% respectively ($p=0.04$). Overall response rate at T40 was 80% for neostigmine and 65% for sugammadex ($p=0.33$), primarily reflecting constraints on activities of daily life. Muscular strength did not differ. Improvements in recovery scores from T15 to T40 were observed in both groups, without significant differences . Postoperative assessments were feasible using PQRS at T15 and T40 and seem appropriate for comparisons between postoperative recovery domains and overall recovery . These preliminary results suggest nociceptive and emotional domains recovery at T15 may be faster with sugammadex.
Conclusion: The results support the adopted PQRS validation process and the potential of this scale as a tool for the evaluation of post operative recovery evaluation in the Portuguese population.

1AP3-9

Airway emergencies beyond theatres-on wards and onwards

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Background and Goal of Study: The NAP 4 looked at airway emergencies outside theatres and the contributing factors. Patients presenting in the emergency department are managed by multidisciplinary teams. However, patients on the wards are managed by ENT teams or crash teams for any airway emergency.
The wards may not be adequately equipped to deal with airway catastrophes which is likely to contribute to morbidity and mortality. In the United States[1] 0.5% of emergency intubations required a surgical airway (the National Emergency Airway
Registry(NEAR). In a study in Scotland[2] 8.5% of those who had emergency intubations outside theatres had a Cormack and Lehane grade of 3-4. This necessitates regular training of staff and also a robust system of clinical governance and audit to ensure provision of appropriate equipment on wards for these emergencies. A national survey in 2006[3] made recommendations for an Oxford box with equipment on ENT wards for airway emergencies.
We performed a survey to identify emergency airway equipment available on ENT wards and staff training on its use.
Materials and Methods: A telephone national survey was conducted across all acute trusts (164) in England and Wales.
Results and Discussion: 127 hospitals had inpatient ENT wards and were included in the survey. The Nurse in charge on each ENT ward was called. The response rate was 93%(118). 59%(75) had an airway tray or trolley. This included dedicated airway trolley or tray set up for patients with tracheostomies or post airway surgery. All wards had an allocated person for regular checks of the trolley.The contents of the trolley vary widely and only in 7.8% (10) of the wards the contents comply with the recommendations made for the Oxford box.
In 7 % (9), the first port of call is the anaesthetist for any airway emergencies. In 52.7% (67) cardiac arrest team and in 29.9% (38) ENT teams are called first to manage any airway emergencies on the wards.
In 48% (61) there is no formal training for nursing staff for tracheostomy care.12.5% (16) provide regular training sessions for the nursing staff. In 9 % (12) formal training is given on induction but is not followed by regular sessions. In the remaining 19.6% (25) training is infrequent or once every 1-2 years.
Conclusion(s): Robust guidelines for standardisation of emergency airway equipment on the wards are needed. Nursing staff should have regular training in routine tracheostomy care and airway emergencies.

1AP3-10

Patient's satisfaction with anesthesia consultation: does it matter?

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Background: Preoperative evaluation of patients should be carried out with enough time before the schedulled procedure[1] and this is a standard of care in our hospital. However, studies about quality of the service offered to patients are lacking and the literature is scarce about this subject. Patient satisfaction has become an importante component of quality improvement[2] and it remains the best way to assess the outcome from the point of view of the patient[3].
The aim of this study was to assess patient satisfaction with anesthesia consultation by means of a questionnaire developed to this purpose.
Materials and Methods: Prospective study with a questionnaire (16 questions) extended over a period of four months. The inquiry form took place

in two phases: before and after consultation. Data were analyzed using the Mann-Whitney test, Chi-Squared test and McNemar-Bowker test; differences were considered statistically significant when $p < 0.05$.

Results and Discussion: 750 patients were included: 97% answered the questionnaire. Mean age was 58,6. The majority were men (54,3%) with no significant differences in answers between genders. In general, patients expected 4 weeks for appointment with anesthesiologist. Mean time spent in the clinic was 93,4min and mean time waiting for doctor was 60-120min. Patients considered the anesthesiologist very good (43.8%)/excellent (40.6%) and they were satisfied with amount of information received (87.1%).

Patients for whom there was a need for more information came predominantly from Urology/Otorhinolaryngology ($p=0.001$). After consultation, the majority of patients felt less anxious and better prepared to anesthesia. The best scores found came from questions related with functional and communicating components of the consultation and the worst scores came from questions related to time spent in the clinic. The Cronbach Coefficient Alpha was 0.844, demonstrating that the instrument was reliable and consistent.

Conclusions: The authors concluded that information and communication components of the anesthesia consultation have a significant impact on patient satisfaction.

However, quality improvements are possible for total amount of time spent in the clinic. Moreover measures should be taken to improve information provided to patients (eg: flyers, internet site,etc).

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1AP3-11

A survey of orthopedics patients who refuse regional anaesthesia, causes of refusal and the role of the anaesthesiologist

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Background and Goal of Study: Regional anesthesia (RA) for orthopedic surgery is a trend due to decreased nausea and vomiting, less postoperative pain and quicker mobilization. However, there are still orthopedic patients who refuse it. This study was carried out to investigate the reasons for refusing RA in order to gain some insights into the attitudes and concerns of patients and if there is the possibility of changing their opinion and choosing a safer type of anesthesia

Materials and Methods: After institutional approval, 100 patients who had refused regional anaesthesia during preanesthesia visit, were interviewed just before entering the operating room. They were asked to give one or two reasons for refusing regional anesthesia. After that, the anesthetist in charge tried to convince them for the benefits of RA versus GA by explaining the risks and underlying the quicker mobilization (p.es. early postoperative liquid and solid food consumption after a per. block.) After the operation pts were asked why they changed their mind and what type of anesthesia they would prefer for a future orthopedic surgery

Results and Discussion: 94 of the 100 pts were convinced to receive RA. 51 pts received neuraxial technique ,43 received PerNerve Block , 6 GA.

56% of the fears of the respondents were about paralysis and neurologic disorders, 38% about seeing the surgery and hearing the surgical procedure, 32% about peri-operative pain ,29% were worried of backache and 14% were afraid of the needle. None of the patients were aware of the risk of aspiration or the risks of general anaesthesia. Finally, 96.8% of the pts who received regional anaesthesia would choose regional anaesthesia for a future orthopedic surgery.

The most important reason for changing their minds was the reassurance that the complications are not so often as they thought, that they would receive a sedative and the early postoperative liquid and solid food consumption after a block

Conclusion: Patients' fears and conceptions about regional anaesthesia are distorted due to the lack of information regarding regional anaesthesia and the risks of general anaesthesia.

Anesthesiologists should be aware of the patients' concerns and must be capable and willing to discuss with them the relevant problems and suggest with evidence- based data the safest way to receive anesthesia.

1AP4-1

Quality of recovery after tonsillectomy *vs.* nasal surgery: a discriminant validation study using the Postoperative Quality of Recovery Scale (PQRS)

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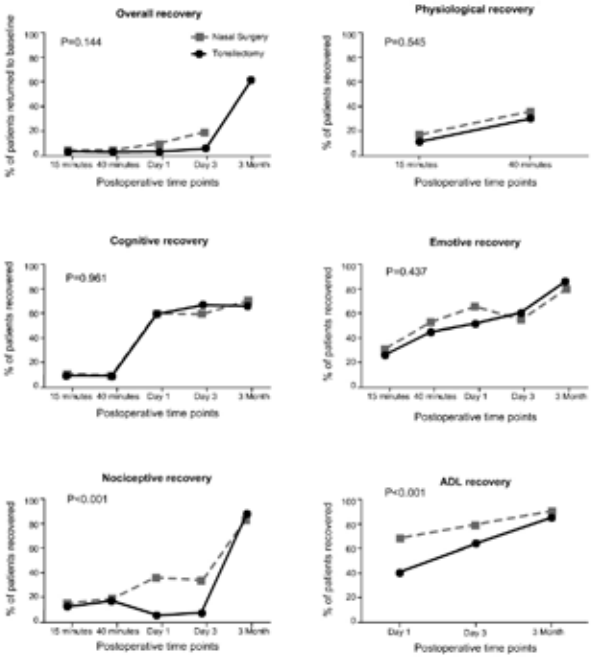
Background and Goal of Study: The Postoperative Quality of Recovery Scale (PQRS)1 can assess quality of recovery in multiple domains over repeated times. The aim was to investigate whether the PQRS could discriminate recovery between two groups with well-known differences in recovery (nasal operations vs. tonsillectomy).

Materials and Methods: A single centre, single surgeon and anaesthetist, prospective observational study included 89 patients undergoing nasal surgery, and 46 patients undergoing tonsillectomy as the primary procedure, who were older than 6 yr. The PQRS was performed prior to surgery, 15 mins, 40mins, 1 and 3 days, and 3 months after anaesthesia. Recovery was measured in multiple domains: physiological, nociceptive (pain and nausea), emotive (anxiety and depression), cognitive, and activities of daily living (ADL). Recovery was defined as "return to baseline values or better" and dichotomised to recovery or not. Cognitive recovery included a tolerance factor to account for normal performance variability.

Data are presented as proportion of patients recovered. Analysis tested the global hypothesis of whether the groups differed in recovery overtime using the Cochran Mantel Haenzel test.

Results and Discussion: Nasal surgery patients were significantly older (mean (SD) 32 (18) vs. 25 (17.8) years, $P=0.031$), and had longer duration of anaesthesia (42. (7.8) vs. 29.5 (12.6) min, $P < 0.001$). Recovery in each domain over time is shown in figure 1.

Tonsillectomy patients had worse recovery in the nociceptive ($P < 0.001$) and activities of daily living domains ($P < 0.001$). This was most evident at day 1 and 3 after surgery. By 3 months was recovery was equivalent.



[Figure 1]

Conclusion(s): The PQRS was able to discriminate differences in recovery in pain and ADL between tonsillectomy and nasal surgery. Future research should aim at interventions during the first week after surgery to improve quality of recovery.

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Acknowledgements: Baxter Healthcare funded the study.

1AP4-2

Preoperative oral rehydration therapy with 2.5% carbohydrate beverage alleviates insulin resistance in volunteers

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Background and Goal of Study: The preoperative carbohydrate loading that is recommended in the enhanced recovery after surgery (ERAS) protocol enhances insulin action by approximately 50% [1]. In some Japanese hospitals, preoperative oral rehydration therapy is performed for preventing dehydration during surgery. We hypothesized that preoperative oral rehydration therapy with a 2.5% carbohydrate beverage that is widely used in Japan can enhance insulin action. Therefore, we investigated the effect of this 2.5% carbohydrate beverage on insulin action in healthy volunteers.
Material and methods: Six healthy volunteers participated in this crossover randomized study. The participants were segregated into 2 groups: a control group (C group) and an oral rehydration therapy with 2.5% carbohydrate beverage group (OS group). The C group fasted from 9 pm onward on the evening before the investigation, and subjects were allowed to drink only water; conversely, the OS group fasted from 9 pm onward and drank 500 mL of the beverage containing 2.5% carbohydrate (OS-1; Otsuka Pharmaceutical Factory, Tokushima, Japan) between 9 pm and 12 pm and again at 6.30 am. At 8.30 am, a hyperinsulinemic normoglycemic clamp was initiated using an artificial pancreas STG-22 (Nikkiso, Tokyo, Japan). Insulin resistance was evaluated in both groups using the glucose infusion rate. Statistical analysis was performed, and P values less than 0.05 were considered statistically significant.
Results and Discussion: Subject age was 36 ± 8 years (mean ± SD), and body mass index was 23 ± 3 kg/m^2. Blood glucose levels at the initiation of the clamp procedure were 92 ± 4 mg/dL for the C group and 92 ± 3 mg/dL for the OS group; thus, the difference was not statistically significant (P = 0.99). However, the glucose infusion rate for the OS group was significantly higher than that of the C group (8.6 ± 1.5 vs 6.8 ± 2.0 mg/kg/min, P = 0.009). The efficacy of insulin action in the OS group was less than that of insulin action due to the 12.6% carbohydrate beverage, which is recommended in the ERAS. Therefore, we considered that carbohydrate dose is the key factor for improving insulin action.
Conclusion: An oral rehydration solution containing 2.5% carbohydrate enhanced the action of insulin more than fasting alone.
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1AP4-3

Patients safety during laparoscopic operations

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Background and Goal of Study: The main problem of an anaesthesiologist is to defend the patients from surgical agression by safe and adequate anaesthesia. Cardiovascular responces to peritoneal insufflation of CO_2 in laparoscopic cholecystectomy (LCHE) is wellknown. How is EEG changed in this time? Goal of study is to make a comparison of hemodynamics and cerebral responses (changes in bispectral index) during LCHE.
Patients and methods: After Ethics Committee approval, 59 patients ASA 1 - 2, scheduled to undergo LCHE. Mean age 43,7 ± 2,5, 70% from them were women. All patients were screened before the operation according the programme of our clinic. Anaesthesia standartised: induction with Propofol (1-2mg/kg), Fentanyl (1,5-2μg/kg), Atracurium (0,3-0,5 mg/kg). Anaesthesia was maintained with Sevoflurane (up to 1 - 1,3 MAC) and Fentanyl (1 μg/kg). Patients were ventilated with low flow oxygen. Monitoring: SBP, DBP, ECG, HR, SpO_2, $etCO_2$ and Sevoflurane concentration. BIS monitoring by "ASPECT A-1000". Hemodynemic (CO, SV, SVR et others) investigated by noninvasive bioimpedance method. Statistical analysis was performed using Students t test and results were expressed as mean ± standart deviation.
Results and Discussion:
1. The most significant changes in hemodynemic occurred after peritoneal insufflation of CO_2 and transfered the Patients to anti-Trendelenburg 30°.
2. The base thoracic impedance was reduced and indicated of accumulation fluid in the chest.
3. Correction of arterial hypotension should be done by inotropic drugs, but i.v. fluids should be restricted.
4. We registreted decreasing BIS-index and some hemodynemic parameters (CO, SV, CI) after hypotension.
5. BIS-monitoring helped to reduce consumption of drugs for general anaesthesia and decreased incidence of postoperative nousea and vomiting by 15%.
6. BIS- index is most close connected with expiration concentration of sevoflurane - coefficient of correlation (r) - 0,71.
Conclusion: The study demonstrated that the use of standarted anaesthesia (Propofol + Fentanyl + Sevoflurane) with monitoring hemodynamics and BIS-index in LCHE can be successfully and safety performed.

1AP4-4

Preliminary experience with evaluation of factors influencing burnout syndrome in ICU staff of a tertiary hospital

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Background and Goal of Study: Intensive care unit staff is a well known high risk contingent for developing burnout syndrome (BOS) due to chronic occupational stress exposure. Burnout is associated with lower work effectiveness, decreased job satisfaction and ultimately threatens the quality of care and safety of ICU patients. Age, standing and work regimens (day or night shifts) are among important factors potentially influencing the frequency and severity of BOS. We aimed at evaluation of these factors relationships with BOS in nurses of a 26 beds general ICU.
Materials and Methods: We prospectively evaluated 38 ICU nurses with the Maslach Burnout Inventory (MBI). MBI forms were filled on anonymous basis and surveyed by blinded investigator. Respondent's age, shift regimen (day time or night) as well as length of service in ICU were recorded in conjunction with MBI scores. Parameters were categorized into following groups: age - Gr. I: 21-30 (n=17); Gr. II: 31-40 (n=14) and Gr. III: 41-50 years (n=7); standing - 1-5 years (n=18), 6-10 years (n=12) and more than 10 (n=8) consecutive years of service in the same department; shift type - day time - 0 (n=10) and night -1 (n=28). Statistical analysis was performed by independent samples t-test and between subjects ANOVA with subsequent Post Hoc Tukey test. Values are expressed as means and standard deviations
Results and Discussion: BOS prevalence was 33.8 % when cut-off value of 60 points was applied. Average MBI score in total population was 64.7. We detected an association between increasing MBI scores and age: 61.6 (10.1), 61.8 (10.3) and 78.2 (10.8) for groups I, II, and III respectively with a statistically significant difference between Gr. I and Gr. III (p=0.003) and Gr. II and Gr. III. (p=0.004). There was no similar association between standing or shift subgroups and MBI points (p=0.68 and 0.83 respectively).
Conclusion(s): Our data demonstrated high prevalence of BOS among ICU nurses. From three parameters only increasing age significantly correlated with high MBI scores but we didn't detect similar relationships with regards to standing and work regimen. Limitations include small sample volume and difficulties with exclusion of other factors potentially influencing incidence and severity of BOS. We've planned future expanded studies highlighting interplay between multiple factors and their changes after organizational interventions.

1AP4-5

The temporal trend (1997-2008) of patterns of anesthesia under Taiwan National Insurance System: a nationwide population-based study

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Background and Goal of Study: The trends of modes of anesthesia of inpatient and ambulatory anesthesia can be an important reference for governmental health policy. Based on a nationwide database, we examined the trend changes of inpatient and outpatient anesthesia in Taiwan during 12 years from 1997 to 2008.
Material and methods: We used National health insurance discharge claim data to study the temporal change of modes of inpatient anesthesia, and the Longitudinal Health Insurance Database 2000 (LHID2000), a sub-dataset contains claim data of one million beneficiaries who were randomly selected from the system in 2000, to study the trend of outpatient anesthesia. Simple linear regression was used to distinguish the temporal trends over time of the modes of anesthesia.
Results and Discussion: The annual inpatient anesthetic practice in Taiwan increased gradually, except the Severe acute respiratory syndrome (SARS) outbreak year 2003, during 1997-2008. However, the annual outpatient anesthetic practice peaked at 2002, and decreased gradually. The predominant

modes of inpatient anesthesia was general tube anesthesia (55.43%), followed by spinal anesthesia (23.69%) and epidural anesthesia (7.99%); whereas the most practiced outpatient anesthesia was intravenous/intramuscular general anesthesia (IV/IM GA) (60.77%), followed by general tube anesthesia (18.33%) and nerve block (5.27%). The temporal trend analysis revealed an increased trend for general tube anesthesia (52.8% at 1997; 59.26% at 2008) and mask general anesthesia (2.44% at 1997; 4.73% at 2008) and a decreased trend for nerve block (2.07% at 1997; 0.88% at 2008) for inpatients; whereas for outpatient anesthesia, an increased trend for IV/IM GA (47.51% at 1997; 70.47% at 2008) and a decreased trend for general tube anesthesia (22.15 at 1997; 18.33 at 2008).
Conclusions: Significant rising trend of application of tube and mask general anesthesia was observed in inpatients and IV/IM GA in outpatients in Taiwan 1997-2008.

1AP4-6

General anesthesia versus monitored anesthetic care with dexmedetomidine for closed reduction of nasal bone fracture

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Background and Goal of Study: Reduction of nasal bone fracture can be performed under general or local anesthesia. The aim of this study is to compare general anesthesia (GA) and monitored anesthetic care (MAC) with dexmedetomidine on the basis of intra-operative vital signs, comfort of patients and surgeons and the adverse effects after closed reduction of nasal bone fracture.
Materials and Methods: Sixty patients with ASA class I or II were divided into GA group (n = 30) or MAC group (n = 30). Standard monitorings were applied. In GA group, general anesthesia was carried out with propofol -sevoflurane - N_2O. In MAC group, dexmedetomidine was administered for sedation and analgesia. Intraoperative vital signs, postoperative pain scores by visual analog scale (VAS) and postoperative nausea and vomiting (PONV) were compared between groups.
Results and Discussion: Intraoperatively, systolic blood pressures were significantly higher, and heart rates were lower in MAC group compared to GA group. There were no differences between groups in the patient and surgeon's satisfaction, postoperative pain scores and the incidence of PONV.
Conclusion: MAC with dexmedetomidine led to comparable satisfaction of patients and surgeons compared to general anesthesia. Incidence of postoperative adverse effects and the severity of postoperative pain were also similar between the two groups. Therefore, both anesthetic techniques can be chosen for the reduction of nasal bone fracture, based on the patients' preference and medical condition.
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1AP4-7

Evaluation of anaesthetist-specific feedback on patients' quality of recovery

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Background and Goal of Study: Anaesthetists rarely receive systematic feedback on their patients' experience of recovery in the immediate post operative period. Sustained, frequent and specific performance feedback has been shown to stimulate quality improvement but the specific mechanisms of effect are not well understood. This study aimed to evaluate an initiative at St Mary's Hospital, London, to monitor and provide continuous personalised feedback to anaesthetists on quality of recovery from surgery.
Materials and Methods: In March 2010, data collection on quality of recovery, pain, emesis, and ward waiting time commenced in the recovery unit. All elective surgical patients were included. Monthly, personalised reports for anaesthetists and departments were implemented in September 2010. These compromised anonymous data, in longitudinal and cross-sectional formats, personalised for each individual anaesthetist's case load.To investigate acceptability and usefulness of the initiative, an evaluative survey was developed and administered pre and post implementation to a cohort of 32 anaesthetists. Items addressed the perceived reliability, comprehensiveness, timeliness and credibility of feedback using 8-point response scales. Statistical results were analysed using repeated measures t-tests (significance level $p < 0.01$).
Results and Discussion: Piloting and development of the survey achieved high scale reliability (Alpha > 0.8). Comparison of time points revealed pronounced effects on local perceptions of quality monitoring and feedback. Significant increments in mean scores between time points was observed for quality indicator adequacy (mean change 3.55; $t = -6.83$, $p < 0.01$), feedback effectiveness (4.22; $t = -6.94$, $p < 0.01$), and constructive data use (2.93; $t = -4.68$, $p < 0.01$). The initiative had a mixed effect upon local workplace climate. Anaesthetists reported improvement in the department's capacity to demonstrate compliance with best practice and the ability to use personal performance data constructively.
Conclusion(s): This initiative showed that it is possible to define and implement relevant, reliable and credible quality indicators for patient recovery; providing useful feedback to anaesthetists. Potential applications of this initiative include supporting clinician revalidation in the UK.

1AP4-8

Is the patient satisfied with anesthesia care?

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Background and Goal of Study: Clinical audit can be an effective method for checking and improving clinical practice. Patient satisfaction is an important measure of the health system quality. There are several factors that can influence the degree of satisfaction of patients, they are: anxiety level, nausea, vomiting, postoperative pain and the patient's clarification regarding their anesthetic plan. These work objectives were to measure patient satisfaction and determine which factors can influence this level of satisfaction.
Materials and Methods: We conducted a total of 138 surveys to adult patients submitted to elective general surgery, between November 2010 and January 2011. The patients were visited between 12 and 36 hours after the anesthetic procedure. We analyzed demographic features, recorded patients satisfaction and several variables related to the perioperative period. We used the Chi-square test.
Results and Discussion: The mean of age was 61.8 years and 51.5% were women. Most patients (84%) were preoperatively assessed by an anesthesiologist, 73.9% had clarified their concerns and to 45.7% the anesthetic plan was explained. The majority received pre anesthetic medication (62%) and 25.4% had postoperative analgesia prescribed by the anesthesiologist. The most frequent complaints were nausea and vomiting (16.7%), mild pain (29%), moderate pain (20.2%) and severe pain (34.1%). As in others studies, our patients showed high degrees of satisfaction, 68.1% very satisfied and 31.2% satisfied. We found no relation between the use of pre anesthetic medication and degree of satisfaction ($p=0.352$). Neither post operative analgesia prescribed by the anesthesiologist ($p=0.769$), nor the type of anesthesia ($p=0.91$) were related to the degree of patient satisfaction.As it has been described in the literature, nausea and vomiting ($p=0.025$) and pain ($p=0.000$) were related with de degree of satisfaction. Also the enlightenment of patients concerning the anesthesia care was related to their satisfaction ($p=0.000$).
Conclusion(s): Post operative investigations in anesthetized patients are without doubt an excellent instrument to draw conclusions regarding our clinical practice.
We concluded that is not the type of anesthesia that influences the patient satisfaction, but other factors like, postoperative pain, nausea and vomit, and the communication between the anesthesiologist and the patient

1AP4-9

Quality of recovery after surgery in patients with obstructive sleep apnea

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Background and Goal of Study: Obstructive sleep apnea (OSA) is an important clinical condition associated with perioperative complications and may affect quality of recovery after surgery. The aim of this study was to evaluate the quality of recovery in patients with high risk of OSA patients.
Materials and Methods: Observational prospective study approved by the Centro Hospitalar São João Ethics Committee and written informed consent was obtained. All consecutive adult Portuguese-speaking patients submitted to elective non-cardiac and non-neurological surgery were eligible to the

study, during a 6-week period of time. A total of 221 patients were enrolled to the study. Demographic data, perioperative variables and length of recovery room stay were recorded. Patients were classified as being at high risk for OSA (HR-OSA) if their STOP-BANG score was 3 or more and were classified as being at low risk (LR-OSA) if their score was less than 3. The Quality of recovery 40 Portuguese version (QoR) was used to measure health status before surgery (T0) and 3 months after surgery (T3). Descriptive analyses of variables were used to summarize data and non-parametric tests were performed for comparisons (Wilcox signed rank test and the Mann Whitney U -test).

Results and Discussion: One hundred ninety eight patients completed the evaluation at T0 (47% were HR-OSA patients) and 190 at T3 (45% were HR-OSA patients). HR-OSA patients had overall significantly lower global QoR scores at T3 compared to LR-OSA patients (median 189 vs. 194 p=0.043). At T0 there were no differences between patients in all QoR40 dimensions and in global score. In patients with LR-OSA regarding evolution in QoR40 total and each QoR40 dimensions between T0 and T3 the median results were similar for psychological comfort (p=0.117), physical independence (p=0.578), and pain (p=0.491) but were higher for emotional state (p=0.035) and for global score (189 vs.179, p=0.008) while the same evolution in patients with HR-OSA showed similar median global score (p=0.245) and in all QoR dimensions except physical comfort (p=0.015).

Conclusion(s): Three months after surgery HR-OSA patients had a worse outcome according to QoR while LR-OSA patients showed improvements in QoR global scores.

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1AP4-10

Use of a multi-modal care pathway for laparoscopic cholecystectomy: preliminary results

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Background and Goal of Study: Laparoscopic Cholecystectomy (LC) is performed as a day-case procedure in many institutions. LC is associated with a high incidence of post-operative pain and post-operative nausea and vomiting (PONV). In our institution, LC is never performed as a day-case procedure. Our study aimed to evaluate if a care pathway bundle including many proven interventions would facilitate a transition to a day-case LC service.1

Materials and Methods: Our study was approved by the Clinical Research Ethics Committee of our hospital. Consent was sought from all patients. It was a prospective, observational study. Over 4 weeks, 17 patients underwent LC. Following exclusion criteria, 12 patients received a set “bundle” of treatments and interventions, and post-operative data was gathered. Patients received IV fluids, oral paracetamol, celecoxib, gabapentin, and IV dexamethasone pre-operatively, a bilateral-dual TAP block, intra-peritoneal local anaesthetic, and fentanyl boluses intra-operatively, and po paracetamol, celecoxib, and oxycodone post-operatively. IV morphine was avoided. Our primary end-point was suitability for discharge at 6-hours post-operatively (Post-anaesthetic discharge score (PADS) > 8).[2]

Results: Medain (IQR). The 5 excluded patients had contra-indications to study drugs, had drains inserted intra-operatively, or refused consent. Of the remaining 12 patients, 11 were female, age 45.5 (40.5-49.3), BMI 29.75 (26.3-32.2), ASA 2 (1-2). Eight patients (66.7%) achieved a PADS > 8 at 6-hours post-operatively. All 8 patients also had a PADS > 8 at 24 hours post-op. Intra-operative fentanyl dose was 310 mcg (300-400), and total oxycodone consumption post-op was 10 mg (5-20). Of the 12 patients, only 5 (42%) received all elements of the care-pathway bundle.

Conclusion: Our study suggests that 67% of pre-selected LC patients would be fit for discharge at 6 hours post-op, and maintain a PADS > 8 at 24 hours, facilitating a day-case service for the majority of LC patients. Further improvements may be possible with only 42% of patients receiving all elements of the bundle. We plan to use this bundle in a day-service LC pilot project and audit the results.

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1AP5-1

A northern deanery survey on the consent, prevention and treatment of shivering under neuraxial blockade

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Background and Goal of Study: Shivering is a common problem during neuraxial block (spinal and epidural) (1). There is uncertainty in the treatment and prevention of shivering under neuraxial blockade due to a lack of good evidence base. In obstetrics, there is a potential for the fetus to be affected by shivering in the mother due to compromise of oxygen supply to placenta especially in cases of fetal compromise due to other factors. Neonatal effects of placental transfer and secretion into breast milk of drugs used in the treatment of shivering also need to be considered.

In the face of uncertainty about the optimum treatment strategy, we performed this survey to ask the anaesthetists about their views about this problem, and to determine whether there is a common consensus about the management of shivering during neuraxial block.

Material and methods: We designed and sent an online questionnaire through group of obstetric anaesthetists in north-east website (www.goa-ne.org.uk) to anaesthetists in the northern deanery. The results were collated and data was analysed.

Results and Discussion: There were a total of 87 responses. Only 26% anaesthetists included shivering as a risk of neuraxial block in the consent. The prevention and treatment of shivering was considered by 32% and 36% of anaesthetists respectively.. The temperature monitoring was considered when patient was shivering under neuraxial blockade during emergency LSCS (33% responses), elective LSCS (38%), emergency LSCS (68%) and elective LSCS (51%).

The most common interventions used to reduce shivering associated with neuraxial blockade were use of warm blanket (82%), warm fluids (59%), increasing theatre temperature (39%) and opioids (47%). Less common interventions were use of warm local anaesthetic extradurally/intrathecally (1%), Doxapram (2%) and Clonidine (3%).

Conclusion: The results showed a lack of anaesthetist appreciation of perioperative shivering despite its common occurrence and serious physiological sequelae. The available evidence base regarding therapeutic options for prevention and treatment of shivering are limited (2). but there are a number of treatment strategies in common use. This survey showed areas of improvement in the consent and consideration of prevention and treatment of perioperative shivering.

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1AP5-2

The effects of the warming devices in patients undergoing tourniquet technique for total knee arthroplasty under the general anesthesia

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Background: It is important to maintain patients normothermic during surgery under the general anesthesia. In total knee arthroplasty, the pneumatic tourniquet makes some effects on body temperature during inflation and after deflation. The aims of this study are to compare the efficacy of the various warming devices and to investigate the effectiveness of bladder temperature monitoring under the general anesthesia in total knee arthroplasty.

Methods: One hundred thirty two patients with ASA physical status I–II, who were scheduled to undergo total knee arthroplasty, were included in this study. The patients were randomly divided into 4 groups (n=33): Group 1, without any heating method; Group 2, with fluid-warmers; Group 3, with air-warmers; and Group 4, with a combination of both heating methods. After the induction of anesthesia with propofol (2-3mg/kg), sevoflurane, and rocuronium (0.6mg/kg) as a muscle relaxants, the esophageal and urinary bladder temperature were monitored and recorded every 5 min during tourniquet inflation and every 1 min after tourniquet deflation.

Results: Thirty minutes after the anesthesia induction, esophageal temperatures were increased more in group 2, 3, and 4 than in group 1 ($P < 0.05$). One min after tourniquet deflation, esophageal temperatures in group 3 and 4 started to be reduced less than group 1 and 2 ($P < 0.003$). There were statistically significant differences between esophageal and urinary bladder temperature during inflation and after deflation of the tourniquet ($P < 0.01$).

The bladder temperature was not correlated with urine output.
Conclusions: Fluid-warmers, air-warmers and combination of both warming methods were effective during tourniquet inflation. However, air-warmers and combination of both warming methods were more effective after tourniquet deflation. In addition, the urinary bladder temperature was higher than esophageal temperature during tourniquet inflation and after deflation

1AP5-3

Perioperative hypothermia in thoracic surgery, a single center retrospective analysis

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Background and Goal of Study: Hypothermia due to anesthetic-induced impairment of thermoregulatory control and exposure to a cool environment is common in surgical patients. Peripheral vasodilation due to neuroaxial blockade may aggravate hypothermia. There is few data on perioperative hypothermia in patients undergoing thoracic surgery under combined general and regional anesthesia. We reviewed all thoracic surgical patients between 2006 and 2011 to determine the incidence and extent of hypothermia with or without an epidural anesthesia and evaluated its effect.
Material and methods: 396 patients underwent lung resection procedures: 197 with general and epidural anesthesia (GA+EPI), 199 with general anesthesia alone (GA). Statistical analyses were performed to determine the association between hypothermia (T< 36°C) and transfusion requirements, length of stay (LOS) in the intensive care unit (ICU), hospital LOS and mortality.
Results: The overall incidence of hypothermia was 55.8%. Multivariate regression analysis revealed three significant risk factors for the development of hypothermia: long induction time (p=0.011), small body surface area (p=0.003), and application of more fluid intraoperatively (p< 0.001). Factors determining the extent of hypothermia were receiving an open thoracotomy (p=0.009), placement and use of an epidural catheter (p=0.002), and a lower BMI (p< 0.001). Additional epidural anesthesia reduced core temperature by 0.26°C (95% CI -0.414 to -0.095 °C, p< 0.05). There was no difference in transfusion requirements, ICU or hospital LOS, or mortality between both groups.
Conclusion: More than half of all thoracic patients suffered from hypothermia. A long induction time, small body surface area and large intraoperative fluid application were independent risk factors for the development of perioperative hypothermia. Additional epidural anesthesia to general anesthesia did not increase the incidence of hypothermia but decreased body core temperature to an albeit not clinically significant degree. Patients scheduled for thoracic surgery might benefit from a period of prewarming prior to induction to reduce the high incidence of perioperative hypothermia.

1AP5-4

Postoperative acute kidney injury in non-cardiac surgery: incidence and risk factors

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Background: Postoperative acute kidney injury (AKI) is associated with increased morbidity and mortality both in the short- and long- term , even when increases in creatinine level are small. Information on the incidence of AKI after non-cardiac surgery is scarce.
Goal of study: The aim of this study was to evaluate the incidence and risk factors for postoperative AKI after major non-cardiac surgery.
Methods: A prospective cohort study was performed in 2 tertiary hospitals during 7 randomized weeks over 6 months in 2011-12. Eligible subjects were patients undergoing intermediate-high surgery-specific risk of non-cardiac (elective or urgent) surgery, under general or regional anaesthesia. AKI was defined and stratified according to the AKI Network classification when diagnostic criteria is met: serum creatinine rises by ≥ 26μmol/L within 48 hours or serum creatinine rises ≥ 1.5 fold from the reference value. Preoperative and intraoperative risk factors for AKI were analysed. SPSS 19.0 statistical package was used to compile descriptive statistics and compare qualitative variables with a χ^2 test and quantitative variables with a t test. Bivariable and multivariable analyses were performed. Relative risks and their 95 % confidence intervals were calculated.
Results: Data were based on a sample of 198 patients. AKI was developed in 18 (9.1 %) patients: 14 (7.1%) stage I, 3 (1.5%) stage II, and 1(0.5%) stage III. Risk factors for AKI were: history of peripheral vascular disease 4.4 (1.7-11.4) and chronic kidney disease 3.0 (1.1-8.2); preoperative corticoids 5.1 (2.1-12.2), and, postoperative antibiotics 2.5 (1.1-6.2). Multivariable analysis showed -peripheral vascular disease (4.5; 1.1 -18.7) and corticoids (5.8; 1.8-21.3) were statistically significant. AKI was associated with postoperative hypotension 5.0 (1.9-12.9), tachycardia 6.7 (1.2-37), decreased urine output 2.2 (1.6-3.2), postoperative infection 3.8 (1.5-9.5), SIRS 7.5 (1.8-31), and longer ICU and hospital stay (25.4 vs 14.8 hours and 9.3 vs 14 days ,respectively).
Conclusion: A history of peripheral vascular disease and preoperative corticoid use were significant risk factors for postoperative AKI. Hospital and ICU stay were higher in patients who developed AKI. Recognising early stages of renal dysfunction allows early action to prevent progression.
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1AP5-5

Intraocular pressure changes during laparoscopic nephrectomy

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Background and Goal of Study: Recently, perioperative visual impairments after laparoscopic nephrectomy have been reported. Laparoscopic surgery and intraoperative body position are known to change the intraocular pressure (IOP), but there was no report about the IOP changes during lateral decubitus position combined with pneumoperitoneum. Therefore, we evaluated the combined effects on the IOP between two eyes in patients undergoing laparoscopic nephrectomy.
Materials and Methods: Prospective observational study was conducted with 23 patients with no preexisting eye disease, ASA 1-2, undergoing laparoscopic left nephrectomy. Anesthesia was induced with thiopental sodium and rocuronium and maintained with sevoflurane and 50% oxygen. IOP in both eyes was measured prior to anesthesia in supine position (T0), after intubation (T1), 10 min after lateral decubitus position (T2), 5 min and 30 min after pneumoperitoneum (T3,T4), 5 min and 30 min after mannitol administration (T5,T6), 30 min after the end of pneumopeitoneum (T7), and 30 min after the end of surgery (T8).
Results and Discussion: Baseline (T0) IOP was similar (15.6±3.3 mmHg in non-dependent eye and 15.5±3.7 mmHg in dependent eye) and after intubation, both IOP was significantly decreased from the T0. After pneumoperioneum, both IOP was increased significantly from the T0 (p< 0.0001). The mean IOP in the dependent eye was significantly higher than that in the nondependent eye during the operation with lateral decubitus position and pneumoperitoneum (p=0.0414).
Conclusion(s): Pneumoperitonuem with lateral decubitus position was significantly increased IOP and IOP of dependent eye was more higher increased than nondependent eye.
References:
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1AP5-6

Prevention of perioperative hypothermia in transurethral resection under spinal anesthesia

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Background and Goal of Study: Hypothermia is a frequent complication during perioperative period. Its occurrence must be avoided in order to decrease morbidity/mortality and to increase patient satisfaction. During transurethral resection (TUR) considerable amounts of liquids at low temperature are used for bladder irrigation,bringing about a decrease in the core temperature of the patient.Moreover, spinal anesthesia causes hypothermia.
The aim of this study is to assess the effect of prewarming in the prevention of perioperative hypothermia during transurethral resection with spinal anesthesia
Materials and Methods: Once the approval of the Clinical Research Ethics Committee of our hospital was obtained, we carried out a prospective con-

trolled study. Patients who underwent TUR under spinal anesthesia were collected for a period of 4 months. Patients were randomized into two groups: Group A, prophylaxis of perioperative hypothermia not carried out; Group B, prewarming with forced warm air applied. Data were analyzed using SPSS 15.0

Results and Discussion: One hundred thirty seven patients were included (88.3% men 11.7%women) with an average age of 70 (42-96) years old.The ASA physical status was ASA I: 4.4%, ASA II: 32.8%, ASA III: 54% and ASA IV: 8.8%. Both groups were comparable with regards to gender, age and ASA physical status.

75.9% of the patients were submitted to TUR for bladder cancer, while 24.1% were submitted to TURP. The average duration of the procedure was 34 (10-100) minutes. The average glycine infusion was 10.13 (1-34) liters. The average temperature of the operating room was 22.62 (21.6-24.2)ºC. Patients arrived in the operating room with an average body temperature of 35.83 (34.7-37.1)ºC.

54% of the patients were given prophylaxis for perioperative hypothermia through WarmTouch Mallinckrodt Medical device at 36-40ºC, and 46% were not.

At the end of the procedure, the average temperature of Group B was 35.49ºC (IC 95% 35.36-35.62) versus 35.07ºC (IC 95% 34.92-35.23) for Group A. Therefore, there were statistically significant differences (p 0.02).

33% of Group A suffered from post-surgical shivering, versus 8.11% of Group B.

Conclusion: Preoperative prophylaxis with forced warm air prevents the occurence of perioperative hypothermia and post-surgical shivering in short duration transurethral resection under spinal anesthesia.

1AP5-7

Self-positioning following awake fiberoptic intubation is a safe and well-tolerated procedure for positioning of the morbid obese patient in the prone position

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Background and Goal of Study: Positioning of anaesthetized morbidly obese patients in the prone position is labor intensive and may be complicated by injuries to soft tissue, and nerves (1).

Therefore we decided to perform awake fiberoptic tracheal intubations in a series of obese patients who afterwards positioned themselves in the prone position and to register complications associated with the placement on the operating table.

Materials and Methods: Thirteen consecutive patients scheduled for spine surgery, BMI >40 and/or weight >130 kg, were included. Under light sedation (remifentanil 2-5 m/kg/h and 1-2 mg of midazolam i.v) the patients were topical anaesthetized with 1% lidocaine in the pharyngeal cavity, 2% at the base of the tongue, and 4% on the vocal cords and intratracheally. Fiberoptic tracheal intubation was performed and afterwards the patients settled themselves in a comfortable prone position on the operating table where after general anaesthesia was induced. Data on sore throat, hoarseness, pain in neck or shoulders, nerve injuries, and acceptance of the procedure were registered 3and 24 hours postoperatively.

Results and Discussion: Five women and 8 men aged 21-65 years where included. Median weight was 130 kg (range 106-171) and median BMI 43 (range 35-55). Median duration of surgery was 110 minutes (range 40-225). All patients tolerated topicalization and the intubation well. Their only complaint was to the taste of the local anaesthesia. No patient had paraesthesia after the surgery. Three hours postoperatively 5 patients had light pain localized to the shoulders (VAS 1-3). Two of these patients scored 1 the following day. Two patients suffered from light neck pain (VAS 1) at three hours and on the day after. Three patients suffered from sore throat at 3 hours (VAS 1-3) and 2 (VAS 1) on the day after the surgery.All patients stated that they would not hesitate to go through the same procedure another time.

Conclusion(s): Awake fiberoptic intubation of obese patients followed by self-positioning in the prone position seems to be a safe and well tolerated procedure wich might reduce pain from nerves, muscles, and joints after surgery. In addition this method saves manpower.

References:

1. Brodsky JB. Positioning the Morbidly Obese Patient for Anesthesia. Obesity Surgery 2002; 12: 751-758.

1AP5-8

How much do our children suffer during anesthesia induction?

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General anesthesia may be induced by inhaled or intravenous routes, though the former is most often used for children because it avoids awake venous access. Nevertheless it is not worldwide used because although many anesthesiologists believe it is less psychologically traumatic, it is known that children may become apprehensive and resist the application of the mask, which may prolong the induction and be emotionally traumatic for the child.

Although among all inhalational anesthetics sevoflurane is considered the agent of choice in children, it is said that avoiding sevoflurane and using propofol as anesthetic agent is associated with a smoother recovery profile.

The aim of this randomized trial is to evaluate children anxiety during induction, quality of anesthesia induction and postoperative period and induction time parameters in these different anesthesia techniques.

Materials and Method: After local ethics committee approval, written informed consent was obtained from the parents of 40 ASA I pediatric patients scheduled for tonsillectomy. Those with previous surgery were excluded. Patients were randomly allocated to receive intravenous propofol applying anesthetic cream before punction or inhaled sevoflurane induction.

Modified Yale Preoperative Anxiety Scale (mYPAS) measures children's anxiety during induction. mYPAS scores>40 were classified as anxious.

Induction Compliance Checklist (ICC) represents negative behaviors during induction; ICC≥4 was considered poor behavioural compliance.

Smoothness Induction Index (SII) measures children behavioral compliance during induction. SII=1 (smooth induction) calm children, SII=2 (moderate induction) children crying, SII=3 (traumatic induction) children fighting.

Children's behaviour in the postanesthetic care unit (PACU) was assessed using a 5-point scale: child sleeping, awake and calm, crying, inconsolable crying, and disorientation.

Student's t test or Chi square were used as appropiate. A $p < 0,05$ was considered significant.

Results: See table. No child was withdrawn. Children receiving inhalational induction showed significantly lower levels of anxiety (mYPAS=37.8±10.1) as compared with children receiving intravenous induction (mYPAS=78.9±5.2).

Conclusions: Children receiving inhalational induction suffer less anxiety and better induction compliance without prolonging the time of anesthesia induction. There did not exist major index of postoperatory agitation with sevoflurane.

1AP5-10

Poor quality of recovery and QoR-40 prior to surgery

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Background and Goal of Study: The Quality of Recovery 40 (QoR-40) has been shown to be correlated with postoperative quality of life (QoL) [1]. The aim of our study was to know the incidence of Poor Quality of Recovery (PQR) in our Center and to verify if QoR-40 applied prior to surgery can identify patients that will have a PQR.

Materials and Methods: Observational prospective study approved by the institutional ethics committee and written informed consent was obtained. All consecutive adult Portuguese-speaking patients submitted to elective non-cardiac and non-neurological surgery were eligible to the study, during a 6-week period of time. Demographics data and perioperative variables were recorded. The QoR-40 Portuguese version was used to measure health status before surgery (T0) and 24h after anaesthesia (T1). PQR was defined for patients with a QoR-40 score lower to the mean QoR-40 score at T1 minus 2 standard deviations. Descriptive analyses of variables were used to summarize data and non-parametric tests were performed for comparisons.

Results and Discussion: QoR-40 was measured at T0 and T1 in 114 patients. Mean T1 QoR-40 score was 169,5 ± 27.0 and PQR patients were identified if their QoR-40 score was lesser than 115,5. PQR occurred in 11 patients (9,7%). Global median scores for PQR patients were lower at T0 (117 vs. 182, $p < 0.001$) and at T1 (107 vs. 175, $p < 0.001$). According to the various QoR-40 sub-scales, PQR patients showed lower median scores at T0 for emotional state (23 vs 37, $p < 0,001$), physical comfort (28 vs 55, $p < 0,001$) and pain (7 vs 32, $p < 0,001$), while in the other sub-scales (psychological support and physical independence) the results were similar. At T1 the previous pattern was followed between PQR patients and the others: emotional state (20 vs 39,

p< 0.001), physical comfort (25 vs 52, p< 0.001), pain (10 vs 30, p< 0.001) and no differences in the other sub-scales.
Conclusion: Patients with PQR measured 24 hours after surgery have lower QoR scores prior to surgery, which suggests that these patients might be identified before surgery using QoR. This may allow earlier and more effective interventions particularly in the more affected dimensions in order to improve the recovery of patients undergoing surgery.
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1AP6-1

Comparison of two forced-air warming devices for the prevention of hypothermia during abdominal surgery in the Lloyd-Davies position

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Background and Goal of Study: Prevention of perioperative hypothermia may be challenging especially in situations where positioning of the patient leaves minimal body surface area available for warming strategies. This is the case for the Lloyd-Davies position (30° Trendelenburg position with legs apart and with the hips flexed at 15°).
The present study was designed to evaluate the effectiveness of an underbody forced-air warming mattress in patients undergoing surgery in Lloyd Davies position, in comparison with the upperbody forced-air warming blanket.
Materials and Methods: After approval of the local Ethics Committee and informed consent 44 patients undergoing surgery in Lloyd-Davies position with a combined general and epidural anesthesia were randomly allocated to 2 treatment arms: group A: Mistral-Air® Forced Air Warming Underbody and group B: Bairhugger® Forced Air Warming Upperbody.
From time of induction core temperature was monitored with an esophageal probe and recorded every 15 minutes. Temperatures over time in the different groups were analyzed using two-way analysis of variance for repeated measurements. Data are expressed as mean with standard deviation.
Results and Discussion: Forty four patients were included in a period of 24 months. One patient was excluded because of malfunction of the thoracic epidural. Finally, data of 21 patients in group A and 23 patients in group B were used for analysis. There were no differences in patient characteristics between groups.
Temperature data are summarized in the table.

	T0	T15	T30	T45	T60	T75	P between time points
Group A	36.1 (0.4)	36.0 (0.4)	35.9 (0.6)	35.8 (0.5)	35.7 (0.4)	35.7 (0.4)	**<0.001**
Group B	36.0 (0.4)	35.8 (0.5)	35.6 (0.6)	35.4 (0.5)	35.4 (0.5)	35.5 (0.5)	**<0.001**
P between groups	**n.s.**	**n.s.**	**<0.05**	**<0.05**	**<0.05**	**n.s.**	

[Table 1]

Temperatures at T30, T45 and T60 were higher in group A than in group B.
Conclusion: The forced-air warming underbody seems to provide better early temperature maintenance than the routinely used forced-air warming upperbody.

1AP6-2

Quality indicators in anaesthesia - an audit of local practice

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Background: Anaesthesia has made great strides in establishing and maintaining standards of safety and quality. There is, however, no national standard for measuring quality in Anaesthesia in the UK.
We devised a set of 9 quality indicators and used them to audit local practice.
Method: The following indicators were used to audit 3817 sets of patient notes. Patient demographics (gender, age, ASA Grade and urgency) were also collected.
Pre-operatively:
- Pre-operative visit on day of surgery?

Peri-operatively:
- Anaesthetic time?
- Documentation of minimum standards of Association of Anaesthetists of Great Britain and Ireland (AAGBI) monitoring? (pulse oximetry, blood pressure, ECG, vapour, FiO_2, $ETCO_2$ & airway pressure)

Post-operatively:
- Handover to recovery?
- Critical incident in recovery?
- Any unplanned overnight admission?
- Any unplanned admission to ICU?
- Time spent in recovery?
- Over 2 hours in recovery?

Results: Patient demographics showed variability believed to be representative of most District General Hospitals.
Pre-operatively:
- 273 (7.2%) patients not seen by an anaesthetist

Peri-operatively:
- Median anaesthetic time of 12 minutes (range 1-120, IQR 14)
- 1538 (40.4%) did not have monitoring documented to AAGBI standards

Post-operatively:
- 1104 (29%) patients not handed over to recovery
- 5 patients (0.13%) suffered a critical incident
- 10 patients had an unplanned overnight admission
- 16 patients had an unplanned admission to ICU
- Median recovery time of 38 minutes (range 1-1519, IQR 34)
- 97 (2.55%) patients had a recovery stay >2 hours.

Discussion: There is no UK national standard to compare our results to. Some can be compared to AAGBI standards, others can only be reported and put into context.
The audit found several areas where practice could be improved. Particularly, 7.2% of patients were not seen pre-operatively, 40.4% had inadequate documentation of monitoring and 29% were not handed over to recovery.
Conclusion: This audit of quality indicators showed several areas where local practice could be improved. The quality indicators would be suitable for use in most UK anaesthetic departments.
References:
1. Recommendations for standards of monitoring during anaesthesia and recovery; 4th Edition; AAGBI; March 2007.
2. Good Medical Practice; GMC; November 2006.

1AP6-3

Evaluation of the atropine wastage in a french university hospital: the benefit of the extemporaneous preparation or pre-filled syringes

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Background and Goal of Study: Atropine syringes are routinely prepared in each operating room to quickly treat any bradycardia. When there are not used, these syringes are thrown at the end of the day. Extemporaneous preparation (EP) or pre-filled syringes (PFS) of atropine may contribute to health savings.
The aim of the study was to assess the actual cost of the routine preparation (RP) of atropine syringes and to assess the potential savings with different modes preparations.
Materials and Methods: In a first part of the study, the RP cost of atropine syringes was estimated retrospectively for the year 2010. The use of atropine in pediatric surgery and for neuromuscular blockade reversal were excluded.
In a second part, 39 anesthesiologists, residents, nurse anesthetists and student nurse anesthetists took part in a simulated intraoperative bradycardia. Time for preparing an atropine syringe of 0.5 mg was recorded according to 2 scenarios (S):
S1, 2 vials of 0.25 mg/ml and sampling equipment available on a sterile tray;
S2, 1 vial of 0.5 mg/ml and sampling equipment available on a sterile tray.
The cost of atropine preparation with PFS was estimated by Aguettant.
Results and Discussion: In 2010, 7835 syringes of atropine were routinely prepared at the opening of the operating rooms. Only 1223 syringes were used, it equals 611.5 mg of atropine for € 1015.1 and a waste of € 5488.1.
Mean preparation time ± SD (range) for scenarios S1 and S2 were 26.5 ±7.9 (17-60) and 18.1 ±3.5 (10-25), respectively (p< 0.01). The spending distribution for the syringe preparation according to the proposed methods is shown in Table 1, without taking into account manpower cost and waste disposal and treatment.

Product	Unity	Routine preparation	Scenario 1	Scenario 2	Pre-filled syringe
Number of atropine syringes		7835	1223	1223	1223
syringe (2ml) and needle, €	0.04	313.5	45.9	45.9	-
Sterile tray, €	0.43	3369.1	525.9	525.9	-
2 vials of 0.25 mg/ml, €	0.36	2820.6	440.3	-	-
1 vial of 0.5 mg/ml, €	0.18	-	-	220.1	-
PFS 5ml, 100µg/ml, €	3.50	-	-	-	4280.5
Estimated cost, €	-	6503.2	1021.1	791.9	4280.5
Estimated health savings (%)	-	-	84.4	87.8	34.2

[Table 1. Preparation cost of atropine syringes]

Conclusion(s): RP of atropine syringes represents a significant wastage. PFS are immediately available and allow estimated health savings of 34.2%. EP with atropine vial of 0.5 mg/ml (S2) are performed in a mean time lower than 20 seconds and would make savings of 87.8%.

1AP6-4

Cost implications of wasted emergency drugs

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Background and Goals: Emergency drugs are commonly drawn up at the start of a list. Most of these drugs are not used and are then discarded at the end of the day, representing a waste of resources at considerable cost. Our aim was to quantify the magnitude and cost of these wasted drugs to our department.
Methods: Emergency drugs were audited across in-patient theatres over a two weeks. Data was collected on drugs drawn up at start of day and drugs discarded at end of day. Cost of individual drugs was obtained from pharmacy. A wasted drug was defined as a drug drawn up from the ampoule but not used. The cost of wasted drugs was calculated and extrapolated over 12 months. The results were presented at our departmental audit meeting and anaesthetists asked to draw up emergency drugs only as needed. The audit was repeated 12 months later and costs calculated again.
Results: Results from both cycles are shown. There was a 51% reduction in the cost of discarded drugs.

Drug (Cost per amp)	Drawn up (2 weeks)	Discarded (2 weeks)	Money wasted (2 weeks)	Money wasted (12 months)
Glycopyrolate (£1.48)	40	32 (80%)	£47.36	£1231.36
Atropine (£0.11)	21	17 (81%)	£1.87	£48.62
Ephedrine (£0.14)	45	33 (73%)	£4.62	£120.12
Metaraminol (£1.82)	62	29 (47%)	£52.78	£1372.38
Suxamethonium (£0.70)	58	58 (100%)	£40.60	£1055.60
			Total	£3828.08

[Cycle 1 - Quantity and Costs of Wasted Drugs]

Drug (Cost per amp)	Drawn up (2 weeks)	Discarded (2 weeks)	Money wasted (2 weeks)	Money wasted (12 months)
Glycopyrolate (£1.48)	12	7 (54%)	£10.36	£269.36
Atropine (£0.11)	8	8 (100%)	£0.88	£22.88
Ephedrine (£0.14)	18	11 (61%)	£1.54	£40.04
Metaraminol (£1.82)	52	26 (50%)	£47.32	£1230.32
Suxamethonium (£0.70)	16	16 (100%)	£11.20	£291.20
			Total	£1853.80

[Cycle 2 - Quantity and Costs of Wasted Drugs]

Discussion: We initially wasted approx £3800pa on wasted emergency drugs. The most viable way for us to reduce these costs without impacting upon patient safety was to draw up drugs only when needed, instead of routinely at the start of a list. The routine use of pre-filled syringes was more expensive than drawing drugs up from the ampoule. However, they remained available for emergency situations where there was not sufficient time to draw a drug up. This approach allowed us to reduce the number of discarded drugs and cut these costs by half.
It is important for us all to be cost aware and consider what drugs we may need to use on a case-by-case basis. These figures represent wasted resources in one hospital alone. If this was extrapolated across the health board, there is potential to make even bigger savings.

1AP6-5

Morbidity and mortality associated with hip fracture in the elderly patient. Analysis of our environment

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Background and Goal of Study: Hip fracture is a prevalent condition in the elderly population, with exponential growth, high rates of morbidity and mortality associated with quality of life and healthcare consumption.
We determine the epidemiological variables and mortality, we describe the causes of surgical delay and its consequences and the impact on health care and the process involved for adequate provision of resources.
Methods/Design: We performed a retrospective observational study reviewing all patients with a diagnosis of hip fracture operated in our hospital between January 2007 and December 2008. We recorded general epidemiological facts, antiplatelet/anticoagulation treatment, type of anesthesia and complications, transfusion rate, hospital stay, surgical delay and mortality among others. We also performed a predictive model of death at 30 days and one year using logistic regression and multivariate analysis. The variables of interest (gender, age, ASA, comorbidity, baseline hemoglobin, admission diagnosis, infectious or general complications and surgical delay), setting the statistical significance at $p < 0.05$.
Results: 765 patients were included, 78% being females, average age 83 (± 7.33). 59.8% of patients were ASA III. 35.5% had some type of treatment prescribed antiplatelet or anticoagulant. Trasfusional rate was 52.5% with a median of 2.25 units. We found a surgical delay on an average of two days due to antiplatelet / anticoagulant treatment, baseline disease decompensation and operating room availability. The cumulative incidence of death at 30 days was 6.9% and 23.5% annually. The multivariate analysis of our predictive study with logistic regression showed the risk factors associated with increased 30-day mortality were gender related (OR 4.49 in males), age related (OR 1.077), ASA (OR 1.75), postoperative complications (OR 7.1) and surgical delay (OR 1.92), being statistically significant.
The same predictive study was performed to know the mortality rate at 12 months; the variables related to late mortality were gender (OR 3.06 in males), age (OR 1.072), ASA (OR 2.25), thus showing more impact in the annual mortality risk than mortality at 30 days. Baseline haemoglobin was evidenced as a protective factor (OR 0.879, $p = 0.022$).
Conclusions: Surgical delay results in increased postoperative complications and a higher mortality rate. Hip fracture is a serious problem, with important implications in the immediate and long-term costs.

1AP6-6

A comparison of cost effectiveness analyses about intraoperative goal directed therapy

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Background: Decisions about adoption and reimbursement of new perioperative strategies are often complicated by the complexity and uncertainty intrinsic to health care. Intraoperative goal directed (GDT) therapy has been shown to improve outcome in high risk surgical patients, yet the cost impact has not been established. Mathematical decision models are increasingly used to capture the relationship between inputs (comorbidities), intervention and output (outcomes) in order to predict future costs and outcomes. The aim of this paper is to assess the cost-effectiveness of GDT by comparing the results of a deterministic decision tree and two probabilistic mathematical simulation models.
Methodology: Comparison of three simulation methods. A simple decision tree, a Marcov analysis and a Monte Carlo Simulation were constructed to replicate the long term follow up period of a high risk surgical patients undergoing high risk surgery and receiving intraoperative goal directed therapy.
Results: Intraoperative goal directed therapy was shown to be cost-effective by all three methods (incremental savings of £1,539.75; £1034.00; £1033.04). The decision tree estimated the highest mean costs, mean cost savings and lowest mean survival (Table 1). The probabilistic Marcov and Monte Carlo simulation estimated fairly similar costs and quality adjusted life expectancy (2.78 years (5.26-8.04) versus 2.67 years (5.16-7.83).

Conclusion: Intraoperative goal directed therapy is shown to be a cost effective clinical strategy by all methods used. Probabilistic analysis reported similar results, but significantly diverged from the results estimated by the decision tree. This is thought to be due to the deterministic nature of the decision tree describing average results, and neglecting the random elements inherent in disease recovery. Probabilistic simulation replicates the dynamics of health care more accurately and may be a more useful tool in informing decision makers about resource allocation.

	Decision Tree	Marcov Analysis	Monte Carlo
Incremental Cost Savings of GDT	£1,539.75	£1,033.04	£1,034.00
Mean Costs GDT	£6,888.33	£5,706.90	£5,804.81
Mean Costs Standard Treatment	£8,428.08	£6,740.90	£6,837.85
Incremental Effect (QALY)	2.6	2.78	2.67
Mean quality adjusted life years - GDT (QALY)	3.28	8.04	7.83
Mean quality adjusted life years - Standard (QALY)	0.61	5.26	5.16

[Incremental and Maximum Costs and Effects of GDT]

1AP6-7

Powerful placebo puncture - no difference in AcupEnd a double-blinded, randomized controlled trial comparing real versus placebo acupuncture to improve tolerance of diagnostic esophagogastroduodenoscopy (EGDE) without sedation

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Background and Goal of Study: Sedation in diagnostic EGDE is widespread and increases patient comfort. However, the perceived benefits of improved patient comfort and must be measured against the increased risk of adverse cardiopulmonary events and higher attendant costs. Therefore, we examined if an acupuncture during elective, diagnostic EGDEs could increase the comfort of patients refusing systemic sedation.
Materials and Methods: A single-center, double blinded, placebo controlled superiority trial to compare the success rates of elective, diagnostic EGDEs with real and placebo acupuncture using the Streitberger placebo needle[1] after approval of the protocol by the local ethics committee. All patients received real or placebo acupuncture at KG 24 middle line (to reduce choking), Pericard 6 bilateral (to reduce gastroenteral motility) and Di 4 bilateral (to reduce nausea and vomiting). Half to one inch 32G needles were placed and left in their position for five minutes prior and throughout the endoscopic procedure. The primary endpoint (rate of successful elective diagnostic EGDEs) was defined as a composite score of patient satisfaction with the procedure as well as quality of the examination (technical adequacy) as assessed by the examiner. All patients aged 18 years or older scheduled for elective, diagnostic EGDE who refuse a systemic sedation are eligible.
Results and Discussion: From 670 patients screened 354 patients were finally included. 259 EGDEs were successful (73.16%). We found no differences in the primary endpoint rate of successful elective diagnostic EGDEs (real acupuncture 130 patients [36.7%] vs. placebo acupuncture 129 patients [36.4%]). In patients receiving real acupuncture 68 patients (38.6%) perceived a De-qi sensation compared to 26 patients (14.7%) in the placebo group ($p < 0.001$). Despite the difference in De-qi sensation real and placebo acupuncture demonstrated equal rates of successful elective diagnostic EGDEs. Doubtless, one of the key points in placebo controlled acupuncture studies remained the definition and choice of the sort of placebo intervention.
Conclusion: The selected acupuncture points were comparable to facilitate a high rate of successful elective diagnostic EGDEs regardless of real or placebo acupuncture in our trial suggesting a powerful placebo effect.
Reference:
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1AP6-8

Perioperative hemodynamic goal directed therapy: potential cost-savings with implementation

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Background: Many studies have demonstrated the ability of perioperative Hemodynamic Goal Directed Therapy(pGDT) to decrease post-operative morbidity in patients undergoing medium-to-high risk surgery(1). Because of post-operative morbidity reduction,As a result pGDT may actually be a cost-saving strategy. Our goal was to provide an estimation of potential cost-savings based on recent literature.
Materials and Methods: The largest and most recent meta-analysis[1] on pGDT was used to estimate what could be the reduction of post-operative morbidity if pGDT was to be adopted. Costs related to the treatment of patients developing at least 1 (1+) post-operative complications were obtained from two recent US[2] and Swiss[3] publications. Potential cost-savings related to the adoption of pGDT were calculated according to the actual morbidity rate, assuming 0%pGDT use so far, and 100% compliance rate after implementation.
Results: The 2011 meta-analysis[1] of 29 RCTs (4,805 patients) showed that pGDT is associated with a reduction in the rate of patients developing 1+ post-operative complications with odd ratios ranging between 0.35 and 0.55. Importantly, these odd ratios were not related to the morbidity rates. In the US publication[2], extra-costs for treating patients with 1+ complication were $17,949. In the Swiss (CH) publication[3], they were $34,446.

Actual morbidity rate no pGDT(%)	10	20	30	40	50	60
Expected morbidity rate pGDT(%)	3.5- 5.5	7- 11	11- 17	14- 22	18- 28	21- 33
Expected cost reduction/US patient($)	808- 1167	1615- 2333	2423- 3500	3231- 4667	4039- 5833	4846- 7000
Expected cost reduction/CH patient($)	1550- 2239	3100- 4478	4478- 6545	6200- 8956	7578- 11023	9300- 13434

[Cost reduction with pGDT]

Conclusion: Depending on the pre-implementation morbidity rate, the degree of pGDT-induced morbidity reduction and the country, cost-savings ranged between $808 and $13,434 per patient. This large variability suggests that local/hospital estimations are desirable before starting pGDT implementation. These tailored evaluations would also allow more precise cost-saving estimations by taking into account the actual and expected pGDT compliance rates.
References:
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1AP6-9

Audit of recyclable waste from anaesthetic drug use and potential financial savings - abstract for consideration for poster presentation

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The NHS produces an average of 250,000 tonnes of waste every year at a cost of £40+ million[1]. Less than 10% of NHS waste is recycled[2]. The reduction of waste production and increase of recycling has both environmental and financial advantages.In the UK 5.5kg of waste per patient per day is produced. This figure falls significantly in countries with a greater commitment to waste minimisation and recycling such as France (1.9Kg waste/patient/day) and Germany (0.4Kg waste/patient/day). Packaging is non-hazardous, and therefore potentially recyclable. The Leeds Teaching Hospital Trust (LTHT) is one of the largest in Europe. Contributing to the total waste produced is the packaging of anaesthetic drugs and equipment which is currently disposed

of in all the available waste streams, often the nearest waste bag is the one that is used.
This audit aimed to establish the amount of recyclable waste generated by the packaging of anaesthetic drugs used in a theatre setting and the potential savings. It also aimed to look at the practical logistics of altering the waste streams to facilitate this shift in practice.
Methods: A pharmacy database revealed the number of each anaesthetic item dispatched over a 1 year period. The packaging of each item was then weighed using the same set of calibrated digital scales. The cost of disposing this waste was then calculated. We also looked at the packaging of commonly used anaesthetic equipment. The number of anaesthetics given was established and the amount of anaesthetic equipment used calculated.
Results: 49,106 anaesthetic cases took place. 271,640 individual glass vials from 39,420 packaging boxes were used and 82,714 bags of IV fluid were given. The total weight of packaging was 6.3 tonnes. The total weight of the equipment packaging was 2.946 tonnes.
Discussion: This audit only looked at packaging as this is non contaminated and potentially immediately recyclable. When the packaging of surgical equipment is also considered the potential becomes huge. As demonstrated in other European countries, significant reductions in waste production per patient can be achieved. Theatres could be the ideal place to trial a system from a logistical point of view that if rolled out trust wide could make a very significant impact.

1AP6-11

Cardiopulmonary exercise testing: an independent predictive marker of long term outcome and mortality post endovascular aneurysm repair (EVAR)

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Background and Goal of Study: Previous studies have demonstrated varying association between peak oxygen concentration (V02 peak) and anaerobic threshold (AT) determined by cardiopulmonary exercise testing (CPX), and postoperative mortality in abdominal aortic aneurysm repair (AAA). This study assesses the association between the results of preoperative CPX and long term outcome in AAA repair.
Materials and Methods: Patients from our institution undergoing AAA repair between 01/01/2007 and 31/12/2008 who underwent pre-operative CPX were included. $V0_2$peak and AT in ml/kg/min were recorded. Intervention type, and mortality data were obtained from case-notes. Patients were followed up until July 2010. Cox proportional hazard analysis was used to examine the association between functional capacity and long-term outcome.
Results and Discussion: 137 patients(118 male) were studied., 71 underwent open repair (OR) and 66 received endovascular aneurysm repair (EVAR). The median(range) age of the study population was 75.7(56.5 - 91.7) years. For OR age was 75.7(56.5 - 87.2) years, forEVAR age was (SD) 77.3(59.3 - 91.7) years. The age difference between the two groups was significant, p=0.002. Median(range) patient follow-up was 657(1-1318) days. During follow up, there were 30 deaths (21.9%), 12 post OR and 18 post EVAR (p=0.142).
The mean(SD) AT was 11.7(2.7) in OR patients and 10.2(2.8) EVAR patients (p=0.003). Mean(SD) VO2peak was 16.1(4.4) in OR patients and 14.2(4.1) in EVAR patients (p= 0.011). The hazard ratio (HR) for death during follow-up increased with decreasing AT and VO_2peak. In OR patients the HR for death during follow-up per ml/kg/min decrease in AT was 1.01(0.75-1.35). The HR per ml/kg/min decrease in VO_2peak was 0.97(0.84-1.12). For EVAR patients the HR for AT was 1.84(1.16-2.92); and 1.23(0.97-1.57) for VO2peak.
Conclusion: These data show a significant difference in AT between the OR and EVAR sub-groups and identifies the independent predictive value of CPX in longterm outcome and mortality post EVAR. Given the significant long term attrition of EVAR patients shown in this study there is a strong case for the early use of functional testing as part of the preoperative assessment of AAA patients. The results of such testing may serve as a key tool to help direct a multidisciplinary intervention decision making process.

1AP7-1

Ketamine vs. magnesium sulphate for prevention of postoperative shivering in patients undergoing general anesthesia

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Background and Goal of Study: postoperative shivering is a common problem during anesthesia. The incidence of shivering is up to 40-60%, even in regional anesthesia. Shivering produces an important increment in the metabolic activity and an oxygen consumption up to 100%. Also, it has been related with a higher risk of myocardial ischemia, arterial hypoxia, increases in the intracranial and intraocular pressures; cardiac output, peripheral resistance, carbon dioxide production and lactic acidosis. Perioperative hypothermia and shivering are usually prevented using physical methods, like surface warming; and pharmacologically, with drugs like ketamine and magnesium sulphate obtaining good results.
Objective: To compare the efficacy of low doses of ketamine and magnesium sulphate as preventive agents of shivering in patients undergoing general anesthesia.
Materials and Methods: It was a prospective, double-blind and random study, including 90 patients ASA I-II undergoing general anesthesia; divided in three groups of 30 patients each one. Group K received ketamine 0,4 mg/kg; group M received magnesium sulphate 50 mg/kg and group C received 20 mL of physiological solution. Each solution was administered ten minutes before the end of surgery. Shivering was graded using grada scale described by Crossley y Mahajan at 10, 20 and 30 minutes after surgery.
Results and Discussion: There were significantly more patients who experienced less shivering, at different times of measure (10, 20 and 30 minutes), in the group K (76,6%; 76,6%; 63,3%) than the group M (43%; 53,3%; 76,6%) respectively. In base to these results, ketamine was more effective than magnesium sulphate during the first 20 minutes after surgery with few adverse events, meanwhile, the magnesium sulphate group presents a better effect preventing shivering only at 30 minutes after the drug was administered. However, the ideal drugs for prevention of shivering, are those having a longer lasting effect. This is the only study comparing these drugs for prevention of postoperative shivering.
Conclusion(s): Low doses of ketamine are more effective than magnesium sulphate for prevention of postoperative shivering.

1AP7-2

Oral midazolam or clonidine as premedication in paediatric adeno-tonsillectomy?

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Background and Goal of Study: Clonidine and Midazolam are both used as premedication for children undergoing adeno-tonsillectomy. Oral premedication with midazolam one hour before the surgical procedure helps to reduce anxiety, increases the cooperation of the young patients during the face mask induction and reduces the incidence of PONV. Clonidine, compared to midazolam, in addition to anxiolytic and sedative effect, has an analgesic effect. The aim of this study is to compare the clinical effects of oral premedication of both drugs at issue, and to show if the oral clonidine premedication is higher than oral midazolam.
Materials and Methods: From January 2011 to January 2012 we examined 48 pediatric patients aged between 4 and 8 years,ASA I-II, undergoing adeno-tonsillar surgery. They were divided into two study groups. Group C(24 pts): premedication with oral clonidine 3 mcg/kg 60-90 min before the surgery. Group M(24 pts): premedication with oral midazolam 0.5 mg/kg 60-90 min before the surgical procedure. Then we examined the time of onset and the level of sedation, the quality of separation from parents, acceptance and cooperation during induction of anesthesia via face mask, the possible postoperative shivering and vomiting and the satisfaction of the parents. Finally, we evaluated the postoperative agitation and pain using the Objective Pain Scale (OPS).
Results and Discussion: We used the U test of Mann-Whitney for the inferential analysis (p value 0,001). In comparison with Group M,Group C results were significantly better as far as the level of sedation, +the quality of separation from parents, acceptance of face mask, the rate of analgesia and PONV. We also observed that the children of Group M in the postoperative period were significantly more agitated; the postoperative shivering was observed

with the same frequency in both groups. Finally, we noted that the satisfaction of the parents was significantly higher in Group C.
Conclusion(s):In this study, premedication with oral clonidine of patients underwent to adeno-tonsillectomy appeared to be superior to oral midazolam. In particular, the oral clonidine provided better sedation, better acceptance of the face mask, no clinically relevant values of PONV, greater parent satisfaction, significantly reduced values of pain and postoperative agitation.
References:
Effects of premedication of midazolam or clonidine on perioperative anxiety and pain in children. Cao J, et al. Biosci Trends. 2009 Jun;3(3):115-8.

1AP7-3

The impact of preoperative oral rehydration on the magnitude of hypotension during general anaesthesia in low-risk patients: a comparison with previous data for preoperative intravenous hydration

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Background and Goal of Study: Overnight fasting before surgery is unpleasant for patients. According to preoperative fasting guidelines, a fasting routine up to 2 hours before anaesthesia is recommended. The aim of this study was to test the hypothesis that preoperative oral rehydration therapy causes different relative mean arterial blood pressure (MAP) and fluid redistribution during general anaesthesia compared to conventional overnight fasting and preoperative intravenous hydration.
Materials and Methods: This prospective observational study enrolled 60 ASA status I/II patients undergoing tympanoplasty. Patients drank 200-1000 ml of oral rehydration solution until 2-3 hour before anaesthesia induction. Anaesthesia was induced by fentanyl and propofol, and maintained with sevoflurane and remifentanil. Coinciding with anaesthesia induction, 15 ml/kg of acetated Ringer's solution was administered intravenously over 60 min followed by 1 ml/kg of acetated Ringer's solution over the next 30 min. A case-matching procedure was performed regarding preoperative fluid intake volume between the present study (oral group) and our previous study of 60 patients that underwent overnight fasting and intravenous hydration (intravenous group) [1]. MAP and whole-body bioelectrical resistance for extracellular fluid (R_e) during anaesthesia were compared between the two groups. Data are expressed as mean (SD) or median (interquartile range).
Results and Discussion: After a case-matching procedure, 17 pairs in the intravenous and oral groups were analysed. Time to induction (hours from 9:00 AM to the time anaesthesia induction was initiated) (4.8 (1.7) h vs. 4.6 (1.6) h, $P = 0.73$) and amount of preoperative fluid intake (7.1 (2.3) ml/kg vs. 7.5 (2.4) ml/kg, $P = 0.67$) were comparable for the intravenous and oral groups. There were no significant differences for mean MAP during the 30-90 min period relative to baseline (0.65 [0.61-0.69] vs. 0.63 [0.58-0.75], $P = 0.56$) and R_e value at 90 min relative to baseline (0.950 [0.923-0.967] vs. 0.942 [0.930-0.956], $P = 0.89$) between the intravenous and oral groups.
Conclusion(s): Preoperative rehydration route (intravenous or oral) does not affect the magnitude of hypotension in low-risk patients undergoing minor surgery when comparable amounts of fluid are preoperatively taken.
References:
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1AP7-4

Magnesium sulphate as an adjuvant to anaesthesia in patients with arterial hypertension

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Background and Goal of Study: According to contemporary guidelines for good clinical practice (GCP), the initial pharmacological treatment of arterial hypertension may include any of the five classes of leading antihypertensive drugs. Magnesium, acting as natural calcium-channel blocker, induces direct and indirect vasodilatation thus playing a role in treatment of arterial hypertension.
Materials and Methods: In this double blind, prospective, randomized and controlled clinical trial, we assessed the effects of magnesium sulphate on cardiovascular stability in patients undergoing diverse planned surgical procedures under general balanced anaesthesia, who are diagnosed with arterial hypertension Grade 1 and 2. The research encompassed 100 patients of both sexes, aged from 20 to 65. Immediately before induction of anaesthesia with propofol, the patients received 30 mg/kg bolus doses and magnesium sulphate infusion at 10 mg/kg/h (M group, n=50) or saline placebo (K group, n=50). Anaesthesia was achieved and maintained with sevoflurane, fentanyl and rokuronium. Throughout the procedure, the following parameters were monitored and recorded: hemodynamic parameters, incidence of postoperative shivering, nausea and vomiting, time to waking up from anaesthesia, and pain intensity after waking up from anaesthesia.
Results and Discussion: Statistical analysis of categorized values of median arterial blood pressure (MAP) and heart rate (HR) revealed statistically significant difference between the groups in 60th and 90th minute of anaesthesia. MAP values were within the range of hemodynamic stability (-20% to 20% decline from basal values) in 21 patients from group K (42%) and in 38 patients from group M (76%). HR values were within the interval from -30% to 30% decline from basal values in 26 patients from group K (52%) and in 37 patients from group M (74%). Furthermore, lower incidence of postoperative shivering, nausea and vomiting was noticed in patients from group M.
Conclusion(s): We can conclude that magnesium sulphate as an adjuvant to anaesthesia reduces hemodynamic changes during anaesthesia and lowers the incidence of postoperative shivering, nausea and vomiting, yet not affecting the wake-up time after anaesthesia or pain intensity during the immediate postoperative period.
References:
1. Houston M. The role of magnesium in hypertension and cardiovascular disease. J Clin Hypertens 2011;13(11):843-7.

1AP7-5

Sugammadex: a novel approach to controlling spiralling drug costs

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Background and Goal of Study: While the use of Sugammadex in Scotland is officially restricted to the immediate reversal of rocuronium-induced neuromuscular blockade following RSI, increasing clinical experience has demonstrated a place for reversal with Sugammadex in many other situations. This has lead to an increase in its use and a subsequent increase in the cost of the drug to health boards.
As a result of pressure from our health board to reduce these costs, we have audited the use of Sugammadex within our department for one year and have adapted our prescribing policy in order to minimize cost.
Materials and Methods: Our hospital has 9 in-patient, 2 day surgery, and 2 obstetric operating theatres. Sugammadex was initially freely available in 500mg/5ml vials in theatre until the 200mg vials in Nov 2011became available and were used for routine reversal. Each vial was treated like a controlled drug and had to be "signed out" by two members of staff (anaesthetist and nurse). No restrictions were placed on the indications for use other than an audit form had to be completed giving the reason for its use in each particular case. These forms were discussed three-monthly at our departmental audit meetings.
Information on drug expenditure was obtained from our hospital pharmacy.
Results and Discussion: Results are for the 18-month period between April 2011 and end of Sept 2012. The audit was commenced in Nov 2011. Cost data is split into 6-month periods for the two sizes of vial available, as shown in Table 1.

	April 2011 to September 2011	October 2011 to March 2012	April 2012 to September 2012
200mg/2ml vials	£0	£2,862	£2147
500mg/5ml vials	£8,674	£1,722	£1,722
Total	£8,674	£4,584	£3,869

[Table 1 - Departmental expenditure on Sugammadex]

Since the audit started, there has been a 55% reduction in the cost of sugammadex to our department. Across all sites in our health board, this would equate to a saving of nearly £22,000.
Conclusion(s): By making Sugammadex a controlled drug and auditing its use, we have halved our costs. Anaesthetists can still use the drug freely but the process of signing it out and justifying this decision ensures that the use of Sugammadex is restricted to those patients who would benefit most. This is a relatively simple way to control the costs of Sugammadex that could be applied to all anaesthetic departments.

1AP7-6

Sugammadex: a one-year prospective audit of its use

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Background and Goal of Study: Our hospital has a total of 13 in-patient theatres and we report on a one year audit of our department's experience of the use of Sugammadex for the reversal of neuromuscular blockade. We sought to gain an idea of common specific indications for its use, following pressure to justify the rising drug budget for this relatively new agent.
Anaesthetists were asked to fill in an audit form every time Sugammadex was used.
Materials and Methods: The reason for using the drug, which NDMR, time from last dose, TOF count, whether the patient was extubated, age, discharge destination, co-morbidities, operation, and other comments were all recorded. We also asked if Sugammadex was used to reverse blockade, did the drug prevent an ITU admission. The audit form was kept next to the Sugammadex in theatre recovery's drug cupboard.
Results and Discussion: 72 audit forms were completed (6 patients had no form or missing data) over a one year period. While many patients had multiple co-morbidities, obesity (30), IHD (27), Age>75 (20), Tachycardia (20) and COPD (19) were the most common. 47 patients were admitted to the ward, 21 to HDU, 2 to labour ward and interestingly, only 2 in a year were admitted to ITU. Added comments (though subjective) showed that at least 7 ITU admissions were prevented, and about the same number of HDU admissions. Only one patient received Sugammadex following an RSI, though he was extubated successfully 20 minutes later. All patients got rocuronium as the NDMR. No patients were given Sugammadex in a "Can't Intubate, Can't Ventilate" situation.
Conclusion(s): While Sugammadex has been available in Scotland for over 3 years, at present the SMC only recommends its use in the reversal of profound blockade following RSI using rocuronium[1]. The use to facilitate extubation in the context of serious co-morbidities has been studied and its ability to reverse profound blockade has also been shown[2,3]. We conclude that our use has been appropriate and has reduced costs by preventing ITU and HDU admissions.
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1AP7-7

Stopped short: sugammadex in undiagnosed *Myasthenia gravis*

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Background: Myasthenia Gravis (MG) is an autoimmune disease affecting 2 per 10,000(1). We present a case of undiagnosed MG which was unmasked following inadequate antagonism of neuromuscular blockade using sugammadex.
Case report: A 68-year old male presented with a 1 year history of intermittent dysphagia. Background history included atrial fibrillation. After investigation he was diagnosed with benign oesophageal stenosis and unsuccessfully treated with dilatation. MRI showed large anterior cervical osteophytes causing extrinsic pressure on the oesophagus. He was scheduled for an elective osteophytectomy.
A modified rapid sequence induction was performed with propofol 2mg/kg and rocuronium 1.2mg/kg. Anaesthesia was maintained with sevoflurane. The procedure was uneventful and neuromuscular blockade was reversed with sugammadex. In HDU, following apparent recovery, he complained of dysphagia and dysarthria with no immediate improvement.
Additional investigations were performed. CT and MRI brain were unremarkable. Barium swallow revealed features of bulbar palsy. Edrophonium testing was performed with positive results. There was complete recovery after a course of gammaglobulin and pyridostigmine. He was discharged on day 10 on pyridostigmine.
Discussion: Dysphagia is a common presentation of MG and initial misdiagnosis often occurs(2). Respiratory failure after general anaesthesia has been described in these cases, leading to the correct diagnosis. While sugammadex has been used in the perioperative management of MG, it is administered to patients taking concomitant cholinesterase inhibitors(3).
We propose that sugammadex resulted in incomplete return of neuromuscular function as it does not influence the concentration of acetylcholine at the motor end plate. An additional factor was use of steroids which can cause paradoxical weakness in 8-10%.
Learning Points: This case highlights the complexities of drug interaction at the neuromuscular junction and suggests that sugammadex alone may not be adequate for antagonism of neuromuscular blockade in patients not receiving cholinesterase inhibitors.
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1AP7-8

Effect of single-dose dexmedetomidine on coughing during emergence from sevoflurane-remifentanil anaesthesia after thyroidectomy

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Background and Goal of Study: Coughing during emergence from general anaesthesia may lead to dangerous effects including laryngospasm, detrimental haemodynamic changes. Post-thyroidectomy bleeding occurs in 1-4% of patients, and severe coughing may cause bleeding. Dexmedetomidine, a potent α adrenoreceptor agonist, is theoretically appropriate for reducing airway and haemodynamic reflexes during emergence from anaesthesia.
In this study, we invesgated wheather intravenous single-dose decmedetomidine at the end of surgery reduces coughing during extubation after thyroidectomy.
Materials and Methods: 89 ASA Ⅰ-Ⅱ patients, aged between 18 and 75 yr, having elective thyroidectomy were divided into 2 groups. 15 minutes before end of surgery, remifentanil was reduced to 1 ng ml^{-1} by target effect-site concentration, and maintained 5min after extubation. Patients randomly allocated to receive either dexmedetomidine 0.5 $\mu g\ kg^{-1}$ (Group D) (n = 47) or saline placebo (Group P) (n = 42) intravenously over 10 min in a double-blind design. After infusion of study drug, sevoflurane was reduced to 1% 5 min before end of surgery. The coughing grades (incidence and severity) before/during/after extubation were evaluated.
Results and Discussion:
Table 1. Patients' characteristics and operation details. Values are mean (SD) or number.

	Group P (n = 47)	Group D (n = 42)
Age; years	47 (13)	44 (10)
Gender; M / F	12 / 35	5 / 37
Weight; kg	62.4 (11.5)	60.7 (9.8)
Height; cm	163.3 (8.7)	160.5 (6.8)
Duration of surgery; min	92 (41)	98 (31)
Duration of anaesthesia; min	166 (40)	122 (31)

[Table 1.]

Table 2. Emergence profile. Values are mean (SD), or number (proportion)

	Group P (n = 47)	Group D (n =42)
Total number of patients with cough	41 (87%)	29 (69%)*
Incidence of coughing during extubation	1.2 (0.8)	0.9 (0.9)
Severity of coughing during extubation	1.3 (1.3)	0.7 (0.7)*
Response time of verbal order; sec	378 (159)	508 (173)*
Extubation time; sec	466 (168)	64 (192)*
Ramsay sedation scale 5 min after tracheal extubation	2.3 (0.5)	2.7 (0.7)*
Spontaneous respiratory rate 5min after tracheal extubation; min-1	12 (3)	12 (4)
Time in PACU; min	48 (18)	47 (16)

[Table 2]
* $p < 0.05$

Conclusion(s): Additional single-dose of dexmedetomidine 0.5 μg kg^{-1} during emergence from sevoflurane-remifentanil anaesthesia reduces the severity of coughing without serious adverse event. However, awakening may be delayed.

1AP7-9

Isoflurane and vecuronium requirement in diabetic patients with and without autonomic neuropathy undergoing elective surgery

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Background and Goal of Study: Recovery time after neuromuscular blockade is found to be prolonged in diabetic patients. Minimum effective dose of isoflurane is found to be reduced in diabetic rats. The requirement of isoflurane or vecuronium has not been studied in diabetic neuropathy patients previously and is speculated to be lesser in these patients. We studied the requirement of isoflurane and vecuronium in diabetic patients with and without autonomic neuropathy and non diabetic control patients.
Materials and Methods: A prospective double blind study was done in diabetic autonomic neuropathy patients (DAN group (n=12)) and diabetics without neuropathy (DM group (n=14)). Non diabetic patients served as the control (C) group (n=14). Entropy™ sensor (Datex-Ohmeda, Madison, WI) and kinemyograph neuromuscular monitor (NMT) was used to guide the administration of isoflurane and vecuronium respectively. Patients underwent elective surgery under general anaesthesia with fentanyl, propofol, vecuronium and isoflurane in a mixture of oxygen and air.
Results and Discussion: The demographic profile of the patients in the three groups was comparable. The isoflurane consumed in millilitres(mean ± SE) was 23.84 ± 2.32 in group DAN as compared to 17.31 ± 2.12 in group DM and 19.24 ± 2.14 in group C (p=0.124). The vecuronium consumed in milligrams(mean ± SE) was 7.82 ± 0.27 in group DAN as compared to 7.65 ± 0.25 in group DM and 7.71 ± 0.25 in group C (p=0.911). The onset of neuromuscular blockade was comparable in the three groups. The time to recovery count one (T1) and count three (T3) after vecuronium was prolonged in group DAN and group DM than in group C. (T1: 46.33 ± 4.12 Vs. 42.79 ± 7.02 Vs 40.36 ± 4.27 seconds, p=0.026), (T3: 54.53 ± 5.43 Vs 52.62 ± 8.84 Vs 47.89 ± 3.86 seconds, p=0.025).
Conclusions: Recovery from vecuronium neuromuscular blockade is delayed in controlled diabetic patients and is further prolonged in patients with autonomic neuropathy. There is no difference in the requirement of vecuronium and isoflurane in controlled diabetic patients with and without neuropathy. Further studies in diabetic patients with varying severity of autonomic dysfunction, extreme age groups and BMI is necessary to extend the results of this study to all diabetic patients.

1AP7-10

Effect of dexmedetomidine on the quality of surgical field and requirement of hypotensive agents during endoscopic sinus surgery under general anesthesia

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Background and Goal: During endoscopic sinus surgery (ESS), excessive bleeding makes surgery difficult due to poor visibility and increases the incidence of complications. Many drugs have been described to induce hypotension and to reduce bleeding in the surgical field [1]. No drug has so far been demonstrated to be ideal and there is a need for further research. Dexmedetomidine is a highly specific alpha 2 - agonist with analgesic and sedative properties [2]. The primary goal of this study was to assess effect of dexmedetomidine on Mean Arterial Pressure, the quality of surgical field and requirement of nitroglycerine or metoprolol for ESS during general anaesthesia.
Materials and Methods: This prospective, randomized, double blind study was conducted in 60 ASA III patients of either sex, of age 18-60 years, scheduled for elective ESS under General anaesthesia. Thirty patients in Group I (Dexmedetomidine Group) received dexmedetomidine 1 μg/kg bolus, 10 min before induction of anaesthesia and 0.5 μg /kg/h infusion during maintenance. Group II (Control Group) received Normal saline with same dosage schedule. Mean arterial pressure was recorded intraoperatively and bleeding during surgery was assessed by the surgeon using Fromme Scale [3].
Results and Discussion: Mean arterial pressures (mm Hg) at induction, post- induction and 20 min post -induction were 76.46±8, 82.53±11.12 and 69.16±5.71 in dexmedeomidine group as compared to 89.29 ± 14.2, 93.58 ± 21.02 and 74.65 ± 9.96 in Control Group (P< 0.05). Amount of nitroglycerin required was significantly higher in Control Group (P < 0.05) than Dexmedeomidine Group. Fromme Scale Score was significantly lower in Dexmedtomidine Group than Control Group (P 0.011). No patient required metoprolol in Dexmedotomidine group. This may be explained due to sympatholytic, vagomimetic, and vasoconstrictive properties of dexmedtomidine.
Conclusion: Dexmedetomdine maintains optimal hypotension, offers better surgical field by reducing bleeding and minimizing the use of nitroglycerine or metoprolol.
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1AP7-11

Benefits to use rocuronium in micro laryngeal surgery. A study of 30 patients

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Background and Goal of Study: Suxamethonium is a depolarizing neuromuscular blocker, this has a fast onset of action and a short action. Rocuronium is a nondepolarizing neuromuscular blocker with a short latency time, and rapid development of the blockade. Length of action is proportional for the administered dose, 0.3 mg/ kg achieve a maximum neuromuscular blockade after 3 to 4 min, with a duration around 22 min.
This study aims to evaluate the quality of relaxation both for intubation and for maintenance using suxamethonium or rocuronium in patients undergoing laryngeal microsurgery.
Materials and Methods: Study with 30 patients, ASA I-II,scheduled for laryngeal microsurgery at the University Hospital Miguel Servet in Zaragoza, which was administered during the induction suxamethonium (1mg / kg) or rocuronium (0.3 mg / kg).
After standard monitoring we used neuromuscular monitoring (TOF) and after the induction was used rocuronium (0.3mg/kg) or suxamethonium (1mg/kg), according to the group. Intubation was made after assessment of a TOF with 0 responses. Measurements were made at 30, 60, 90, 120, 150, 180, 210 and 240 seconds, after neuromuscular blocker administration.
After right intubation, time of surgery was recorded and before extubation were reassessed the TOF: a T4/T1 ratio> 0.8 was considered optimal for extubation.
The analysis was performed using the statistical program Epi Info 3.2.2, Windows Word and Microsoft Excel.
Results and Discussion: We evaluated 30 patients in two groups: A (suxamethonium) B (rocuronium), 15 patients in each group. The average age for group A was 59 years and for B 63 years. The optimal condition for faster intubation was obtained in a patient of group A (30seconds), while 60% of the members of group B was intubated without difficulty at 180seconds after of rocuronium.
Only in the group which received suxamethonium had fasciculations, showing them in 87% of cases (13 patients).
The procedure had a mean duration of 18 and 22 min (A/B) respectively. No case need additional dose of neuromuscular relaxants, and finished the surgery, all patients in both groups were extubated without incidences, presenting a TOF T4/T1> 0.8.
Conclusion(s): Dose of 0.3 mg / kg allows optimal intubation conditions at 180 seconds after its administration with a short duration, allowing its use in short duration surgery, avoiding the use of depolarizing muscle blockers and adverse effects they carry with them.

1AP8-1

Von-Hippel Lindau Syndrome (VHL) suspicion on pheochromocytoma surgery - anesthetic management

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Background: VHL is characterized by retinal or CNS hemangioblastomas, as well as renal and pancreatic cysts, erythrocytosis and pheochromocytoma[1]. We present a patient submitted to pheochromocytoma exeresis, with suspicion of VHL.
Case report: 68 year old female with adrenal incindentaloma, proposed to adrenalectomy. Co-morbidities were hypertension, DM2, dyslipidemia, CRF with chronic anemia. Skin hemangioma raised the VHL presumption. Neurological examination and MRI of the brain and eye were normal.
The preparation was conducted for 15 days with iv fluid therapy, phenoxybenzamine, nifedipine and propranolol. On the OR, BP was 160/90mmHg. Besides the classic non-invasive monitoring, invasive BP was monitored and lumbar epidural catheter was placed. Anesthesia was performed with fentanyl, propofol and rocuronium and maintained with desflurane. Prior to tumor removal, the patient reached MAP's of 70-90mmHg. After its extraction MAP reached 45 mmHg and a Noradrenaline infusion was started and maintained until the D2 PO. The patient was discharged after 5 days.
Discussion: When presented with pheochromocytoma and VHL presumption, one must screen other benign/malignant tumors, and the preparation with alpha-blockers and beta-blockers should be ensured as well as the screening of cardiomyopathy and CHF. It is recommended general anesthesia combined with epidural[2]. The fluid replacement is the first-line treatment for hypotension intraoperatively. If vasopressors are needed, is preferable to use noradrenalin[2].
As VHL can display different clinical presentations, which are mainly unspecific, it is of great importance that clinicians remain vigilant in order to identify cases early in its stages of development and arrange the proper management.
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Learning points: Highlighting the importance of the early presumptive diagnosis of VHL, based on signs, allowing the control of perioperative morbidity; Control/ treatment of disease manifestations without neglecting the necessary preoperative preparation.

1AP8-2

Influence of anesthetic technique on postoperative oral intake in gynecological surgery

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Background and Goal of Study: Since the introduction of the enhanced recovery after surgery (ERAS) protocol, many surgeons and anesthesiologists have shown an interest in postoperative early oral intake. Postoperative nausea, vomiting, and gastrointestinal hypomotility affect oral intake. Concurrently, these factors are also associated with anesthetic techniques. Therefore, we retrospectively investigated the influence of anesthetic technique on postoperative oral intake.
Materials and Methods: We enrolled consecutive patients who underwent gynecological surgery under general anesthesia with postoperative epidural anesthesia or intravenous patient controlled analgesia (IV-PCA) between January 2011 and December 2011. The patients received hospital meals after lunch on the first postoperative day (POD), in accordance with the postoperative management protocol employed in the gynecological department. Patients who underwent cesarean section and could not be adapted to the management protocol were excluded. In study A, we divided the patients into 2 groups: those receiving propofol (group T) and those receiving sevoflurane (group S). In study B, we divided the patients into 2 groups: those receiving postoperative epidural analgesia (group E) and those receiving IV-PCA (group P). Oral calorie intake and the incidences of nausea, vomiting, bowel sounds, and flatus were recorded on POD 0-3. P values less than 0.05 were considered significant.
Results and Discussion: We enrolled 189 patients. In study A, the incidences of nausea and vomiting on POD 0 in group T (N = 93) were significantly lower than those in group S (N = 96) (20% vs. 36%, P = 0.01; 5% vs. 20%, P = 0.003). Oral calorie intake on POD 2 in group T was significantly higher than that in group S (1006 ± 390 vs. 786 ± 399 kcal/day, P = 0.0002). In study B, the incidences of nausea and vomiting on POD 0 and 1 in group E (N = 112) were significantly lower than those in group P (N = 77). The incidences of bowel sounds and flatus on POD 0 in group E were significantly higher than those in group P (65% vs. 42%, P = 0.001; 9% vs. 1%, P = 0.03).
Conclusion: In comparison with sevoflurane, propofol significantly reduced nausea and vomiting on POD 0 in patients who had undergone gynecological surgery. Moreover, epidural analgesia significantly reduced nausea and vomiting on POD 0 and 1. Propofol and epidural anesthesia might contribute to early oral intake.

1AP8-3

New onset atrial fibrillation during goitre surgery

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Background and Goal of Study: Atrial fibrillation (AF) is common complication during cardio-thoracic surgery with the reported incidence of up to 31.9%. AF occurs relatively rarely in non-cardiothoracic surgery. However, there is little data on the incidence of AF in euthyroid patients undergoing thyroid surgery. Therefore, the aim of our study was to determine the prevalence and risk factors for new onset atrial fibrillation (NOAF) in these patients.
Materials and Methods: We did a prospective study and included 1080 euthyroid goitre patients who were in sinus rhythm before operation. Patients with persistent AF were excluded. All surgery was performed during general anaesthesia. Intraoperatively, we noted the occurrence of NOAF. Patients were divided into two groups, the group with and the group without NOAF. We investigated the influence of the following characteristics on the occurrence of NOAF: age, sex, body mass index, ASA score, comorbidity, difficult intubation of trachea, type and duration of surgery and anaesthesia. We used t-test to compare the average values of the parametric features, while Pearson's chi-square test and was used to compare the differences in frequency of categorical feature. P values < 0.05 were considered statistically significant.
Results and Discussion: Our patients had following admission diagnosis: nodular goitre 359 (33.24%); multinodular goitre 652 (60.37%); recidivant goitre 69 (6.39%). NOAF was present in 7 patients (0.65%). Significantly more patients from the NOAF group had preoperatively coronary artery disease (28.57% vs. 5.13%, p = 0.019) and some kind of heart rhythm disturbance in contrast to patients without registered NOAF (42.86% vs. 7.45%, p = 0.001). Two patients had earlier AF from the group of patients with NOAF and 34 from the group without NOAF (66.67% vs. 37.78%), while VES/SVES was present in one patient (33.3%) from the NOAF group and 21 patients (23.33%) from the group without NOAF. The reported incidence of AF during non-cardiothoracic surgery ranges from 0.37% to 20%, dependent of the type of surgery.Our result, 0.65% incidence of NOAF during thyroid surgery is similar to other type of intermediate-risk surgery.
Conclusion(s): We found correlation between earlier occurrence of AF and coronary artery disease with NOAF during thyroid surgery.

1AP8-4

Prophylactic effect of Thai herbal drug (Emblica officinalis) in reducing postoperative sore throat

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Background and Goal of Study: Sore throat and hoarseness are common postoperative complications in patients who undergo general tracheal anesthesia.
This study was performed to evaluate the effectiveness of prophylactic Thai herbal drug (Emblica officinalis) in reducing the postoperative sore throat (POST) and hoarseness.
Materials and Methods: This was a prospective, randomized, triple-blind controlled trial. The study population consisted of 300 patients between 15 and 75 years old who were classified as American Society of Anesthesiologists I-II and were scheduled for elective gynecological operation under general anesthesia with endotracheal tube. The patients were divided randomly into two groups by block of 4 randomization. Patients in the control and herbal groups received placebo and Thai herbal drug 3 tablets 30 min before tracheal intubation, respectively. Demographic data, vital sign, cuff pressure, airway pressure were monitored during anesthesia.The patients were interviewed immediate at recovery room, 2, 6, and 24 hour after the operation. The incidence of POST and hoarseness were recorded. Data were analysis with Chi-square test and Fisher's exact test.
Results and Discussion: The incidence of POST at immediate in recovery room, 2,6 and 24 hour after the operation were lower in herbal group than in

the control group with significantly(40.7, 33.4, 26, 19.3 and 63.3, 60, 40.6,40.7 respectively p< 0.001) . Also the incidence of hoarseness of herbal group were lower than controlled group at immediate in recovery room , 2, 6 and 24 hour after the operation (24.7, 17.3, 14.7, 8.6 and 54.7, 52.6, 46.6, 35.4 respectively p< 0.001).

Conclusion(s): Thai herbal drug was effective in reducing incidence of POST and hoarseness after tracheal intubation.

1AP8-5

Severe autonomic hiperreflexia in a patient with spinal cord injury during urologic procedure under sedation and analgesia. A case report treated successfully with intravenous lidocaine

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Background: Autonomic hyperreflexia (AHR) is a potentially life-threatening hypertensive condition that develops in patients with spinal cord injury (SCI) above T6 level as a result of exaggerated spinal sympathetic excitation. AHR is tipically precipitated by distension of the bladder or rectum.[1] There are reports that lidocaine (Ld) anal block significantly limits the AHR response in susceptible patients undergoing anorectal procedures[2] and cases of AHR treated successfully with epidural Ld.[1]

Case report: A 44yr-old male,with a SCI at T4,was scheduled for elective cystoscopy. The patient had no history of AHR in several years before this surgery.

In the operating room, patient was reluctant to have general anesthesia. Subarachnoid block was technically difficult in the previous surgery and he had thrombocytopenia (98.000). He underwent sedation and analgesia (S&A) with midazolam 2mg iv, fentanyl 0,1mg iv, acetaminophen 1g iv and ketorolac 30mg iv.

Prior to the introduction of the cystoscopy, blood pressure (BP) was 131/76mmHg and heart rate (HR) was 78bpm (normal sinus rhythm).

After distension of the bladder, BP increased to 194/125mmHg and severe bradycardia occurs (30bpm). Atropine 0.5+0.5mg iv was given. BP continues to rise to 200/126mmHg and tachycardia occurs (118bpm) with ventricular bigeminy. The patient complained of severe headache. Fentanyl 0,1mg + midazolam 2mg were administered. Therefore, 80mg of iv Ld was given.

About 3 min later, there was complete resolution of symptoms, with BP and HR return to baseline.The surgery lasted 25min and the patient went to the PACU hemodynamically stable. He was discharged home in first postoperative day, and no sequelae were noted.

Discussion: This case reports a serious condition in a SCI patient, demonstrating that these patients are likely to develop AHR during cystoscopy performed under S&A. To date, there is no consensus regarding anesthesia management of these patients.[3] Many anesthetic techniques have been proposed and used with varying success,but none of them is uniformly successful.[3] To our knowledge, this is the first case report of severe AHR treated successfully with iv Ld.

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Learning points: Health professionals should educate SCI patients regarding risks of AHR and possible life-threatening complications, if urologic procedures are carried out under S&A.

1AP8-6

Anesthesia in a case of hereditary angioedema (HAE)

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Background: Perioperative management of a patient with HAE type I.

Case report: 60years old female, 75 kg is admitted for total hip replacement. During the preoperative screening, HAE is mentioned with a first appearance at the age of 15 with a clinical presentation of bilateral lower limb oedema and abdominal pain. Since then, there have been no symptoms and no medication has been received.

Full laboratory analysis tests were ordered and low levels of C4 and C1-Inh were detected. The rest of the personal medical history was clear.

During the perioperative period, benzodiazepines, tranexamic acid and androgens were administered. **C1- Inh 500 IU was given** 2 hours pre-surgery. Patient in full monitoring. Spinal anaesthesia with 15 mg of bupibacaine and 27G needle was conducted. lidocaine cream was applied at the sites of cutaneous access.

The patient underwent the surgery with her consent. Surgical operation was 80 min. After surgery, the patient was observerd at the Post Operative Unit Care for 3 hours without complications. Tramadol iv was gived for post-operative analgesia.

Discussion: HAE is a rare disorder (1/50000-1/10000) of autosomal dominant inheritance. HAE patients have a defect in the gene that controls C1-inh. As a result either inadequate(type 1) or non- fuctionining C1-inh(type 2) are produced. Its role is to regulate activation of complement, fibrinolytic, coagulation and kinin systems and finally the release of bradykinine. It is characterized by swelling of limbs, face, airway and abdominal pains caused by trauma, cold and stress.The mortality rate is up to 35% due to laryngeal oedema therefore spinal anesthesia was preferred. Laboratory tests that set the diagnosis are **low levels of C1 Inh[1], C4 factor but C3 is normal**. Treatment includes androgens and antifibrinolytic agents. Adrenaline, corticosteroids and antihistamines are ineffective.

References:

Jerrold H. Levy, MD, FAHA, * Douglas J. Freiberger, MD,* J. Roback, MD, PhD†, HAE: Current and Emerging Treatment Options, Society of Cardiovascular Anesthesiologists, May 2010, Vol.110, Number 5, pg1271-1280

Learning points: Even though the world literature is poor and it suggests as few invasive manipulations as possible, there were no complications in our case. The proper perioperative preparation remains the cornerstone.

1AP8-7

Does quality of recovery improve by preoperative oral carbohydrate?

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Background and Goal of Study: Preoperative oral carbohydrate (CHO) has been shown to reduce postoperative discomfort and postoperative hospital stay. It is unknown whether preoperative CHO also improves postoperative quality of recovery (QoR) after anesthesia. To improve QoR is important in the light of improving patients' quality of life. In this study, we evaluated the effect of preoperative CHO on patients' recovery using the Quality of Recovery 40 (QoR-40) Japanese version questionnaire.

Materials and Methods: The study was prospective, randomized, controlled clinical trial. ASA physical status 1 and 2, 20 to 79 year-old patients undergoing the surgery of body surface were enrolled. Patients with impaired gastrointestinal motility, poor Japanese comprehension, or psychiatric disturbance were excluded. Subjects were randomized into one of three groups. Arginaid Water™ (AW) group received 250ml of AW at 6.00 hours on the morning of surgery. OS-1™ group received 1000ml of OS-1 from 20.00 hours on the night before surgery till 2 hours before anesthesia. Control group were fasted from midnight. The primary outcome was the QoR-40 at 24 hours after surgical procedure. Data was analyzed using Kruskal-Wallis Test.

Results and Discussion: 96 subjects were randomized, and 86 completed the study. Patients' baseline characteristics were not different among groups (Table 1).

	AW (n=29)	OS-1 (n=28)	Control (n=29)	p value
Age (yr)	69 (63-75)	65 (57.5-71.25)	70 (59-73)	*0.487*
Sex ratio (M:F)	22:7	23:5	21:8	*0.732*
Height (m)	1.62 (1.58-1.65)	1.66 (1.59-1.72)	1.64 (1.59-1.69)	*0.206*
Weight (kg)	62.1 ± 6.7	65.2 ± 8.1	63.1 ± 9.7	*0.340*
ASA physical status (1:2)	11:18	6:22	10:19	*0.399*
Duration of anesthesia (min)	136 (125-169.5)	135 (116.5-173.25)	137 (118-353)	*0.686*
Intravenous infusion (ml)	800 (600-1025)	750 (692.5-1000)	800 (600-1300)	*0.970*
preoperative QoR-40 score	196 (186-198)	196.5 (187-200)	195 (189-198.5)	*0.777*

[Table 1]

The median (interquartile range) for the QoR-40 score after the surgery was 188 (175-195), 189 (162.25-196), and 182 (165-193) for the AW group, OS-1 group, and control group, respectively ($p=0.5662$). A sample size of 188 subjects per group was estimated to achieve 80% power to detect a 7-point difference in the aggregated QoR-40 score for the 3 study groups to be compared

assuming an overall standard deviation of 21. The results showed no statistical difference, and to detect this difference, a huge number of subjects will be necessary.
Conclusion: A preoperative CHO has little improvement on quality of recovery in less-invasive surgery.

1AP8-8

Electroconvulsive therapy as a new indication for laryngeal mask ventilation

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Background and Goal of Study: Current standards in general anaesthesia (GA) for Electroconvulsive Therapy (ECT) include oropharyngeal airways and facial masks (FM) to open and maintain the patients airway.
The aim of this study was to verify the effectiveness of Laryngeal Mask (LM)[1] when compared with FM in GA for outpatient ECT.
Materials and Methods: Clinical controlled trial (prospective, randomized, double blind and matched pairs study). Local Ethics and Clinical Investigation Committee approval and informed consent in all cases.
14 ASA I-III patients, 75% of them women and schedulled for outpatient maintenance ECT were included in the study.
Both LM and FM groups (matched pairs) had identical anaesthetic and psychiatric management in every ECT procedure; they differed only in a 45% reduction in ECT energy dose applied to LM group and in the use of FM or LM when randomized for each patient.
Monitoring: Heart Rate (HR), Non Invasive Blood Pressure (NIBP), Pulse Oximetry (SpO_2), End Tidal CO_2 ($ETCO_2$), average expiratory Tidal Volume (TV), Central and Peripheral Convulsion (C&PC) times.
Servo 900C Ventilator (SIEMENS) for anaesthesia and Spectrum 5000Q (MECTA) for ECT in all cases.
Statistical analysis with SPSS 14.0 for Windows: Kolmogorov-Smirnov Normality Test, Levene Homogeneity Test, ANOVA, Student T Test for paired data and Pearson Correlation Test were used as needed. Choosed significance level was a=5%.
Results and Discussion: Higher energy doses in FM group failed to get longer C&PC, yet led to worse hemodynamic or ventilatory parameters.
Central and peripheral convulsions were longer in ECT procedures performed with LM, even though ECT energy dose had been reduced by 45% in those procedures ($p < 0.05$).
Bigger hemodynamic changes in HR and NIBP in FM group ($p < 0.05$).
Better ventilatory parameters in SpO_2, $ETCO_2$ and TV in LM group ($p < 0.05$)[2].
Conclusion(s): Both analyzed airway maintenance methods, LM or FM are suitable for GA in TEC.
However, LM has proved its superiority in this study and therefore we recommend it for GA in ECT.
Moreover, the difficulty in a daily clinical basis of reproducing study conditions with FM ventilation, reinforces our recommendation to use LM for GA in ECT.
Finally, LM ventilation may be the only option for outpatient ECT anaesthesia in those difficult psychiatric patients with no central convulsion even with maximum energy doses.
References:
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1AP8-9

Changes in intraocular pressure during steep trendelenburg position under propofol versus sevoflurane anesthesia

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Background and Goal of Study: Perioperative visual loss has reported in patients placed trendelenburg position and many previous reports has shown that the intraocular pressure (IOP) was increased in trendelenburg position. Thus, perioperative visual loss may be raised IOP decreasing ocular perfusion and causing an ischemic optic neuropathy. Awad H. et al. have reported that IOP increases significantly in patients undergoing robotic prostatectomy in the steep trendelenburg position.
But there are no reports to compare the IOP changes under propofol and sevoflurane anesthesia. Therefore, we conducted to compare IOP changes under propofol and sevoflurane anesthesia during robotic prostatectomy in the steep trendelenburg position.
Materials and Methods: In prospective randomized controlled study, 27 patients undergoing robotic prostatectomy were studied. Patients were randomly allocated to the propofol or sevoflurane group and the anesthetic agent was administered to maintain the bispectral index between 40 and 60. The IOP was measured using a Tonopen XL hand-held tonometer before anesthesia in supine position (T0), 10 min after intubation (T1), 10 min and 2 hours after steep trandelenburg position & pneumoperitoneum (T2,T3), 10 min after prostatectomy (T4), 10 min after returning to the supine position & deflation of abdominal gas (T5), and 30 min after admitted recovery room (T6).
Results and Discussion: There was a significant increase in IOP during robotic prostatectomy with steep trendelenburg position in both groups. The IOP tended to be higher in the propofol group than in the sevoflurane group, although the differences between the groups were not statistically significant. Patients with glaucoma were not included in our study, further studies would be required to prove the IOP changes in patients with preexisting eye disease.
Conclusion(s):
During robotic prostatectomy with steep trendelenburg position, IOP was significantly increased, but there were no differences between propofol and sevoflurane anesthesia
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1AP8-10

Hereditary hemorragic telangiectasia (HHT) or Osler-Weber-Rendu syndrome - a case report

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Background: HHT is a rare autosomal-dominantly inherited vascular dysplasia that occurs in approximately 1-2/100.000 people, characterized by 3 of the following criteria: family history, recurrent epistaxis, mucocutaneous telangiectases and arteriovenous malformations (AVMs) in gastrointestinal tract, liver, lungs and central nervous system[1]. We report a successful clinical case of a patient with HHT and gastric angiodysplasia, submitted to a Total Gastrectomy and Roux-en-Y Esophagojejunostomy.
Case report: 48-year-old female, ASA II, family history of HHT, recurrent epistaxis, oral telangiectases, cerebral abscess medically treated 11years before and several gastric hemorrhagic episodes due to angiodysplasia. Pulmonary and cerebral AVMs were excluded preoperatively. Hemoglobin10,1g/dL; Platelets147x10^9/L. Balanced general anesthesia, with rapid sequence induction and orotracheal intubation with a number7 tube was provided, with standard monitoring, laboratory evaluations, *BIS* and invasive arterial blood pressure. Filters applied in intravenous lines. Antibiotic prophylaxis administered. Volume controlled ventilation adapted for peak pressures around 15mmHg. The patient remained hemodynamically stable, with estimated blood losses of 500mL. 1U of RBC, 2U of FFP and platelets pool were administered. Analgesia and nausea and vomiting prophylaxis provided. Extubated after surgery and minimized aspiration. No postoperative complications were documented.
Discussion: Surgery is indicated in HHT with visceral AVMs. Airway protection, low pressure ventilation and early extubation in order to avoid exacerbation of intra-pulmonary shunt are some of the anesthetics specific considerations. No hemodynamic instability was observed, which may occur due to low systemic vascular resistance and unpredictable response to vasodilators/pressors. Blood losses were the expectable, with no evidence of AVMs rupture or coagulopathy. There were no postoperative complications or signs of thromboembolism or infection, that can be favored due to lack of capillary matrix.[1]
References:
1. Peiffer KMZ,et al.AANA Journal 2009;77(2),115-118
Learning points: Being aware of the challenges presented in HHT patients is the first step to provide a safe and effective anesthesic technique. This involves specific interventions with regard to control of bleeding, maintaining adequate oxygenation and balancing hemodynamic values to optimize perfusion without compromising anesthesic death.

1AP8-11

Vascular erosion secondary to central venous catheterization - a case report

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Background: Central venous catheterization is frequent during the intra-operative period. Despite the physician's experience, technique-associated complications may occur, such as pneumothorax, arterial puncture, hydrothorax and gaseous embolism. Late complications may also occur, such as sepsis, cardiac tamponade and vascular erosion.
Vascular erosion may occur, generally 48h after the central catheter placement, but there are also reports of complications up to 2 months later.
Case report: 78 year-old female, ASA III, diagnosed with gastric neoplasia, presented for subtotal gastrectomy. In the intra-operative period, catheterization of the right internal jugular vein was attempted, but the internal carotid artery was punctured with formation of a hematoma. The left internal jugular vein was then catheterized. The technique was uneventful. The chest x-ray showed a well-positioned catheter.
On the 3rd day post-operative, patient developed respiratory failure. Pulmonary embolism was suspected and the patient was admitted to an ICU, where mechanical ventilation was initiated. Breath sounds were absent on the right thorax and the chest x-ray showed pleural effusion. Chest drain was placed and 500ml of glycosylated fluid were drained. The central venous catheter was then removed and the patient's clinical status improved dramatically. She was extubated shortly after. 24 hours later the patient was transferred to the surgical ward, from where she was discharged.
Discussion: Superior vena cava erosion secondary to central venous catheter placement is a rare but potentially lethal complication, with a mortality rate of up to 74%. As it is a late complication, with an unspecific presentation, diagnosis is often very difficult.
Left internal jugular approach has as increased risk of this complication - the increased distance to the right atrium increases the risk of positioning the catheter tip against the superior vena cava wall.
References:
1. POLDERMAN, KH et al. *Central venous catheter use - Part 1: Mechanical complications*. Intensive Care Medicine 2002;28:1-17
Learning points: Central venous catheterization presents early and late complications, even on experienced hands. Confirmation of the correct placement of the catheter is mandatory.
Although rare, vascular erosion may occur after well-succeeded catheterization, so an elevated suspicion is needed to avoid worse complications.

Ambulatory Anaesthesia

2AP1-1

Comparison of the anti-emetic effect of ramosetron and ondansetron after strabismus surgery: a prospective, randomized, double blinded study

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is one of the most common complications after strabismus surgery under general anesthesia. Although mechanisms of PONV after strabismus surgery are not still clearly understood, traction on extraocular muscles (EOM) as well as drugs used for general anesthesia is the known triggering factor of PONV. This prospective, randomized, double blinded study was designed to compare the prophylactic effect of ondansetron and ramosetron on PONV after strabismus surgery under general anesthesia. The secondary purpose was to investigate if the number of involved EOM in the strabismus surgery was related to PONV.
Materials and Methods: In total, 105 patients (aged 16-60) undergoing strabismus surgery were enrolled and randomly allocated to one of the three groups, placebo, ondansetron, or ramosetron group. Each of the three groups was subdivided into two groups regarding the number of extraocular muscle involved in the surgery: group S, single-muscle correction; group M, multiple muscle correction.
General anesthesia was induced with 2 mg/kg propofol and 0.6 mg/kg rocuronium. After tracheal intubation, anesthesia was maintained with 1.5-2 vol% sevoflurane, medical air in oxygen (fraction of inspired O_2 [FiO_2] = 0.5), and continuously infused IV remifentanil 2-3 ng/ml. Patients received placebo 2ml, ondansetron 4mg, or ramosetron 0.3mg at the end of surgery. The incidence of nausea or vomiting, and patients' satisfaction were recorded at 2 h, 24 h, and 48 h after surgery.
Results and Discussion: The incidence of nausea was significantly lower in ramosetron group at 2 h (9.4%) and 24 h (3.1%) after surgery than was in placebo and ondasetron group ($p = 0.033$ and 0.029, respectively).
Patients in ramosetron group were more satisfied with the antiemetic therapy at 2 h (7.88 ± 0.98) and 24 h (8.50 ± 0.67) after the surgery than those in placebo (6.84 ± 1.34, 7.45 ± 1.29, respectively at 2 h and 24 h) and ondansetron group (6.85 ± 1.83, 7.27 ± 1.59, respectively at 2 h and 24 h) ($p < 0.05$). When comparing S and M group in each group, there were no significant intra-group differences in incidence of nausea and use of rescue antiemetics, and satisfaction of patients.
Conclusion(s): Ramosetron has superior anti-emetic effect to ondansetron after strabismus surgery in adults. The number of EOM involved in strabismus surgery was not in association with the incidence of PONV.

2AP1-2

Addition of low-dose ketamine to midazolam-propofol-fentanyl based sedoanalgesia for outpatient colonoscopy: a randomized, double-blind, controlled trial

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Background and Goal of Study: Adequate patient sedation for ambulatory colonoscopies should include amnesia, sedation, analgesia with haemodynamic stability and minimal adverse effects. We examined the potential beneficial effect of low dose ketamine on Midazolam-Fentanil-Propofol based sedoanalgesia for outpatient colonoscopy.
Materials and Methods: One hundred patients undergoing colonoscopy with sedoanalgesia were randomly assigned to two groups of 50 patients each in a double-blinded fashion. Patients received midazolam (0.02 mg/kg), fentanyl (1 μg/kg), ketamine (0.3 mg/kg) and midazolam (0.02 mg/kg), fentanyl (1 μg/kg), placebo (%0.9 NaCl) in Group C+K and Group C respectively. In both groups incremental doses of propofol used in order to have a Ramsay sedation score of 3-4. Values of heart rate, blood pressures, oxygen saturation, respiratory rate and Ramsay sedation scores were recorded every 2 min for the first 10 min and every 5 min thereafter, until the completion of the procedure. Procedure times, recovery times, drug doses used, complications associated with the sedation, physician and patient satisfaction during and after colonoscopy were also recorded. Student T test and χ^2 test were used for data analysis with SPSS.
Results and Discussion: A total of 97 patients were included in this study. Mean systolic blood pressures at 4, 6, 8, 10 min ($p < 0.01$) and diastolic blood pressures at 4, 6, 8 min ($p < 0.01$), mean respiratory rates at 4, 6, 8, 10, 15, 20, 25 min ($p < 0.01$), and mean SpO_2 at 6, 8, 10, 15 and 20 min ($p < 0.05$) were lower in Group C compared with Group C+K. Induction time ($p < 0.0001$), the amount of propofol used ($p < 0.0001$), the use of mask ventilation ($p < 0.05$), the incidence of disruptive movements ($p < 0.005$) were significantly lower and physician satisfaction at the begining of the procedure ($p < 0.05$) was superior in Group C+K. Recovery times and patient satisfaction were similar. No unpleasent dream or hallucinations were reported.
Conclusion(s): Low dose ketamine is a useful adjunct to conscious sedation in patients undergoing colonoscopy. It's addition, results in better quality and depth of sedation, more stable haemodynamics, less propofol consumption and less adverse effects with similar recovery times in patients sedated using Midazolam-Fentanil-Propofol based sedation.

2AP1-3

Influence of pain on patient's preference to discharge after day case shoulder surgery

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Background and Goal of Study: All patients who wish to go home and fulfill day case criterion are discharged after shoulder surgery in our institution. We designed this project to find out if pain during recovery at home would alter their choice to overnight hospital stay if they have to have the same operation again.
Materials and Methods: 60 consecutive, ASA 1-3, patients who underwent elective shoulder surgery at a day case hospital were recruited. All patients received GA and interscalene block with 0.25% bupivacaine and were provided with paracetamol, NSAIDS and dihydrocodeine / tramadol as appropriate to take home for analgesia. information regarding demographic data, surgical data, pain scores (1-mild, 2-moderate, 3-severe) and reflection on their choice to go home after their overnight experience was collected.
Results and Discussion: All patients were comfortable and pain free at the time of discharge. 49 patients could be contacted in accordance with the protocol. Pain scores were 1, 2 and 3 for 8, 25 and 16 patients respectively after the recession of the block.
40 patients stood firm on their preoperative choice of going home. 9 patients said that had they known the severity of the pain after the recession of block, they would have preferred to stay in the hospital overnight. Table 1 shows the details of these patients.

ASA Grade	Sex	Age (yrs)	Operation	Time of block	Time block receded	Block Duration	Pain score after block receded	Pain score after analgesia
1	F	51	SAD (Sub Acromial Decompression)	13:40:00	06:00:00	16:20:00	3	2
1	F	44	Open RC (Rotator Cuff repair)	14:45:00	01:00:00	10:15:00	3	3
2	M	46	RC	09:10:00	23:30:00	14:20:00	3	3
1	M	49	RC	12:30:00	04:00:00	15:30:00	3	2
2	F	51	RC	10:15:00	01:00:00	14:45:00	3	3
1	M	48	RC	11:45:00	21:00:00	9:15:00	3	1
3	M	64	SAD	09:00:00	04:00:00	19:00:00	3	2
1	M	58	RC	14:40:00	01:30:00	10:50:00	3	3
1	F	57	RC	12:50:00	06:00:00	17:10:00	3	3

[Table 1: Patients who preferred Hospital Stay]

Compared to Wilson et al[1] who reported that 20% patients suffer excruciating pain after shoulder surgery, 33% patients in our study reported severe pain and more than half of them said that they would prefer to be in hospital next time for a similar operation.
Conclusion(s): Our study suggests that patients with mild to moderate shoulder surgery may be discharged home on the day of surgery but patients undergoing major surgery such as rotator cuff repair should either be considered for overnight hospital stay or community nerve block.
References:
1. Wilson AT, Nicholson E, Burton L, et al, Br J Anaesth. 2004 Mar; 92(3): 414-5

2AP1-5

Nasal remifentanil combined with low-dose IV midazolam for 3rd molar extraction

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Background and Goal of Study: Procedures in stomatology are accompanied by discomfort and fear of patients. For this reason, various drugs are used to relieve anxiety and potentiate analgesia. Remifentanil is used intravenously; there is only 1 study when remifentanil was used by nasal administration [1]. We expected that nasal administration of remifentanil would induce analgesia and would potentiate anxiolytic and amnesic effects of intravenous midazolam without significant adverse effects.
Materials and Methods: After ethic committee approval and patients consent, remifentanil 5 μ/kg was administered intranasal using atomization device MAD 300 before extraction of (semi)retained wisdom tooth (VIII.). Midazolam 2 mg was administered i.v. at 5th min and additional doses 1 mg each were added in minimal 3 minutes interval to get/maintain Verril's sign. Onset of Verril's sign and midazolam dose, blood pressure, pulse and SpO_2 were measured. Recovery was tested by modified Romberg's test. Amnesia was measured 10 minutes after surgery by recall of 3 words told 3 min. after midazolam administration. ANOVA test was used for analysis of cardiorespiratory parameters, P value < 0.05 was considered significant.
Results and Discussion: 15 healthy patients aged 22 - 56 years of both sex and BMI 23.5 $\pm$0.5 kg/m^2 were included. Duration of procedure was 36.8 $\pm$11.7 min. First sign of remifentanil effect according to patients' report started in 2.8 $\pm$ 0.8 min, Verril's sign started 3.1 $\pm$ 0.6 min. after first midazolam dose in all patients, total midazolam consumption was 0.081$\pm$0.027 mg/kg.
All patients remained cooperative and calm, tolerability of administration of local anaesthesia and surgical procedure was excellent according to a dentist assessment in all cases. Changes of cardiorespiratory parameters compared to pre-administration ones were non-significant.
Patients recalled 0 (4 pts.) or 1 (11 pts.) word. Patients were discharged accompanied 1 hour after extraction.
Conclusion(s): This is the first study combining nasal remifentanil with low-dose intravenous midazolam for analgesic sedation in adults. Nasal remifentanil 5 mcg/kg with low-dose midazolam produces anxiolysis, analgesia and amnesia in patients with (semi)retained VIII. Onset is rapid and there are no significant changes of cardiorespiratory parameters.
References:
1. Verghese ST et al.,Anesth Analg 2008;107:1176-81
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2AP1-6

Antiemetic prescribing for day-case patients: can we change practice?

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Background and Goal of Study: Best practice in preventing Post Operative Nausea and Vomiting (PONV) requires recognition of high risk patients and the selection of appropriate anaesthetic and pharmacological methods[1]. In 2006, the British Association of Day Surgery (BADS) published a 'Guide to PONV'[2], based on the 1999 Apfel criteria[3]. We aimed to assess compliance with these guidelines, in order to reduce the incidence of PONV and preventable admission after day-case surgery. This was audited in 2011, discussed at the department governance meeting, and re-auditted a year later to determine if there was a change in practice.
Materials and Methods: Retrospective audit of consecutive day-case patients who underwent a general anaesthetic. Theatre and anaesthetic records were used to collect data regarding patient, anaesthetic and surgical characteristics as well as information about the postoperative period.
Results and Discussion: 153 and 139 cases were analysed in the 2011 and 2012 respectively; the overall incidences of PONV were 12% and 14%. Compliance with the prophylaxis guideline increased from 23% to 32%. In the initial audit there was wide variation in number and class of antiemetics prescribed. However, in the re-audit, 97% of patients received at least one of the reccomended antiemetics (5HT3 antagonist, dexamethasone). Of the 'non-compliant' cases, 76% of cases were given 'too many' antiemetics for their risk group, which increased to 97% in the re-audit. For treatment of established PONV, 69% and 72% of patients had the recommended anti-emetics prescribed. The number patients needing overnight admission due to PONV was similar (2%, 4%).
Conclusions: The results show a modest change in practice: there was a small improvement in overall guideline compliance, with increased use of the recommended antiemetics. Most patients received 'too many' antiemetics, especially in the low risk groups, which has associated costs and side effects. However, this has contributed to a lower incidence of PONV than widely quoted figures. Local guidelines are required to rationalise anti-emetic use, increase patient satisfaction, and decrease unnecessary admissions after day-case surgery.
References:
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2. BADS Guide to PONV. Journal of One Day Surgery 2006b;16:2-45.
3. Apfel, et al. Anesthesiology 1999; 91: 693-700

2AP1-7

Measurement of cognitive function recovery after general anaesthesia in patients scheduled for ambulatory surgery - a prospective comparison of 3 psychological tests

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Background and Goal of Study: The recovery of patients after general anaesthesia is usually measured using clinical signs and scores (1,2). There is a lack of objective measurement methods, which can be used in clinical routine. The aim of this study was to evaluate the existing psychological methods for measurement of cognitive recovery in patients after general anaesthesia in ambulatory setting.
Materials and Methods: Each of 113 patients scheduled for ambulatory gynaecological surgery underwent 3 standard psychological tests before (T1), 15 minutes after the surgery (T2) and on discharge from the recovery room (T3). Wechsler memory scale (test 1, attention and short-term memory), d2 - test (test 2, concentration) and computer-based 4-choice-reaction time (4CRT, test 3, psychomotor function) as well as Postanesthesia Discharge Scoring System (PADSS) were used.
The same test battery was used in 51 healthy female volunteers. The results of 3 tests were compared at T1, T2 and T3 using Bonferroni-adjusted Student's *t*-test for paired data.
Results and Discussion: In patients, the short-term memory and concentration (tests 1 und 2) decreased, the 4CRT (test 3) increased at T2 vs. T1 and T2 vs. T3 ($p < 0.01$). At T3 the parameters of test 1 and test 3 reached the preoperative level T1, in test 2 the concentration increased at T3 as compared to T1 ($p < 0.001$) due to learning effect. PADSS increased from 8 (T2) to 10 (T3) (median, $p < 0.001$). Healthy volunteers demonstrated the clear learning effect in all 3 tests through the course of the study ($p < 0.01$).
Conclusion(s): All 3 tested methods, being more sensitive than PADSS, can measure the recovery of cognitive function in patients after general anaesthesia, although the computer-based 4CRT seems to be the most convenient in clinical routine.
References:
1. Aldrete & Kroulik. Anesth Analg 1970;49:924-34.
2. Chung. Can J Anaest 1995;42:1056-8.

2AP1-8

Comparative study: propofol vs midazolam and fentanyl in sedation during colonoscopy

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Background and goal of study: Our study stems from the need to optimize the sedative treatment for endoscopic practices executed in day hospital such as colonoscopy, comparing the efficacy and the safety of the administration of propofol to the association of Midazolam and Fentanyl.
Material and methods: 88 patients between 18-75 years of age who were undergoing endoscopic procedures were recruited for our study. Patients were divided into two groups: P Group (propofol) and M+F group (midazolam plus fentanyl). The division was randomized with a 1:1 ratio for the two groups.
A Propofol dosage of 1-2 mg/kg was administered to the patients of P group as induction dose with possible maintenance dose of 1 mg/kg.
A dose of Midazolam of 0.05-0.1 mg/kg and Fentanyl, 1-2 microg/kg, was administered to the patients of M+F group.
Were considered as complications: decrease in SpO2 < 90%, an alteration of the heart rate below 50 bpm or above 150 bpm, SBP less than 90 mmHg.
Were subjected to patients and endoscopists post-procedure questionnaires. Patients were asked for an assessment of pain, discomfort and satisfaction about the procedure on a visual analogue scale from 0 to 10. Was asked to endoscopists to assess the satisfaction about the sedation, the quality of endoscopy and the level of sedation perceived.
To evaluate the difference between the mean values was used a T-student test, rejecting the null hypothesis with $P < 0.05$.
Results and Discussion: None of patients undergoing sedation with midazolam and fentanyl had complications. In the P group, 3 patients had mild hypotension (systolic pressure < 95 mmHg) returned promptly with a proper administration of fluids.
Assessments of patient satisfaction didn't show significant differences between the two groups from analysis of questionnaires submitted.
Conversely, the χ^2 test and the results of the analysis of the evaluations of questionnaires submitted to endoscopists, showed a statistically significant difference in favor of P group. Also the level of sedation detected by endoscopists is proved significantly more appropriate in the P Group than in M+F Group, showing a better control of the patient during the procedure in the propofol group.
Conclusion: According to the results of our study, propofol is a better choice for sedation in colonoscopy considering the better quality of the images obtained from endoscopist and the greater simplicity of execution of the procedures in the P Group.

2AP1-9

A comparative study using sevoflurane and desflurane to evaluate quality of awakening and complications during inhalation anaesthesia for uterine curettage: preliminary report

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Background and Goal of Study: Uterine curettage (UC) is routinely performed in our Institution under inhalation anaesthesia (IA). Sevoflurane is commonly employed as anaesthetic agent. Recently Desflurane, characterized by a lower solubility, has been introduced in practice. We aim to evaluate quality of awakening and incidence of complications related to both drugs.
Materials and Methods: After informed consent, patients submitted to UC were allocated to receive IS using Sevoflurane (group S) and Desflurane (group D) as agents for the maintenance of the anaesthesia. Lost of consciousness was obtained using propofol (2 mg/kg) and fentanyl (2 mcg/kg). Anaesthesia was maintained using an adequate MAC (calculated according to age) to maintain a BIS value between 50 and 60. All patients were mechanically ventilated using a LMA device. Once surgery concluded, anaesthetic gas flow was interrupted and fresh gas (0,5 FiO2) at 12 litres per minutes was given until awakening. LMA was removed and grade of recuperation of the patients was evaluated using the Aldrete Scale. Time from discontinuation of anaesthetic agent to LMA removal was recorded and defined as time of emersion. Incidence of complications was also recorded.
Results and Discussion: During the considered period 50 patients underwent UC: 25 patients then composed each study group. Demographic data were not dissimilar between groups. Main duration of surgery was 19±7,8 minutes. Main time of emersion was 7,4±3,7 minutes, without significant differences between groups. 47,9% of the patients received an Aldrete score of 10, 47,9% of 9, 2,1% of 8. There was no difference between groups in terms of recuperation. 34% of the patients were translated to the post-anaesthetic recuperation room. Intraoperative complications were represented by hemodynamic alterations (hypo or hypertension, brady or tachycardia), patient's movement, and laryngospasm. One patient in group S and eight patients in group D presented hemodynamic complications ($p = 0,0065$). Patient's movement and airway reaction were noted only in-group D.
Conclusion(s): The property of Desflurane to reduce time of emersion from IA was not demonstrated in the present study. Moreover, Desflurane was related to a high incidence of hemodynamic complications. Further enrolments are needed to confirm these preliminary data.
References:
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2. Bolliger D et al. *Br J Anaesth*.; 2010 May;104(5):547-54.

2AP1-10

The use of sevoflurane and laryngeal mask airway (LMA) in mentally retarded children in the dental practice

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Background and Goal of Study: Providing dental care in mentally retarded children is a difficult task for both the stomatologist and the anesthesiologist. As a result of lack of contact with these types of children, problems may encounter for venous access and the use of intravenous anesthetics [1]. Such modern technology as induction of anesthesia using sevoflurane and LMA can solve this problem. The aim of the study was evaluating the effectiveness of spontaneous breathing during inhalational anesthesia with sevoflurane in mentally retarded children with different body weights
Materials and Methods: We conducted a prospective, descriptive, comparative studies of the mentally retarded ASA 1-2 children undergoing dental practice. Patients were divided into two groups. The first group included 26 children with normal body weight. The second group included 25 children with obesity. All patients received a rapid induction of sevoflurane. For maintenance of anesthesia used sevoflurane and a mixture of oxygen and nitrous

oxide 1:1. The average duration of anesthesia was 90±15 minutes. The effectiveness of spontaneous breathing and hemodynamic parameters were studied in groups. Evaluated: respiratory rate, tidal volume, SpO2, pCO2, blood pressure and heart rate. Statistical comparisons were based on the t test.
Results and Discussion: All children received rapid anesthesia which made the easy access for the introduction of LMA. The anesthetic technique maintained hemodynamic stability in both groups. In average, after 40 minutes, 6 patients of the first group and 21 patients of the second group recorded hypoventilation. These patients had an increased expiratory pCO_2 > 47-48 mm.of Hg . All of them were transferred to the mechanical ventilation with CMV mode.
Conclusion(s): The inhalational anesthesia with sevoflurane and using LMA is effective and safe anesthetic technique in mentally retarded children in dental practice. However, 84% obese children registered inadequate spontaneous breathing.Timely mechanical ventilation (CMV) through LMA does not create a problem but eliminates hypoventilation.
References:
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2AP1-11

Intravenous sedation for digestive endoscopy: patient satisfaction and safety

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Background and Goal of Study: Endoscopic procedures are invasive explorations that often cause significant discomfort for patients. It is known that sedation improves tolerance and satisfaction during those procedures (1,2,3). The aim of this study is to evaluate the satisfaction of patients sedated by anesthesiologists during ambulatory endoscopic digestive procedures (colonoscopies) and to assess the safety of this intravenous sedation regimen.
Materials and Methods: This is a prospective observational study. 35 patients scheduled for ambulatory colonoscopies were included. Sedation based on the combination of midazolam (1-2 mg), fentanyl (0,075 mg) and propofol (initial dose 30 mg and 20 mg of additional bolus if necessary) was administered. The incidence of apnea (manual ventilation needed), nausea and vomiting, haemodynamic changes and abdominal pain were measured. The dose of propofol required, main procedure duration and recovery time was collected. 24 h after the procedure a telephone survey was conducted to assess patient satisfaction and evaluate the incidence of late complications.
Results and Discussion: We included 35 colonoscopies. Mean age was 55,23 years (SD 15,22). Most of them were ASA I-II. Apnea was observed in six patients (17,1%) but oxygen desaturation (< 90%) only in three patiens (8,6%). All patients recovered spontaneous breathing and was not required manual ventilation. At discharge, most frequent complication was abdominal pain in four patients (11,4%). There was no nausea or vomiting. One patient presented bradycardia.
Other results are shown in Table1.

	mean	SD
BMI	26,42	3,25
Duration procedure (min)	15,09	7,4
Dicharge time (min)	24,2	9,38
Dose propofol (mg)	104	38,74

[Table1]

At 24h, no complications were registered. In terms of patient satisfaction, all patients had high levels of satisfaction: 29 patients defined the experience as very good and 6 patients as well.
Conclusion: Intravenous sedation for colonoscopies increases patient satisfaction, maintaining adequate safety profile.
References:
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2AP2-1

Comparison of hyperbaric mepivacaine 40mg/ml and hyperbaric prilocaine 20mg/ml for low dose spinal anaesthesia in patients undergoing perianal outpatient surgery

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Background and Goal of Study: The aim of this randomised, clinical trial was to compare the two hyperbaric local anaesthetics mepivacaine 40mg/ml and prilocaine 20mg/ml at a dosage of 0.5ml each for perianal outpatient surgery.
Materials and Methods: After obtaining ethics approval of our local Ethics commission, 160 patients aged 18-80 years were enrolled in this study. The patients were equally randomised to receive a spinal anaesthesia (SPA) with 0.5ml of mepivacaine or prilocaine. We measured the expansion of the block, evaluated postoperative recovery times and determined the incidence of transient neurologic symptoms (TNS) one week after surgery.
Results and Discussion: 160 patients (93 male / 67 female) were available for analysis. The median expansion of the sensory block was higher in the mepivacaine group (prilocaine: S2 (S5-L4) vs. mepivacaine: S1 (S4-L4), p=0.0038) whereas there was no difference concerning the motor block. Prilocaine led to shorter times from SPA to micturition (prilocaine: 178 (110-254) min vs. mepivacanie: 195 (130-305) min, p=0.0008) and discharge (prilocaine: 192 (126-267) min vs. mepivacaine: 220 (140-320) min, p< 0.0001). 152 / 160 patients were available for the telephone call follow-up. Six patients (8.6%) receiving mepivacaine compared to zero patients of the prilocaine group announced typical symptoms of TNS (p=0.0284).
Conclusion(s): Both, mepivacanie and prilocaine are suitable hyperbaric local anaesthetics at a dosage of 0.5ml each for SPA in perianal outpatient surgery. Due to the faster recovery profile and a lower incidence of TNS, we recommend the use of 10mg hyperbaric prilocaine 20mg/ml for this indication.

2AP2-2

Can single-port-access cholecystectomy (SPA) be gold standard in multimodal approach in ambulatory surgery?

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Background and Goals of Study: Ambulatory cholecystectomy is a challenge to the anaesthesiologist team. Several series describing inpatient admission rates of up to 20%, mainly for nausea, vomiting or uncontrolled pain. SPA uses a single small incision using a multichannel port with reduction of scarring and operative trauma to a minimum.
Main Aim: To study if SPA improves the outcome in day-case cholecystectomy.
Our Hypothesis is that ambulatory laparoscopic cholecystectomy is feasible and safe, and that pain, nausea, vomiting, low levels patient satisfaction and time to return to normal activity are diminished with SPA surgery.
Material and methods: Prospective Randomized Trial to compare SPA and traditional laparoscopic cholecystectomy (LC). Institutional Ethic Committee approved the study.
Inclusion Criteria: 18-80 years old, ASA I - II and no previous anaesthetic complications.
Exclusion Criteria : IMC > 35, previous abdominal surgery and NSAID allergy.
The surgical and anaesthetic procedure was performed for the same team with the same anaesthetic-analgesic protocol. All patients started oral feeding at 2 hours post surgery and remained in the hospital 8 h post surgery.
The following criteria were measured :
- Length of intervention.
- Postoperative pain (VAS) at 2 hour intervals up to 8 hours.
- First and second day evaluation.
- Nausea / vomiting.
- Postoperative complications.
- Time to return to normal activity
- Patient satisfaction after one month.

Statistical analysis with U Mann-Whitney Test was performed.
Results and Discussion: 66 patients were operated on: 32 (LC) and 34 (SPA). No statistical differences in sex, age, IMC, ASA,complications and VAS were found.39,1% said they would feel safer to remain one night in the hospital although 84,8% would repeat the experience.
The time of return to normal activity was 1.9 in SPA group and 2.5 days in LC group (p=0,014).
One month later patients were asked about their general satisfaction (0-10).The average was 8,0 in the LC group and 9,8 in the SPA group (p< 0.0005). All

patients in both groups recommended the technique.
Conclusions: The SPA group had similar results to the LC in pain and post-operative complication terms. The time to return to normal activity and patient satisfaction was considered to be better in SPA. Both techniques were safe and feasible in the ambulatory programmes.
Further study is necessary with a higher number of patients to evaluate the potential benefits under SPA surgery.

2AP2-3

Intravenous fluid administration in patients undergoing colonoscopy: double blind, randomised clinical trial of underlying acid-base derangement

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Background and Goal of Study: Normal saline (NSS), lactated (LRS) and acetated Ringer's (ARS) solution can produce acid-base derangement either metabolic acidosis or alkalosis; while its etiology and clinical relevance remains controversial. Some investigators implied that plasma bicarbonate (HCO_3^-) concentration was its underlying mechanism as adapted from Henderson and Hasselbalch. In contrast, the one described by Stewart, emphasized the importance of plasma chloride (Cl^-) resulting in a change of simplified strong ion difference (SID). The current trial was set up to compare the effects of these crystalloids infusion on acid-base balance in patients undergoing colonoscopy.
Materials and Methods: A prospective, randomised, double-blind, controlled trial enrolled ninety consecutive outpatients. Participants were randomized equally into three treatment groups (LRS, ARS and NSS). The volume of fluid administration was calculated by means of Holliday and Segar. The SID was calculated by means of the differences between the positively and negatively charged strong ions in plasma. Continuous data were presented as mean and standard deviation. Comparisons of the blood profiles were performed by one-way ANOVA, F-test and paired t-test. Statistical significance was defined as $p < 0.05$ with 95% confidence interval.
Results and Discussion: All crystalloid infusions had a tendency to cause acidosis irrespective of the chloride content. Compared with LRS and ARS groups, NSS group had significant increase in the chloride (Cl^-) and bicarbonate ($HCO3^-$) values; but a significant decrease in the SID values. Dilutional effect caused by perioperative volume replacement therapy and consequent reduction of SID might be the underlying mechanism. In all groups, Cl^- had a negative correlation with SID; while $HCO3^-$ in NSS and LRS groups had a positive correlation (Figure 1).
Conclusion(s): The crystalloids infusion had a tendency to cause metabolic acidosis. Dilutional effect resulting in the reduction of SID, seemed to be the underlying mechanism of metabolic acidosis.
References:
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Acknowledgements: This research project is supported by Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700 THAILAND (19/01/ 2011)

2AP2-4

Venous thromboembolism prophylaxis in day surgery - NICEly assessed?

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Background and Goal of Study: Venous thromboembolism (VTE) is a major international patient safety issue. The VTE Impact Assessment Group in Europe, used epidemiological models, to estimate more than 700 000 hospital acquired VTE events and related deaths per annum in six EU member states[1]. Day surgery is an expanding field, involving more complex surgery and higher risk patients. In our day surgery unit we use the 2010 UK National Institute of Clinical Excellence (NICE) guidelines[2] for our VTE assessment and prophylaxis, where the risk assessment is done pre-operatively by nurses. We conducted a study, to see if adopting NICE standards has helped our VTE prevention in this cohort of patients.
Materials and methods: We reviewed 209 adult patients who had day surgery under general or regional anaesthesia. We assessed the number of patients that received appropriate thromboprophylaxis (prescribed on the day of surgery) according to the risk factors identified in the pre-operative VTE risk assessment.
Results and discussion: 198 of the sample reviewed had a VTE risk assessment done as per NICE guidance. Of these, 111 patients had a risk score indicating they required single dose pharmacological thromboprophylaxis, but only 21 patients received it. We also identified 12 patients needing extended prophylaxis, but it was only given to 6.
Using NICE guideline to conduct risk assessment, did not translate into administration of appropriate prophylaxis for 78% of patients. This could be due to poor awareness of risk factors by the prescriber, the perceived low risk of day surgery, ambiguity over the interpretation of the guidance or concerns of surgical bleeding.
Conclusion: An estimated 25,000 people in the UK die from preventable hospital-acquired VTE per year. With day surgery service expansion, the impact of shorter admissions on these figures needs clarifying. Better evidence on the actual risk of VTE in UK day surgery patients as well as more knowledge on the most effective preventative regime, may result in better engagement by clinicians with the guidance. Anaesthetists, with their global overview of perioperative care, are well placed to lead the assessment and administration of VTE thromboprophylaxis in these ambulatory patients.
References:
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2AP2-6

The perils of sedating an 'Incredible Hulk'

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Background: When presented with a patient with an extensive list of co-morbidities as anaesthetists the alarm bells ring and we prepare ourselves for a stormy anaesthetic. But what happens when we are presented with a 'super fit' patient who displays a 'super human' physique?
Case report: A 43 year-old man attended for his first session of lithotripsy for the treatment of a renal calculi. A routine anaesthetic assessment revealed that he has never had an anaesthetic and he claimed to be fit and well. However he had a raised creatinine of 109 umol/l and raised alanine transferase of 60IU/L. He had a very muscular build and on further questioning he admitted to using anabolic steroids for power lifting for 15 years and that he was awaiting a liver resection for a benign hepatoma. He underwent sedation for lithotripsy, which was uneventful. However later in recovery his blood pressure rose from a baseline of 134/86 mmHg to 183/105 mmHg. He was not in pain and had now complained symptoms of a 'fuzzy head'.
His investigations revealed tall tented T waves on ECG with evidence of left ventricular hypertrophy and potassium of 6 mmol/l. He was admitted over night and given Intravenous rehydration and commenced on anyhypertensives.
Discussion: Anaesthetists should be aware of the peri-operative risks in managing a patient using long-term anabolic steroids. There are a multitude of side effects associated with the use of anabolic steroids. The more serious problems include effects on the cardiovascular and hepatic systems. Studies suggested that myocardial hypertrophy was more extensive in athletes who used anabolic steroids in addition to exercise.
Animal studies have shown that anabolic agents enhance the pressor response to catecholamines and increased vascular response to noadrenaline. Vascular thrombosis and hypercoagulability have also been demonstrated which can cause subsequent ischaemia and infarction in vital organs. Other body system to consider include the reproductive, neuropsychiactric, dermatological and musculoskeletal systems.
References:
1. Anabolic steroid abuse: physiological and anaesthetic considerations. P. C. A. Kam, M. Yarrow, 2005.
Learning points: Patients on long term anabolic steroids can be difficult to manage, patients are reluctant to volunteer this information and the clinical signs may not be apparent. Therefore a high index of suspicion is required, where a multi-systemic and multi-disciplinary approach is needed.

2AP2-8

A simple technique to prevent severe desaturation and reduce bag-mask ventilation in healthy patients and patients with mild diseases under deep propofol sedation during upper GI endoscopy

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Background and Goal of Study: Most ambulatory patients undergoing upper GI endoscopy (EGD) receive IV sedation and O_2 via nasal cannula (NC). NC delivers minimal O_2 when the mouth is kept open by a bite-block. Oversedation and/or airway obstruction may cause severe desaturation (Desat) even in relatively healthy patients. A simple plastic sheet was shown to improve oxygenation by transforming NC to a face tent in sedated patients during EGD in a prospective study[1]. This technique has been used in our Endoscopy Suite. Our goal is to confirm its effectiveness in preventing severe Desat in healthy patients and patients with mild diseases during EGD.
Methods: Review of patients with ASA Physical Status of I or II who underwent EGD, EUS or ERCP identified 2 groups. NC (n=46) received only NC O_2. FT (n=105) received NC O_2 and a clean plastic sheet covering patient's eyes, nose and mouth[1-3]. Patients received NC O_2 (3-5 l/min or higher) and only IV propofol. Student t-test and Chi Square test were used for analysis. A p value < 0.05 was considered as significant. (Mean±S.D.)
Results: There were no differences in mean age (58-56 yrs), ASA Status (80% II), BMI (27 kg/m^2), baseline O_2 Sat (98±2%), the highest NC O_2 flow (5.0-4.6) and duration (35-41 min). There were significant differences in FeO_2 (NC: 0.41±0.17; FT: 0.71±0.15, $p< 0.0001$), overall propofol dosage (NC: 222±60 mcg/kg/min; FT: 193±64, $p< 0.02$), the lowest O_2 Sat (NC: 87±11%; FT: 97±3%, $p< 0.0001$), severe Desat (O_2 Sat≤85%) (NC: 20/46; FT: 1/105, $p< 0.001$) and bag-mask ventilation (NC: 5/46; FT: 1/105, $p< 0.01$).
Twenty two NC patients had severe Desat (O_2 Sat: 80±10%) and two of them received assisted bag-mask ventilation. All 22 NC patients' NCs were then converted to FTs. Their O_2 Sat was improved to 96±5%, 98±3% and 99±1% at 5 min intervals ($p< 0.0001$).
Conclusion(s): This simple technique reduces severe desaturation and the need for bag-mask ventilation in healthy patients and patients with mild diseases under deep propofol sedation during EGD. This face tent increases O_2 delivery without raising O_2 flow as indicated by high expiratory O_2. Although this face tent can also be used as a rescue device when patient's oxygenation deteriorates, it should be routinely used prior to sedation during EGD. It takes only a few seconds to prepare at no additional cost and may improve patient safety and reduce procedure interruptions.
References:
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3. www.TSEMask.com

2AP2-9

Factors associated with procedural and immediate post procedural cardiac arrest in patients undergoing gastrointestinal endoscopy

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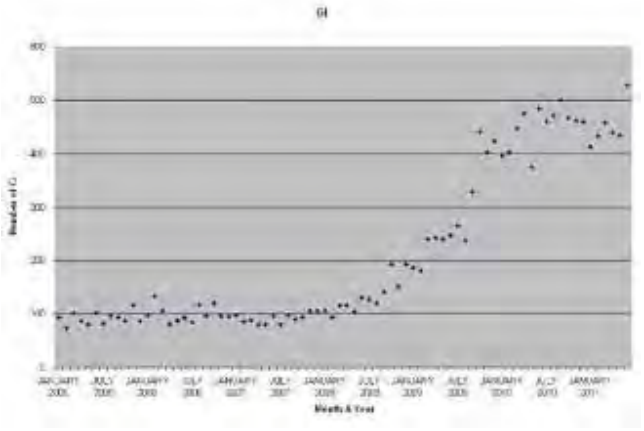
Background and Goal of Study: Airway difficulties are responsible for about 30 percent of all perioperative deaths in closed claims studies[1]. At the Hospital of the University of Pennsylvania, we have seen a significant increase (300 percent) in gastrointestinal (GI) endoscopy procedures done under anesthesia over the last 3 years (graph 1). With this in mind, we decided to review the outpatient gastrointestinal (GI) endoscopy anesthesia records of patients who sustained cardiac arrests.
Materials and Methods: The out patient records and the departmental data base provided the number and type of GI procedures done under general anesthesia and the patients requiring rapid response. The case records of patients who had cardiac arrests were studied in detail, to learn the events leading up to cardiac arrest, their management and the outcome.
Results and Discussion: The total number and type of cases done for the period from 9/8/08 to 3/23/12 is presented in table 1. There were 2 cardiac arrests (both were very brief) with immediate restoration of ventilation and circulation.
Conclusion(s): Despite significant advancements in airway management, airway difficulty resulting in inadequate ventilation and oxygenation remains the commonest cause of cardiac arrest in patients undergoing outpatient GI endoscopy under anesthesia.



[GI endoscopy work load]

ERCP	667
Enteroscopy	81
EGD (Esophagoduodenoscopy) with tumor ablation	99
EGD with gastrostomy	32
EGD with removal of foreign body	37
Sigmoidoscopy (diagnostic =/- therapeutic)	182
EGD (diagnostic and therapeutic including ultrasound	6318
Misc.	685
Total	8101

[Table 1 - Total number and types of cases]

Case number	Procedure	ASA	Comorbidity	/Anesthesia	Primary event	Rescue measure	Airway class (mallampatti)	Duration of CPR (Seconds)	Possible cause	Outcome
1	EGD with ultrasound	3	IHD, RA, DM	Propofol	Hypoventilation, airway obstruction	Mask Ventilation	4	<30	Airway difficult	Admitted via ER and discharged home
2	EGD with ultrasound	2	OSA on CPAP	Propofol	Hypoventilation, airway obstruction	Mask Ventilation followed by LMA	2	Not mentioned	Airway difficult	Transferred to ER and discharged home

[Table 2 - Details of the 2 patients who sustained cardiac arrest]

References:
1. IHD-Ischemic heart disease, RA-Rheumatoid arthritis, OSA- Obstructive sleep apnea, CPAP-Continuous positive airway pressure, EGD-Esophagoduodenoscopy, ER-Emergency room.

2AP2-10

Small-dose spinal anesthesia with prilocaine for outpatient hernioplasty: recovery profiles compared with general anesthesia

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Background and Goal of Study: The revival of shorter-duration-acting local anesthetics has led to a wider use of spinal anesthesia in the day surgery. The goal of this study was to determine whether unilateral anesthesia with low-dose of hyperbaric prilocaine provides equal recovery times without added complications than general anesthesia with propofol in ambulatory inguinal hernioplasty.
Materials and Methods: The study was conducted as a single-center, prospective, randomized trial. Exclusion criteria included the usual contraindications to spinal anesthesia.
55 patients were randomly allocated to receive unilateral spinal anesthesia (SA=26) or general anesthesia (GA=29). The SA group received 1 single dose of 25 mg of hyperbaric 5% prilocaine with 10 μg of fentanyl in lateral

decubitus position for 15 minutes. In the GA group general anesthesia was inducted and maintained with target-controlled infusion propofol 1% combined with fentanyl 1.5 μg/kg. Intraoperative and recovery times, postanesthesia recovery scores, and postoperative outcomes were recorded.
The continuous variables were analyzed according to the Student t test if parametric, or according to the Mann Whitney test if not parametric. Categorical variable were analyzed with χ^2 test or the Fisher's test. The level of significance was set as $p < 0.05$.

Times (min)	Spinal Group	General Group	p value
Surgery duration	45.5(35.0-50.0)	40.0(35.0 - 45.0)	0.091
Anesthesia duration	27.0(35.0-30.0)	30.0(25.0-30.0)	0.286
Time to ambulation	60.0(60.0-65.0)	60.0(60.0-75.0)	0.892
Time to urinary voiding	72.5(63.0-102.0)	80.0(65.0 - 135.0)	0.256
Time to discharge	132.5(120.0-150.0)	150.0(140.0-160.0)	0.010

[Intra-operative and recovery times]

Results and Discussion: The two groups were comparable with respect to patients characteristics and duration of surgery and anesthesia. Only one patient in SA group was converted to general anaesthesia due to inadequate level of sensory block. The times to achieve ambulation and to urinary voiding were similar between groups. The time for home readiness was shorter in SA group (132.5 min CI95% 120.0-150.0) versus GA group (150.0 min CI95% 140.0-160.0)($p=0.010$).
The incidence of post-operative complications were rare in both groups.
Conclusion(s): Unilateral spinal anesthesia with low-dose hyperbaric 5% prilocaine provides recovery profiles and discharge times comparable to general anaesthesia with propofol . Patients receiving SA were able to go home earlier than GA patients without added complications.

2AP2-11

Perioperative negative pressure pulmonary edema: case scenario

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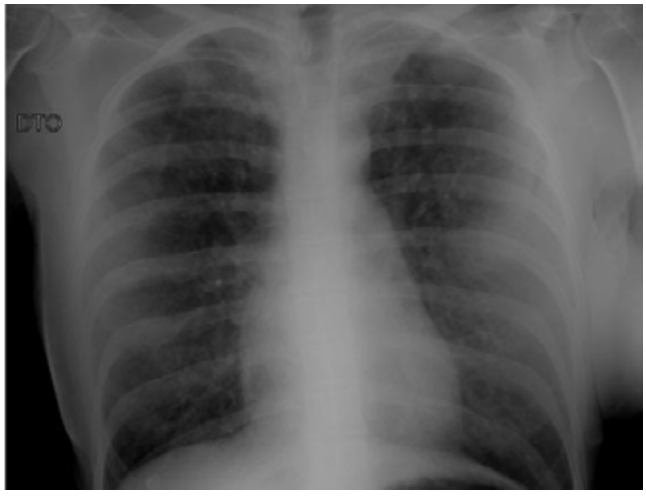
Background: The Negative Pressure Pulmonary Edema (NPPE) is a multifactorial condition,reported in patients after general anesthesia. Despite being uncommon (0.05-0.1%),it is a potentially life-threatening emergency that can be fatal in 11-40%.It characteristically occurs after endotracheal intubation, but has already been described after Laringeal Mask Airway (LMA) use[1]. As its occurrence is under-reported, our aim is to point out the importance of an expeditious diagnosis.
Case report: 24-yr-old woman (50Kg, 1,60m), presented to the ambulatory surgery center for an axillary ganglia excisional biopsy. Patient's medical history was relevant only for a recurrent spontaneous pneumotorax. Unknown allergies.Normal pre-operative study.
Inhalatory anesthesia,atraumatic LMA place.Anesthesia and surgical procedure were uneventful. Transferred to Postanesthesia Care Unit (PACU), spontaneously ventilating (SV).
Ten minutes later, marked respiratory distress, tachypnea, cyanosis, accessory muscle utilization and significant arterial oxygen desaturation (40%)-treated by positive-pressure mask ventilation until improved peripheral oxygen saturation. Physical examination revealed bilateral diffuse crackles and respiratory failure type I (PaO2 52mmHg). Chest radiograph with bilateral pulmonary infiltrates without pneumotorax signs.



[Image 1]

Transferred to Intermediate Care Unit,conscious, hemodynamically stable, SV with supplemental oxygen,SpO2>90%. An echocardiograph(normal) and an angio-computed tomography (acute pulmonary edema in resolution, no signs of thromboembolism) were performed. Progressive recovery without non-invasive pressure support, discharged from hospital on the 4th postoperative day. Follow-up in 8 weeks.
Discussion: When considering differential diagnosis of acute-onset perioperative pulmonary edema, NPPE was considered despite the absence of evident high airway obstruction. However, the clinical presentation and its rapid improvement are consistent with the diagnosis. Given the increasing use of LMA, similar episodes can become recurrent, being crucial its prompt recognition.
References:
1. Int J Crit Sci,2012 May-Aug;2(2):98-103
Learning points: We should be alert for the possibility of NPPE ocurrence

Monitoring: Equipment and Computers

3AP1-1

The effect of hand dominance on neuromuscular monitoring at the adductor pollicis muscle

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Background and Goal of Study: Neuromuscular blockade of the adductor pollicis muscle may be influenced by hand dominance resulting in conflicting results of several studies. The primary purpose of this study was to determine if hand dominance influences measurements of neuromuscular blockade at the adductor pollicis using acceleromyography.
Materials and Methods: After induction of anesthesia, both ulnar nerves were stimulated supramaximally using a train-of-four (TOF) stimulation every 15 seconds in 31 patients. Acceleromyographic responses was monitored in both hands and 0.6 mg/kg of rocuronium was administered. Onset, maximum effect, and offset of rocuronium were measured and compared in both hands. Signals were recorded until TOF ratios were more than 0.9 in all patients.
Results and Discussion: In total, 27 patients were right-handed and 4 patients were left-handed. There were no differences in the mean supramaximal threshold or mean initial TOF ratio between dominant and nondominant hands. No statisticaly significant differences were found between 716 paired TOF ratios in the dominant or nondominant hand.
A correlation was seen between the dominant and nondominant hand [Nondominant = 0.931·Dominant + 1.714, R = 0.929]. Agreement from a Bland-Altman analysis was excellent with a bias of 1.6% and limits of agreement of -21.2% to 24.5% for all signals.
Conclusion(s): Dominant and nondominant hands can be used interchangeably for neuromuscular monitoring at the adductor pollicis muscle.
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3AP1-2

Comparison of bispectral and entropy indices with electroencephalogram during sevoflurane anaesthesia

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Background and Goal of Study: Several studies have compared the numerical agreement of different indices of electroencephalogram (EEG) during anaesthesia. Unfortunately, none of these studies has explained reasons for disagreement between indices. Several reasons, i.e. transients like normal arousal (delta or beta), epileptiform spikes, or artefacts can explain the finding.
We compared the agreement of BIS and Entropy (SE), and concurrent raw EEG, in >50 yr old females during sevoflurane anaesthesia and surgery.
Materials and Methods: With IRB approval, 65 informed patients were enrolled. Anaesthesia was induced with propofol, followed with sevoflurane and rocuronium q.s.. Anaesthesiologist was blinded to the EEG information. Sevoflurane concentration was kept > 0.5 MAC. Electrodes Fp1, Fp2, and Cz (International 10-20 System), added with left outer canthus electrode, were used for continuous raw EEG monitoring and analyses (Nicolet One Monitor™). Upon 10 units disagreement between SE and BIS, lasting > 60 s, the raw EEG was also visually analysed.
Results and Discussion: Total of 46724 concurrent index pairs were recorded, and 45918 artefact-free pairs were analysed. The BIS and SE values differed in 51 patients on 428 episodes (5158 concurrent pairs). BIS > SE was seen in 24 patients, and SE > BIS in 18. In 9 patients, the dominant index fluctuated. Results in Table.

	BIS>SE			SE>BIS		
	Patients (n)	Conc. pairs (n)	Max. difference	Patients (n)	Conc. pairs (n)	Max. difference
Artefacts	23	82	42	12	48	36
EMG	3	3	42	1	2	30
Burst suppression	5	16	26	14	45	43
Theta	4	6	36	3	4	24
Delta	13	29	27	8	16	31
Theta & Delta	17	88	41	3	7	21

[Causative factors in index disagreement]

Conclusion: Both recording artefacts and several EEG patterns can cause significant differences in BIS and Entropy values. External artefacts, burst suppression and spectral EEG characteristics (delta, theta activity) caused the most prominent differences.

3AP1-4

Kinemyography (KMG) versus electromyography (EMG) neuromuscular monitoring in pediatric patients receiving Rocuronium during general anesthesia

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Rationale: There is a limited number of studies that compared kinemyography (KMG) and mechanomyography in the clinical practice but few studies compared KMG to electromyography (EMG) either in adults and none in children. This study compared the time course data for rocuronium relaxation measured by KMG to that measured by EMG in children 2-6 years old.
Materials and Methods: 24 children ASA I or II of both sexes, aged 2-6 years, scheduled for elective surgery under GA were included in the study. Premed with midazolam 0.3 mg/kg orally. Monitoring included ECG, NIBP, pulse oximetry, capnography, anesthetic gas monitor and temperature. NMT monitoring consisted of attaching the pediatric KMG sensor (NMT mechanosensor, for Datex GE, S5)in one hand, while the other hand had a 5 lead EMG (EMG for Datex GE, S5) for simultaneous recoding of both modalities.
Anesthesia was induced with fentanyl 2 μg/kg & propofol 2 mg/kg followed by endotracheal intubation. Ventilation was maintained by endtidal isoflurane 1.2 % in 50% oxygen/ air to maintain endtidal CO2 32-35 mm Hg. After 3 minutes of stable supramaximal stimulation, a train of four stimulus was applied every 15 sec. each patient had a single dose of 0.6 mg/kg rocuronium. The following parameters were collected (1) Lag time, (2) Onset time, (3) Assessing the recovery period by; train of four (TOF) 0.25, 0.50, 0.75 and 0.90. No top-up doses of rocuronium were given. Statistical analysis was done as appropriate.
Results: There were no statistically significant differences in the lag time, the onset time, TOF 0.25, 0.5, 0.75 and 0.9 ratios using either EMG or KMG. In addition, there was an excellent degree of agreement between EMG and KMG in measuring TOF ratio during both induction and recovery of rocuronium (table 1).

Time	EMG	KMG	Mean Difference	Mean (EMG+KMG)/2	T	p value	a c
Lag time (sec)	39.17 ± 8.81	42.46 ± 8.93	-3.29	40.815	1.29	0.20	0.856
Onset time (sec)	101.67 ± 20.57	105.00 ± 22.07	-3.33	103.335	0.54	0.594	0.977
TOF 0.25 (min)	25.42 ± 3.43	25.83 ± 3.47	-0.41	25.625	0.40	0.69	0.986
TOF 0.50 (min)	30.46 ± 3.86	31.04 ± 4.05	-0.58	30.75	0.47	0.64	0.927
TOF 0.75 (min)	35.92 ± 3.57	36.87 ± 3.69	-0.95	36.395	0.93	0.36	0.964
TOF 0.90 (min)	41.88 ± 4.59	42.62 ± 4.85	-0.74	42.25	0.54	0.59	0.980
Dur TOF 0.25-TOF 0.9 (min)	16.45 ± 1.5	16.79 ± 1.42	-0.34	16.62	1.24	0.53	-

[Table 1 - Pharmacodynamic time variables of EMG and KMG]
EMG = Electromyography, KMG = Kinemyography
insignificant p-value > 0.05
a c = Correlation coefficient description for strength of agreement:
<0.6 = unsatisfactory; 0.6 to 0.9 = satisfactory; 0.91 to 1 = excellent

Discussion and conclusion: KMG showed an excellent degree of agreement with EMG for determination of onset and recovery of a single dose of rocuronium in children. For clinical purposes, time course data obtained from KMG can be interchanged with that data obtained from EMG using rocuronium in children. The KMG is easy to use and can guide the clinician in assessing onset and recovery of rocuronium in children

3AP1-5

The response of bispectral index to laryngoscopy, comparison between hemispheres in patients with a brain tumour versus a healthy control group

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Background and Goal of Study: Electroencephalogram during anaesthesia may be affected by brain tumour.[1] We studied whether patients with a brain tumour have different BIS responses after laryngoscopy (LAR). We compared tumour patients with healthy control patients.
Materials and Methods: After EC approval, 40 ASA 1 or 2 patients (control) and 41 intracranial tumour patients(tumour) received standardized anaesthesia while measuring bilateral BIS (BIS VISTA$_{XP4}$ with bilateral sensor).(Covidien, Dublin, Ireland) Remifentanil was randomized to 3 or 5ng/ml effect-site concentration (Minto) and maintained throughout the study. Propofol effect-site concentration(Ce_{PROP})(Schnider) was set at 2 μg/ml and increased with incremental steps of 0.5 μg/ml until loss of consciousness was observed. After 3 minutes, laryngoscopy was performed and BIS was monitored during one minute. The median BIS of 1 minute before LAR is subtracted from the median BIS one minute after LAR to obtain delta BIS for each hemisphere. We tested if delta BIS is significantly different between hemispheres in control, between healthy and diseased hemispheres in tumour and between ipsilateral control and tumour hemispheres. Statistical significance was set at $p < 0.05$.
Results and Discussion: No demographic differences were present except for age.(table 1) Delta BIS is not statistically different, neither between hemispheres in control, nor between healthy and diseased hemispheres in tumour groups.(table 2) No significant difference was found in delta BIS between ipsilateral control and pathological hemispheres.

Age (years+/-SD)	Age (years+/-SD)	Weight (kg+/-SD)	Weight (kg+/-SD)	Height (cm+/-SD)	Height (cm+/-SD)	Time to LOC (sec+/-SD)	Time to LOC (sec+/-SD)
Control group	Tumour group	Control group	Tumour group	Control group	Tumour group	Control group	Tumour group
46 +/- 11	50 +/- 16	76 +/- 15	74 +/- 15	171 +/- 10	172 +/- 10	604 +/- 148	536 +/- 162

[Table 1]

Control group	Control group	Left Tumour group	Left Tumour group	Right Tumour group	Right Tumour group	Central Tumour group	Central Tumour group
Delta BIS Left hemisphere	Delta BIS Right hemisphere	Delta BIS Left hemisphere	Delta BIS Right hemisphere	Delta BIS Left hemisphere	Delta BIS Right hemisphere	Delta BIS Left hemisphere	Delta BIS Right hemisphere
0.6 +/- 5	1.0 +/- 6	-3.1 +/-5	-2.3+/-5.1	-0.3+/- 12	-1.0+/-11.5	-2.8 +/- 8	-1.2+/-3.2

[Table 2]

Conclusion(s): Bilateral BIS does not provide additional information on responsiveness to a standardized stimulus. We could not observe major differences in bilateral BIS response between control and brain tumour patients. Unilateral BIS monitoring seems to be equally informative in healthy and brain tumour patients compared to bilateral monitoring.

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1. Fudickar et al, Journal of Critical Care 2009;24:545-550

3AP1-6

Entropy guided end tidal desflurane concentration during living donor liver transplantation

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Objective: The three phases of living donor liver transplantation (LDLT) represents different liver conditions. Aim is to study the required end tidal Desflurane concentration (ET-Des) guided with Entropy monitoring for depth of anaesthesia.

Methods: After obtaining ethics and research committee approval of the National Liver Institute, Menoufya University, Egypt and informed patient consent, 40 patients were included in this prospective study. Anesthesia maintained with Desflurane-O_2 air. State hypnotic entropy (SE) and Response analgesic entropy (RE) kept between 40 to 60 (GE Datex-Ohemda S/5 Anesthetic Delivery Unit System, Finland).

Results: Age and MELD score were 45± 10 years and 15.43±3.92 respectively. ET- Des were significantly lower in anhepatic phase (2.8 ± 0.4 %) than pre-anhepatic and neohepatic phases (3.3 ± 0.3%, 3.47 ± 0.3% respectively, $P < 0.001$). SE and RE for pre-anhepatic, anhepaic and neohepatic were (45.6±3.7, 47.4±3.2), (44.7±2.1, 46.4±2.04) and (46.1±3.3, 47.9±3.3) respectively with no significant changes between phases, $P>0.05$. Total operative time was 651 ± 88 min and each phase 276 ± 111, 195 ± 55 and 191 ± 24 min respectively.

Requirements of red blood cells 4.69 ± 3.28 unit, fresh frozen plasma 5.36 ± 3.71 unit, Albumin 5% 1613 ± 568 ml, Hydroxy ethyl starch 1983 ± 1342 ml and crystalloids 7367 ± 3245 ml. Significant changes in Haemoglobin g/dl and Haematocrite % between pre-anhepatic & neohepatic phases (10.28±1.5, 30.48±4.3), and (8.88±1.1, 26.63±3.5), $P< 0.05$.

Heart rate and mean blood pressures were stable despite Cardiac index demonstrating a significant reduction during anhepatic phase (2.99±0.22) when compared to pre-anhepatic and neo-hepatic phases (3.60±0.29) and (4.72±0.32), respectively ($P< 0.05$). Significant correlation between CI and ET-Des % ($r= 0.604$, $P< 0.05$)

Conclusion: Inhalational anesthetic requirements differed from one phase to another during LDLT with requirements least during anhepatic phase. Monitoring anesthesia depth is required to avoid excess administration which may compromise the haemodynamics before the critical time of reperfusion.

3AP1-7

Differences between right and left values of bispectral index (BIS) during the induction, intubation and extubation phases of the anesthesia

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Background and Goal of Study: According to manufacturers' recommendations, Bispectral Index (BIS) probes can be applied on left and right sides of the forehead, giving clinically equivalent assessments for depth of anesthesia. However, so far, there is no evidence that bilateral EEG variability can display intrapatient reproducibility. The objective of the study was to investigate differences between right and left values of BIS index during the induction, intubation and extubation phases of the anesthesia.

Materials and Methods: We conducted a nonrandomized, prospective, observational study in forty nine patients undergoing knee replacement surgery. All patients underwent general anesthesia. Basal and values during induction, intubation and extubation times of bilateral EEG, heart rate, blood pressure were recorded and analysis was performed offline. Bilateral BIS values were analyzed 1 minute before intubation, considered maximal induction effect; 1 minute after intubation, as maximal intubation effect and 1 minute before the extubation, expressing maximal recovering effect. During this minute analysis of each moment the median, maximal and minimal values was recorded. Furthermore, the differences between right and left sites were calculated at each second and the median, maximal and minimal values were recorded from those differences. All quantitative values were analyzed with non-parametric test. A $p< 0.05$ was considered as significance.

Results and Discussion: A total of forty nine right-handed patients were studied and 28 were women (57%) with a median age of 71 ± 8 years. Thirty six patients (73%) were ASA I-II. The median surgery time was 101 ± 26 min. There were no differences between the right and left BIS values, except for the maximal BIS value after intubation that was higher in the right side (Median left value 34.5 (22.4 to 90.4) and right value 39.5 (18.4 to 90.6) with a median difference of 4,05 (-4,8 to 21,2).

These data show that there are no differences between basal values as well as depth of anesthesia, but show it might change with stimuli.

Conclusions: Our results support the hypothesis that there are no differences in basal bilateral values of BIS in patients with no brain pathology and they are useful for monitoring depth of anesthesia although clinical judgment should always be used when interpreting it. Further studies should be done in order to discern whether surgical stimuli are significant in bilateral BIS values.

3AP1-8

Bilateral BIS compatible with loss of response to name calling: comparison between patients with and without a brain tumour

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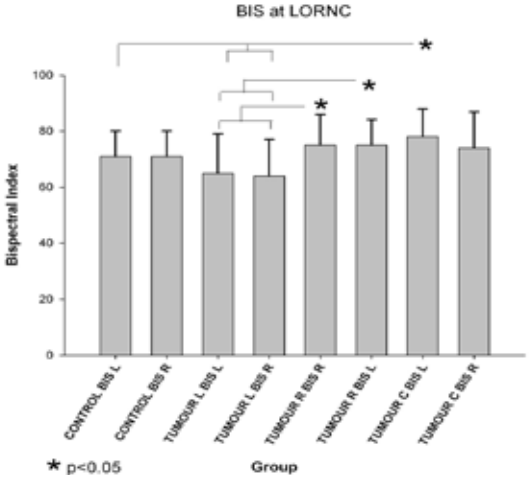
Background and Goal of Study: The electroencephalogram during anaesthesia may be affected by brain tumour.(1) We studied whether patients with unilateral or centrally located brain tumours have different BIS readings at loss of response to name calling (LORNC) in healthy versus diseased hemispheres. We compared tumour patients with healthy control patients.

Materials and Methods: After ethics committee approval, 40 ASA 1 or 2 patients (control group) and 41 patients with intracranial tumour (tumour group) received a standardized anaesthesia while measuring bilateral BIS using BIS $VISTA_{XP4}$ monitor and bilateral sensor (Covidien, Dublin, Ireland). All data were collected using RUGLoopII (Demed, Temse, Belgium) Remifentanil was randomized to 3 or 5ng/ml effect-site concentration (Minto) and maintained throughout the study. Propofol was set at 2 μg/ml (Schnider) and increased with incremental steps of 0,5 μg/ml. Every 15 seconds, the observers' assessment of alertness and sedation scale was determined until loss of response to name calling (LORNC) was observed. A T-test compared BIS compatible with LORNC between healthy versus diseased hemispheres within and between control and tumour patients. Statistical significance was set at $p< 0.05$.

Results and Discussion: No demographic differences are found between groups. Time to LORNC is significantly shorter in the tumour group (536s (+/-162)) compared to control (604s (+/-148)). Ce_{PROP} at LORNC is significantly lower in the tumour group (2.89 μg/ml (+/-0.8)) compared to control (3.32 μg/ml (+/-0.86)). No statistical significant BIS asymmetry is found between left and right BIS at LORNC in any group. Significant differences in BIS between groups are shown in figure 1.



[Figure 1]

Conclusion(s): Patients with tumour located centrally in the brain or in the right hemisphere result in higher BIS at LORNC compared to control patients or patients with tumour in the left hemisphere. As no significant asymmetry is found within individuals, the performance of unilateral BIS in brain tumour patients is probably equally effective compared to bilateral BIS monitoring.
References:
1. Fudickar et al, Journal of Critical Care 2009;24:545-550

3AP1-9

Bilateral BIS-monitoring for early detection of delirium after cardiac surgery

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Background and Goal of Study: Postoperative delirium occurs frequently after cardiac surgery and is associated with an increased morbidity rate as well as a prolonged length of stay at the ICU. Given that delirium displays with cerebral symptoms, we analysed whether it could be detected by bilateral EEG-monitoring prior to its clinical appearance.
Material and Methods: In a prospective observational study, 81 patients undergoing on-pump cardiac surgery were included. Bilateral BIS-monitoring (BIS Vista monitor, Covidien Inc.) was applied during the pre-, intra- and postoperative period, and processed parameters such as EEG-asymmetry (Asym), burst-suppression-ratio (BSR) and Bispectral Index (BIS) were recorded. Delirium was diagnosed according to the CAM-ICU (Confusion Assessment Method for the Intensive Care Unit). Delirious and non-delirious patients were compared by t-test or - in case of a failed normality test - by the Mann-Whitney test. All data are shown as mean ± std dev or as median and interquartile range (IQR).
Results and Discussion: Postoperative delirium was detected in 26 patients (32%). A trend towards a lower EEG-asymmetry was observed in the delirium group on the preoperative day (Asym = 48,2 ± 3,6 %) as well as before induction of anaesthesia (Asym = 49,5 % ; IQR [47,4;51,5]) as compared to the non-delirium group (Asym = 50,0 ± 4,7 %; p = 0,087 respectively Asym = 50,6 %; IQR [49,1;54,2]; p = 0,081). Delirious patients showed a significantly (p = 0,028) higher BSR (1,24; IQR [0,28;3,78]) and remained significantly (p = 0,019) longer in a burst-suppression state (269 minutes; IQR [133;535]) than non-delirious patients (BSR = 0,44; IQR [0,05;2,02]; 136 Minuten; IQR [55;320]). In the pre- and intraoperative period, BIS-values were similar in both groups.
Conclusion: Preoperative monitoring of EEG-asymmetry as well as intraoperative assessment of the burst-suppression-ratio are potential methods to predict a postoperative delirium and should be investigated in further studies. So far it remains unknown, whether there is causal relation or rather an association between preoperative EEG-parameters and the development of a postoperative delirium.

3AP1-10

Faster increase of BIS registered after the reversal of neuromuscular blockade with sugammadex vs. neostigmine

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Background and Goal of Study: Sugammadex binds molecules of rocuronium and hastens recovery of neuromuscular function. Our personal observation w as that patients became awake faster after reversal with sugammadex as compared to the neostigmine reversal. To confirm that observation w e have measured and compared both recovery of bispectral index (BIS) and train-of-four (TOF) after reversal with sugammadex or neostigmine after general anaesthesia.
Materials and Methods: The study was approved by the institutional ethics committee. After obtaining informed consent 44 subsequent adult patients ASA 1-3 undergoing thyroidectomy or breast cancer surgery were enrolled in a prospective, randomized study. General anaesthesia was introduced using propofol 2mg/kg and fentanyl 5 μg/kg, and neuromuscular relaxation with rocuronium 0.6 mg/kg. TOF and BIS were registered in all patients during anaesthesia and after reversal with sugammadex 2 mg/kg (S group, n=20) or neostigmine 50 μg/kg with atropine 25 μg/kg (N group, n=24). BIS w as maintained between 40 and 60 to assure adequate depth of anaesthesia until the end of the surgery. Reversal agents were given at the end of surgical procedure when two twitches at TOF-watch SX appeared. Time to recovery of TOF 90% and mean increase of BIS indices per each minute after reversal were registered. Statistical analysis was performed using two tailed t-test for independent samples. P< 0.05 was considered significant.
Results: Mean age of patients w as 57±11 and 54 ± 12 years (P=0.43), body mass index was 26.8 ± 6.1 and 28.1 ±5.9 (P=0.46) in S and N group respectively. The mean usage of anaesthetics propofol, fentanyl and rocuronium did not differ significantly between groups. Mean recovery time of TOF 90% was 10 min with excessive variability in N group and 2.8 min in S group (P< 0.001). The mean BIS index was 47.7 ± 6.9 in S and 48.9 ± 11.4 in N group at the time of reversal. It increased by 7.4 ± 2.9 in S and by 4.8±2.2 per minute (P=0.04) in N group after reversal agents were given.
Conclusion(s): An increase of BIS index registered after the reversal of rocuronium effects was faster during the recovery period in the patients who were given sugammadex as compared to neostigmine. Although rapid increase of BIS indices was registered in sugammadex group, more sensitive measurements are needed to confirm clinical value of this observation.
References: Chazot T, at al. Br J Anaesth.2011;106:914-6.

3AP2-1

The predictive performance of infusion strategy nomogram based on fluid kinetic model

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Background and Goal of Study: Fluid kinetic model was previously developed to describe change of volume of the fluid space expanded by administration of fluids, which can illustrate nomograms by simulating appropriate loading and maintenance doses[1]. These nomograms can be used to quantify the degree of plasma dilution. The purpose of the study was to evaluate the predictive performance of this model using infusion of three different fluids: Hartmann's solution(H) , Voluven®(V), and Hextend®(X)
Materials and Methods: Seventy nine consenting patients undergoing elective spinal surgery were enrolled in this study. These patients were randomly assigned to three fluid groups (H (n=22), V (n=32), and X (n=25), respectively. After induction of anesthesia, patients received each loading and maintenance volume of fluid predetermined by the Infusion Strategy Nomogram[2] during 60 min via infusion pump. Four arterial blood samples for hemoglobin measurement were obtained at preset intervals; baseline, 10, 20 and 30 min after loading volume of fluid (t-0, 10, 20, 30). The fluid space dilution based on model and plasma dilutions were calculated from fractional change of arterial hemoglobin. Predictive performance of Infusion Strategy Nomogram using plasma dilution was evaluated with the method described by Varvel[3]. The relationship between the fluid space dilution calculated by model and plasma dilution was also determined.
Results and Discussion: The demographic data were similar among three groups. A total of 273 hemoglobin measurements were obtained and used to determine the predictive performance of Infusion Strategy Nomogram. Performance indices for the three groups are shown in Table.

Parameters	Hartmann's solution		Voluven		Hextend	
Bias (%)	-2.7	(-17.8~-4.0)	-1.5	(-11.3~4.1)	9.1	(2.0~18.4)
Inaccuracy (%)	35.6	(29.3~41.5)	43.2	(37.3~48.5)	41.8	(39.1~51.7)

[Pooled Biases and Inaccuracy]

Regression analysis between the fluids space dilution and plasma dilution showed a significant linear relationship in each group (P< 0.05).
Conclusion(s): Although Infusion Strategy Nomogram of three fluid solutions did not show good predictive performance, it may be of help to calculate the amount of fluid required to reach a predetermined dilution in clinical situation.
References:
1. Stahle L, Nilsson A, Hahn RG. Br J Anaesth 1997; 78: 138-43.
2. Kang SJ, Choi KT, Lee JH, Lee DH. Korean J Anesthesiol 2008; 54: 300-6.
3. Varvel JR, Donoho DL, Shafer SL. J Pharmacokinet Biopharm 1992; 20: 63-94.

3AP2-2

A multimodal indicator of depth of anaesthesia detects return of consciousness during emergence with different anaesthetic drugs

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Background and Goal of Study: Electroencephalographic (EEG) depth of anaesthesia monitoring has been suggested supplementing standard monitoring to reduce anaesthesia related risks. The reliability to indicate consciousness and unconsciousness of available monitors has been critically discussed. To improve present monitoring techniques, the anaesthesia multimodal indicator (AMI) integrates EEG and standard monitoring parameters [1]. The present investigation evaluates whether AMI indicates return of consciousness (ROC).
Materials and Methods: After ethics committee approval and written informed consent, 263 adult patients undergoing surgery under general anaesthesia were included in a study conducted in 6 European centres [2]. Data of patients receiving propofol (group A: n = 71), desflurane (B: n = 40), isoflurane (C: n = 104) or sevoflurane (D: n = 22) during maintenance and emergence of general anaesthesia were analyzed. Standard parameters and EEG were continuously recorded and stored together. After loss of consciousness (LOC), anaesthetic doses were increased and anaesthesia was performed according to standard clinical practice. At the end of surgery, drugs were discontinued and commands to squeeze hand were given until ROC. The AMI was developed through a data driven adaptive neuro fuzzy inference system which maps EEG parameters, standard monitoring parameters (heart rate, blood pressure, in- and expiratory gas concentrations, pulmonary peak pressure), patient data and drug protocol onto an output indicator (threefold cross validation) [1]. AMI and BIS (calculated offline [3]) were analyzed during consciousness (baseline 3min before LOC, no anaesthetics delivered, and 30s after ROC) and unconsciousness (15s before ROC). Prediction probability (P_K) with 95% bootstrap confidence intervals (CI) reflects the indicators ability to detect ROC during emergence.
Results and Discussion: The AMI detects reliably ROC for different hypnotic drugs (A: P_K=0.93, CI=0.88-0.97; B: 0.88 (0.77-0.96); C: 0.81 (0.75-0.87); D: 0.80 (0.64-0.92)). P_K of AMI was significantly higher than of BIS (A: 0.65, (0.55-0.76); B: 0.63 (0.49-0.76); C: 0.56 (0.47-0.66); D: 0.50 (0.29-0.72)) at corrected threshold $p < 0.05$.
Conclusions: The multimodal approach of AMI detects adequately the dynamic transition at ROC and may represent a step forward when compared to BIS.
References: [1] Anesthesiology 2011; LBT06 [2] Anesthesiology 2006; 105: A1553 [3] Anesth Analg 2007; 104: 135-9

3AP2-3

Real-time monitoring of end-tidal propofol in exhaled air: where we were, where we are, and where we would like to be. Preliminary results

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Background and Goal of Study: There have been several studies published about the presence of propofol particles in exhaled air. However, it is not clear whether this technique can be reliable and reproducible as to have a clear impact on research or clinical practice. In the past years we have been working on improving the methodology and optimizing the results, improving sampling and data collection to increase the sensitivity and accuracy. A LabView (National Instruments) application developed allows the connection of the infusion pumps, vital signs monitor, BIS and PTR-MS (QMS Ionicon High Sensitivity Proton Transfer Reaction Mass Spectrometer), which allows automatic real-time data collection. We have now developed a new sampling cannula of low absorbent material (PEEK) which introduced into the oro-tracheal tube allows taking the sample. Simultaneously, the sampling system has been improved by heating it and including a micro valve that allows air sampling, exclusively on the expiratory phase.
Materials and Methods: 300 patients, 18-60 years old both sexes ASA I II, scheduled for surgery under general anesthesia were involved. Vital signs, TCI parameters and the propofol concentration (178+1 amu), acetone (58+1 amu) and isoprene (68+1 amu) in expired air are recorded. Propofol concentrations in expired air are being compared with the plasmatic concentration and effect offered by the TCI, as well as its correlation with BIS.
Results and Discussion: With the improvements introduced, the exhaled propofol can now be monitored with a reproducible method, in which variations in the propofol infusion generate changes in exhaled propofol concentration. In the preliminary results, these changes correlate with all plasma concentration, effect concentration and BIS. Preliminary results reveal that the average concentrations of propofol in air are of 48ppb for Plasmatic TCI concentrations of 2.5 mcg/ml, 55ppb for 3mcg/ml and 68ppb for 4mcg/ml we will have to wait for the completion of the study to offer more consistent and definitive results.
Conclusion(s): Improvements introduced in the sample system together with the automation of data collection, allow us to perform studies in large series of patients with reproducibility and accuracy. If the results are confirmed, it could be possible to use this technique as a non invasive propofol monitoring. It would also lead to think that, in the future, a propofol pharmacokinetic model of the lung could be defined.

3AP2-4

Relationship between body composition and hypotension caused by induction of anesthesia

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Background and Goal of study: Bioelectrical impedance analysis (BIA) is a commonly used method of estimating body composition. Recently developed analyzers allow for accurate evaluation of body fat (BF) and total body water (TBW) contents. The aim of the study was to examine whether preoperative body composition is related to extent of blood pressure (BP) changes following induction of anesthesia. Since distribution of infused crystalloid and colloid solutions differs, we hypothesized that this difference might be reflected in different fluid shifts in patients with different preoperative body fat contents.
Material and methods: One hundred thirty patients aged 20-70 years (mean 47 years) with ASA PS-I undergoing general anesthesia were enrolled after obtaining their informed consent. In all patients, BF and TBW were preoperatively measured using a multifrequency bioelectrical impedance analysis device (InBody 720, Biospace Tokyo). After induction of anesthesia, patients were randomly given 4ml/kg of either lactate Ringer's solution (LR group, n=72) or hydroxyethyl starch solution (HES group, n=54). Mean blood pressure (mBP) was measured 5 min after injection of the last induction agent and the relationship between occurrence of hypotension (drop of mBP to less than 60 mmHg) and preoperative BF and TBW values was examined. The Mann-Whitney U test was used for statistical analyses and $p < 0.05$ was considered significant.
Results and Discussion: Hypotension occurred in 32 out of 72 (58%) LR group patients and in 23 of 54 (42%) of HES group patients. In the LR group, hypotensive patients had higher BF ratios (21.5% vs. 24.7%, p=0.038) and lower TBW ratios (57.6% vs. 55.3%, p=0.041) than normotensive patients. This indicated that higher body fat contents caused greater shifts in body fluids after induction of anesthesia when crystalloids were used. In the HES group, the differences between hypotensive and normotensive patients were not observed (BF: 24.9% vs. 22.8%, p=0.038) (TBW: 55.1% vs. 56.7%, p=0.261).
Since colloids remained within the blood vessels they seemed to be less affected by body fat and water contents than crystalloids. Indirectly, this could also indicate that body fat and fluid contents play some role in development of post-induction hypotension.
Conclusion: The results of our randomized prospective study indicate that preoperative body fat and water contents may play some role in development of hypotension caused by induction of anesthesia.

3AP2-5

Capnography in electroconvulsive therapy to optimize and reduce the electrical energy dose needed to achieve a therapeutic central convulsion

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Background and Goal of Study: Current standards in general anaesthesia (GA) for Electroconvulsive Therapy (ECT) include oropharyngeal airways and facial masks (FM) to open and maintain the patients airway. However, monitoring End Tidal CO_2 ($ETCO_2$) is extremely difficult with this ventilatory method. Because of that, in this study we used Laryngeal Mask (LM) ventilation in GA for ECT.
The aim of this study was to verify the correlation between $ETCO_2$ and ECT Electrical Energy Dose (EED) for a Therapeutic Central Convulsion (TCC), defined as ^{3}20 seconds, in outpatient ECT.

Materials and Methods: Clinical controlled trial (prospective, randomized, double blind and matched pairs study). Local Ethics and Clinical Investigation Committee approval and informed consent in all cases.
14 ASA I-III patients, 75% of them women and schedulled for outpatient maintenance ECT were included in the study.
Patients were ventilated in GA for ECT with both LM and FM when randomized (matched pairs) and they always had identical anaesthetic and psychiatric management in every ECT procedure.
Monitoring: Heart Rate, Non Invasive Blood Pressure, Pulse Oximetry, $ETCO_2$, average expiratory Tidal Volume, EED, Peripheral and Central Convulsion times (CCt).
Servo 900C Ventilator (SIEMENS) for anaesthesia and Spectrum 5000Q (MECTA) for ECT in all cases.
Statistical analysis with SPSS 14.0 for Windows: Kolmogorov-Smirnov Normality Test, Levene Homogeneity Test, ANOVA, Student T Test for paired data and Pearson Correlation Test were used as needed. Choosed significance level was a=5%.
Results and Discussion: We found statistical correlation between $ETCO_2$ and CCt ($p< 0.05$). The lower the $ETCO_2$ the longer the CCt.
On the other hand, higher EED in FM group failed to get longer Peripheral and Central Convulsions; yet led to worse hemodynamic ($p< 0.05$) or ventilatory ($p< 0.05$) parameters[1,2].
Conclusion(s): Both used airway maintenance methods, LM or FM are suitable for GA in TEC.
However and because of providing better and easier ventilation, in this study LM has proved its superiority in achieving a lower $ETCO_2$, and therefore a TCC with less EED and, consequently, we recommend it for GA in ECT.
Moreover, LM ventilation may be the only option for outpatient ECT anaesthesia in those difficult psychiatric patients with no TCC even with maximum EED.
References:
1. J ECT 2003 19:211-6.
2. J ECT 2003 19:26-30.

3AP2-6

Assessment of the level of consciousness during propofol anesthesia: validation of the qCON index

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Background: The qCON algorithm (Quantium Medical, Spain) was recently introduced as an index to assess the level of hypnosis (1) during sedation-analgesia. It is calculated from the raw EEG using technology based on Adaptive Neuro Fuzzy Inference Systems (ANFIS). ANFIS is a data driven approach, rather than assuming an underlying function governing the relationship between input and output. In this study, EEG data from a previous study (2) were replayed with the qCON algorithm for the assessment of the level of consciousness during general anesthesia.
Methods: 20 female patients (aged 32±5 y, mean±std), scheduled for ambulatory gynecologic surgery, were enrolled after obtaining approval from the Institutional Ethics Committee (2). A computer-assisted continuous-infusion device was used to infuse propofol to a target effect-site concentration, using the model published by Schnider et al (3). The initial propofol target effect-site concentration (Ce_{PROP}) was set at 1.5 μg/ml and was increased every 4 min by 0.5 μg/ml until loss of all relevant clinical signs. BIS, AAI, level of consciousness (using the OAAS score and the response to eyelash reflex), and reaction to noxious stimulus were recorded before each increase in target concentration. The qCON was calculated offline from the raw EEG. A total of 168 measurements of OAAS, eyelash reflex and reaction to noxious stimuli were considered. The prediction probability (mean(SE)), Pk, of the different indicators to describe OAAS, loss of eyelash reflex, and response to noxious stimulus was calculated.
Results and Discussion: Table 1 shows the Pk values of BIS, AAI, Ce_{PROP} and qCON in the prediction of the OAAS, loss of eyelash reflex, and loss of response to noxious stimulus.

	OAAS		Eyelash reflex		Reaction to noxious stimulus	
Pk	mean	SE	mean	SE	mean	SE
BIS	0.93	0.01	0.95	0.02	0.87	0.13
AAI	0.89	0.02	0.94	0.03	0.88	0.13
CePROP	0.91	0.01	0.94	0.03	0.82	0.11
qCON	0.91	0.01	0.95	0.02	0.87	0.03

[Table 1.]

Conclusion: The qCON performed as well as BIS, AAI and Ce_{PROP} for predicting the three clinical signs, OAAS, loss of eyelash reflex and reaction to noxious stimulus. Therefore, qCON can be used as an accurate indicator for the level of sedation and loss of consciousness during propofol anaesthesia.
References:
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2. Struys et al. Anesthesiology 2002;96:803-16.
3. Schnider et al. Anesthesiology 1998;88:1170-82

3AP2-7

Detection of noxious stimuli during general anesthesia using the NoL™ index for nociception level

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Background and Goal of Study: A novel multi parametric index for the assessment of Nociception Level (NoL) during general anesthesia (GA) was recently developed [1]. The NoL index (0-100) is derived by a non-linear combination of several pain-related physiological parameters: heart rate (HR), high frequencies of heart rate variability (HRV-HF), plethysmograph wave amplitude (PA), and skin conductance properties (SCL and NSCF [2]), together with the time derivatives of those parameters. The objective was to investigate the ability of the NoL index to detect noxious stimuli of different intensities during GA.
Materials and Methods: 25 ASA I-II patients scheduled for elective surgery under GA were prospectively enrolled. Anesthesia protocol was applied as accepted at the study site. Patients' plethysmograph and skin conductance were acquired using the PMD-100™ finger probe (Medasense Biometrics ltd). The physiological parameters HR, PA, HRV and SCL were extracted and compared to the NoL index. 5 events across the surgery were examined: t1=intubation; t2=severe noxious stimuli (first incision or trocar); t3=moderate noxious stimuli (small incision or trocar); t4=minor noxious stimuli (stitching, bladder catheterization) t5=no pain, before first skin incision. The changes (Δ) in parameter values following events t1-5 were investigated using the Wilcoxon rank test.
Results and Discussion: Table 1 presents deltas in parameter values 2min before and 1min after t1-5. NoL increased significantly during all noxious stimuli (t1-4) as opposed to the individual parameters. ΔNoL increased with stimuli severity, indicating the ability of NoL to differentiate between levels of nociception.

Clinical events	ΔNoL mean (se)	ΔHR [min-1] mean(se)	ΔPA [normalized] mean(se)	ΔHRV-HF [normalized] mean(se)	ΔSCL [normalized] mean(se)
t1	20.2(3.7)***	10.5(2)***	-0.69(0.2)**	-0.4(0.19)*	0.2(1)
t2	19.0(3.1)***	9.3(2.4)**	-0.42(0.13)*	-0.35(0.22)	0.14(0.2)
t3	11.8(4.3)**	6.1(1.6)	-0.20(0.1)*	-0.22(0.25)	-0.2(0.19)
t4	8.6(2.8)**	1.9(1.1)	0.01(0.13)	-0.7(0.2)*	-0.17(0.14)
t5	-5.0(1.8)	0.05(0.06)	-0.08(0.08)	0.21(0.22)	0.01(0.04)

*[Table 1. Parameter Response (*p<0.05;**p<0.01;***p<0.001)]*

Conclusion(s): The NoL index better detected noxious stimuli compared to individual parameters that are commonly used for the assessment of nociception. Furthermore, the NoL recognize different levels of nociception. The proposed NoL may potentially be implemented as a clinical tool for pain assessment during GA. Further studies are needed to validate these results.
References:
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2. Storm H et al. Acta Anaes Scand 2005 Jul;49(6):798-803.

3AP2-8

The applicability of pharmacokinetic/-dynamic models of propofol during awake craniotomy

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Background and Goal of Study: Resection of brain tumours and areas of epileptical activity close to the speech centre are often performed using the "asleep-awake-asleep"-anaesthetic technique based on propofol. For this technique the patient ought to be asleep during the beginning and at the end of surgery, but needs to be fully alert and cooperative during surgery in order to undergo extensive tests to determine the size and location of the speech area. As the anaesthetist needs to manage the different stages, accurate

pharmacokinetic/pharmacodynamic (pk/pd) models of propofol are called for. The goal of this study was to determine which pk/pd model predicted plasma concentrations of propofol and depth of anaesthesia more accurately.
Materials and Methods: 13 patients scheduled to undergo awake craniotomy participated in this prospective observational study. Blood samples were taken during surgery and plasma concentrations of propofol were measured using HPLC. These were compared to the calculated plasma concentrations using the models based on Marsh et al. (pk/pd Marsh) and Schnider et al. (pk/pd Schnider). We assessed the prediction error (PE = (measured conc. - calculated conc.) / calculated conc.) as well as its bias (MDPE) and precision (MDAPE). In addition, we calculated the prediction probability Pk, by which the propofol effect-site concentration predicted the depth of anaesthesia, which was quantified by the bispectral index.
Results and Discussion: The patients age was 43±15 years and their body weight 75±11 kg. Pk/pd Schnider reached a significantly (p=0.05) higher precision than pk/pd Marsh (MDAPE Schnider = 21.5 ± 7.7 %; MDAPE Marsh = 28.9 ± 12.0 %). It also tended to reach a lower bias (MDPE Schnider = -5.4 ± 20.7 %; MDPE Marsh = -11.7 ± 14.3%; p=0.09). Pk/pd Marsh tended to underestimate propofol plasma concentrations, especially if concentrations exceeded 5 μg/ml. Prediction probability was comparable between pk/pd Marsh (PK=0.798±0.056) and pk/pd Schnider (PK=0.787±0.055), however after optimising the models by fitting the parameters to each individual patient, pk/pd Schnider was able to achieve significantly higher prediction probabilities (PKfit=0.807±0.056, p=0.05).
Conclusion: When using the "asleep-awake-asleep"-anaesthetic technique during awake craniotomy, the pk/pd-model based on Schnider et al. should be used. Due to considerable interindividual variation, additional monitoring of anaesthetic depth (e.g. BIS) is recommended.

3AP2-9

Peroperative depth of anaesthesia, assessed with the qCON may reduce the postoperative opioid requirements

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Background: Several studies have been published, showing that a number of postoperative outcome parameters depend on the level of anaesthesia and analgesia during surgery. This study is a database study where the EEG data recorded and published previously (1) were analyzed using the qCON level of consciousness algorithm (Quantium Medical, Barcelona, Spain). The objective of the study was to evaluate a possible relation between the depth of anaesthesia assessed with the qCON and the consumption of morphine postoperatively.
Methods: This database study was prospective, observer blinded and included 50 women scheduled for elective abdominal hysterectomy. Anaesthesia was induced using propofol and remifentanil. Before leaving the recovery room the patients were provided with a programmed patient-controlled pump (PCA), which was only activated on demand. The EEG were registered from just before induction of anaesthesia and during the whole procedure, but the anaesthesiologist did not have access to the monitor.
Results: Seven patients were exluded from the study. The 43 patients who complied with the protocol were divided into two groups: Group High (n=12) with a mean qCON>55 of the registration time and Group Low (n=31) with a mean qCON< 55. Group High had significantly higher opioid requirements (0.23(0.05) mg/kg vs 0.17(0.1) mg/kg) in the recovery and activated the PCA-pump more frequently during the first 24 postoperative hours. The reduction in morphine consumption was 25 %.
Conclusion: The results indicate that the peroperative depth of anaesthesia assessed with the qCON may reduce the postoperative analgesic requirements. A more advanced model using features extracted from the qCON index may lead to a more precise prediction of the opioid consumption, rather than only high and low.
References:
1. Peroperative depth of anaesthesia may influence postoperative opioid requirements. Henneberg SW, Rosenberg D, Weber Jensen E, Ahn P, Burgdorff B, Thomsen LL. Acta Anaesthesiol Scand.2005 Mar;49(3):293-6.

3AP3-1

Clinical validation of a continuous non invasive blood pressure monitor: CNAP 500

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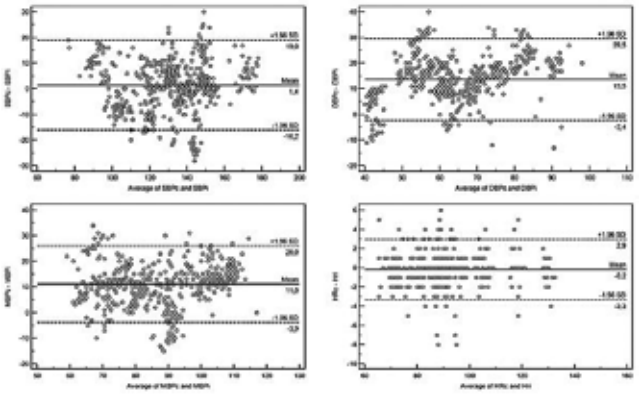
Background and Goal of Study: A new software (ver 3.5) has been released for the CNAP 500 continuous non-invasive blood pressure monitor (CNS System, Austria). Our goal is to validate the monitor for postsurgical critically ill patients.
Materials and Methods: After local ethics committee approval, written informed consent was obtained from 25 post surgical critical care patients. Patients with previous cardiac or vascular surgery on upper limbs, more than 10% blood pressure difference between arms or Raynaud-Syndrome were excluded.
A radial artery cannula was placed in the operating room or in the critical care unit before weaning (Arteriofix, Braun, Germany), which includes a 22G arterial catheter and a noncompliant 80mm tube, connected to a standard monitor (Hewlett Packard Viridia 26C, Hewlett Packard, Germany). A thourogh inspection was made for checking abscence of bubbles well as other artifacts that could affect the outcome.
The CNAP 500 monitor was placed in the contralateral arm of the arterial cathether. We manually collected heart rate, systolic, mean and diastolic blood pressure at the same time from both monitors every 30 seconds after each 10 min self calibration (30 paired measurements were obtained from each patient after three calibrations). Bland and Altman approach was used for statistical analysis. Linear regression was used for proportional error analysis. AAMI states that a bias lower than 5 mmHg and a SD lower than 8 mmHg should be found, but a 10% imprecision in SD is acceptable. Thus, precision lower than 9 mmHg is accepted.
Results and Discussion: Figure 1 shows Bland-Altman plot (bias and limits of agreement). Table 1 shows data. No proportional error was found.



[figure1]

	Invasive	Non Invasive	Bias	Precision
SBP	131.2±21.1	132.6±21.9	1.4	8.9
MBP	82±14.1	93±14.9	11	7.6
DBP	56.7±11.9	70.2±13.9	13.5	8.1
HR	88.6±14	88.4±14.1	-0.2	1.6

[Data show mean±SD.]

Conclusion(s): SBP showed good bias and precision. For MBP and DBP a systematic error should be considered, but precision is good. CNAP 500 can be used interchangeably with IBP specially for SBP in the critically ill patients.

3AP3-2

Clinical significance of the perfusion index in healthy normal volunteers

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Background: Recently, a new multiwavelength pulse oximeter, the Radical-7 (Rad7; Masimo, CA, USA) was developed that offers noninvasive measurement of blood components. Perfusion index(PI) derived from the Rad7 is one of the markers that allows noninvasive and continuous monitoring of peripheral perfusion, but little is known about the true meaning of PI.
The objective of this study was to determine the significance of PI in healthy normal volunteers.
Study Design: Two studies were carried out with 12 adult volunteers.
Study 1: Rad7 probes were attached to the right forefingers of 6 volunteers. On the same side as the Rad7 probe, a tourniquet (ATS 750; Zimmer, USA) was wrapped around the upper arm, and pediatric rSO2 probes (INVOS 5100; Somanetics, MI, USA) were attached over the deltoid and brachioradial muscles (for upper and lower rSO2, respectively). After the baseline measurement (BL), the pressure in the tourniquet was increased step by step from 50 mmHg to 150 mmHg every 20 mmHg (T50-T150); and PI and upper and lower rSO2 values were recorded at each pressure.
Study 2: PI and radial arterial velocity on the same side were measured in the other 6 volunteers. Arterial velocity was measured with an ultrasound transducer (Phillips iE33, 7-15 MHz linear probe). The study protocol using tourniquets and measurement points were the same as in Study 1. Wilcoxon signed-rank test was used to compare between BLs for related samples.
Comparisons between upper and lower rSO2 were made using Mann-Whitney U test. Correlations between PI and rSO2, and PI and radial arterial velocity were assessed using Spearman's rank correlation coefficient. $P < 0.01$ was considered to indicate statistical significance.
Results: PI significantly decreased from T110 to T150. Lower rSO2 was significantly decreased at T70 to T150; and at each point, there were significant differences between upper rSO2. A correlations between PI and rSO2 were $y = 2.0x + 51.1$, $r^2 = 0.41$ ($P < 0.001$), correlation between PI and time-averaged mean velocity were $y = 0.33x + 0.67$, $r^2 = 0.31$ ($P < 0.001$).
Conclusions: The study protocol implemented low perfusion status distal to the tourniquets. Thus, PI measured at the fingertip is positively correlated with radial artery flow velocities and the lower rSO2. The lower rSO2 decreased similarly to arterial flow velocities, which suggests that decrease in rSO2 reflects inadequate tissue oxygenation. Therefore, PI is an accurate index of peripheral blood flow.

3AP3-3

Evaluation of a non-invasive device to measure difference in pulse pressure (dPP) intraoperatively - preliminary results

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Background and Goal of Study: Dynamic parameters like difference in pulse pressure (dPP), synonymous: pulse pressure variation (PPV), have been shown to predict fluid responsiveness reliably (1).
As assessment of dPP requires an arterial line to measure respiratory changes in arterial pressure, a non-invasive technology would be welcome for clinical anesthesiologists. A non-invasive measurement device based on a modified Penaz technique is now available commercially.
Therefore, we compared the non-invasive device to a reference technique based on arterial measurement in a clinical setting.
Materials and Methods: Following IRB approval and written informed consent, 16 patients scheduled for elective urologic surgery and qualifying for arterial blood pressure monitoring, were enrolled.
Anesthesia was standardized. Noninvasive measurement of dPP was performed by modified Penaz technique (CNAP-PPV®, CNSystems, Graz, Austria) according to manufacturer's recommendations, dPP was assessed continuously at the bedside as described previously (2). Systolic (SBP), diastolic (DBP), and mean arterial blood pressure (MBP) was measured both by arterial line and by CNAP-PPV®.
Measurements were taken at defined time points (after skin incision, before and after a volume bolus and at the end of the operation), measurements of the non-invasive device with the reference techniques were compared using Bland-Altman analysis.

Results:

parameter	mean difference	lower limit of agreement	upper limit of agreement
dPP/PPV [%]	-1,4657	-9,6957	6,7644
SBP [mm Hg]	1.0154	-23,1556	25,1864
DBP [mm Hg]	-5,5036	-24,7429	13,7357
MBP [mm Hg]	-4,3021	-23,6458	15,0416

[Results]

Conclusion: Mean differences of parameters measured by the non-invasive device and its reference techniques appear to be rather small in these preliminary data analyzed. However, wide limits of agreement were found. The modified Penaz technique seems to be a promising option that deserves further study.
References: (1) Marik PE et al, Crit Care Med 2009; 37:2642-7. (2) Pestel G et al, Anesth Analg 2009; 108:1823-9

3AP3-4

The clinical utility of Nexfin to assess rapid changes in cardiac index and to predict fluid responsiveness: a comparative study with transpulmonary thermodilution

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Introduction: The Nexfin device (BMEYE B.V., Amsterdam, Netherlands) is a photoplethysmographic technology that offers the ability to non-invasively and continuously monitor blood pressure, cardiac index (CI) and respiratory variations in pulse pressure (PPV_{Nexfin}) and stroke volume (SVV_{Nexfin}). We previously demonstrated the monitor was safe and accurate to measure blood pressure but not interchangeable with transpulmonary thermodilution (TP-TD) to monitor CI.[1]
The aim of this present study was to compare rapid changes in CI after fluid challenge between Nexfin and TP-TD and the ability to predict fluid responsiveness with PPV_{Nexfin} and SVV_{Nexfin}.
Methods: After approval by the local Ethics Committee, 45 patients admitted to the cardiac intensive care unit following conventional cardiac surgery were prospectively investigated before and after a fluid challenge. Simultaneous comparative CI data points were collected from TP-TD (CI_{TD}) and Nexfin (CI_{Nexfin}).
Correlations were determined by linear regression.
A Bland-Altman analysis was used to compare the bias, precision and limits of agreement. Percentage error was calculated. PPV_{Nexfin} and SVV_{Nexfin} before fluid challenge were collected and areas under the receiver operating characteristics curves (ROC_{AUC}) were assessed to evaluate assess their discrimination in predicting fluid responsivness.
Results: Eight (18%) patients were excluded from the study. A weak positive relationship was found between rapid changes in CI after fluid challenge given by both technologies ($N=37$, $r=0.39$, $P=0.019$).
Bias, precision, and limits of agreements were 0.20 $L.min^{-1}.m^{-2}$ (95% confidence interval: 0.02-0.40), 0.57 $L.min^{-1}.m^{-2}$, and $\pm$1.12 $L.min^{-1}.m^{-2}$ before fluid challenge and 0.01 $L.min^{-1}.m^{-2}$ (95%CI: -0.24-0.26), 0.74 $L.min^{-1}.m^{-2}$, and $\pm$1.45 $L.min^{-1}.m^{-2}$ after fluid challenge, respectively. Percentage errors between CI_{Nexfin} and CI_{TD} were 55% and 58%, before and after fluid challenge respectively. PPV_{Nexfin} and SVV_{Nexfin} were not discriminant to predict fluid responsiveness: ROC_{AUC} 0.57 [95%CI: 0.40-0.73] and 0.50 [0.33-0.67], respectively.
Conclusion: The Nexfin cannot be used to measure rapid changes in CI following fluid challenge and to predict fluid responsiveness after cardiac surgery
References:
1. *Br J Anaesth* 2012, 109:514-21.

3AP3-5

Prediction of fluid responsiveness following conventional cardiac surgery: a comparison between arterial pulse pressure variation and plethysmographic variability index

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Introduction: Plethysmographic variability index (PVI, Masimo Corp., Irvine, CA) is a new non-invasive dynamic indice used to predict fluid responsiveness. Initial proof -to-concept studies including selected patients in stable hemodynamic condition reported encouraging results.[1] The present study aimed to compare the clinical utility of arterial pulse pressure variation (PPV) and PVI to predict fluid responsiveness following conventional cardiac surgery.
Methods: After approval by the local Ethics Committee, 87 patients admitted to the cardiac intensive care unit following conventional cardiac surgery were prospectively investigated.
Measurements of PPV and PVI were simultaneously performed before and after a fluid challenge with 500 ml tetrastarch 130/0.4 (6%) over 15 min. Transpulmonary thermodilution cardiac index (CI_{TP-TD}) was used to define the positive response to fluid challenge as an increase in CI_{TD} of at least 15%.
The discrimination of both PPV and PVI in predicting fluid responsiveness was compared by performing areas under the receiver operating characteristics curves (ROC_{AUC}). Sensitivity analyses were conducted after exclusion of patients with a low perfusion index (PI), patients receiving norepinephrine, and patients with infra-clinic right ventricular dysfunction (RVD) assessed by echocardiography.
Results: Fifty-seven (71%) patients were responders and twenty-three (29%) were non-responders. Seven patients were excluded because of abnormalities in cardiac rhythm or technical reasons. ROC_{AUC} were 0.73 [95% CI: 0.63-0.83] *vs.* 0.60 [95% CI: 0.48-0.71] for PPV and PVI in the whole cohort of patients.The limits of the grey zone were 7% to 17% for PPV values and 9% to 23% for PVI values. The inconclusive class of responses included 47 (59%) and 62 (77%) patients, respectively ($P=0.010$).
Whereas the discrimination of PVI remained low whatever the subgroup of patients, the discrimination of PPV markedly increased after exclusion of patients with PI $\leq$ 1.3 (ROC_{AUC} = 0.83 [95% CI: 0.68-0.93]) and patients with RVD (ROC_{AUC} = 0.85 [95% CI: 0.67-0.95]).
CONCLUSIONS. PVI is not discriminant and probably useless to predict fluid responsiveness after conventional cardiac surgery. The discrimination of PPV is globally poor, but could be markedly improved after exclusion of patients with a low PI and/or infra-clinic RVD.
References:
1. Br J Anaesth 2008; **101**: 200-6

3AP3-6

Comparison of the continuous noninvasive Nexfin monitoring system with conventional invasive methods to measure arterial blood pressure in high risk hip surgery

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Background and Goal of Study: Invasive blood pressure measurement is considered standard of care for high risk patients undergoing hip surgery. However, invasive measurements are associated with possible complications like infections, bleeding, arrhythmias, limb ischemia or patient discomfort. The goal of the study is to evaluate the validity of noninvasive arterial blood pressure measurements obtained by the volume clamp method through a finger pneumatic cuff using the Nexfin device (Edwards Life Sciences) in comparison with those obtained by invasive measurements and standard NIBP measurement.
Material and methods: We included 20 patients (49-82 yr, 9men) undergoing elective high risk orthopedic hip surgery. Systolic, diastolic and mean arterial pressures were simultaneously collected at 6 data points using an arterial radial catheter, a standard NIBP cuff and the Nexfin device. Bland-Altman analysis was used to compare bias, limits of agreement and percentage error. Correlations were determined by Pearson coefficient.
Results and Discussion: Bland-Altman plots showed good agreement between Nexfin and the invasive arterial blood pressure measurements. Mean bias of Nexfin compared to invasive measurement for systolic, diastolic and mean arterial pressure was demonstrated to be 5.2 (95% limits of agreement -25.9 to 36.3, percentage error 25%), -5.1 (-29.1 to 19.0, 33%) and -0.8 (-25.0 to 23.5, 27%) mmHg respectively. Pearson correlation coefficient was 0.81, 0.65 and 0.75 in the same measurements.
Agreement between NIBP measurements compared to invasive measurement was less reliable. Especially there was a systematic trend to underestimate invasive blood pressure using NIBP measurements. Mean bias for systolic, diastolic and mean arterial pressure was 9.5 (95% limits of agreement -17.4 to 36.4, percentage error 22%), 5.0(-17.1 to 27.1, 33%) and 12.9 (-12.0 to 37.8, 30%) mmHg respectively. Pearson correlation coefficient was 0.85, 0.62 and 0.70.
Conclusion: The non-invasive Nexfin device is a promising tool for continuous arterial blood pressure measurement in high risk hip surgery patients. Our study showed that blood pressure measurement with this device is safe, reliable and showed a good agreement with the invasive method. In contrast the standard NIBP measurement showed a higher bias and limits of agreement. The NIBP measurement might therefore expose patients to unnecessary vasoactive treatment in cases of false low blood pressure.

3AP3-7

Assessment of the Pleth Variability Index (PVI) to guide fluid therapy during renal transplantation

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Background and Goal of Study: Perioperative fluid management has a major impact on early graft function in kidney transplantation and a direct relationship with morbidity and mortality, especially in high-risk patients, has been previously demonstrated. Pleth Variability Index (PVI) is a non-invasive dynamic index derived from plethysmographic variability induced by mechanical ventilation in anesthetized patients. It has been currently used in major surgery to predict fluid responsiveness[1].
The goal of the study was to determine whether PVI accurately predicted fluid responsiveness in patients undergoing kidney transplantation.
Materials and Methods: After written consent, 46 anesthetized patients were included and studied during renal transplantation. Hemodynamic parameters from esophageal Doppler (stroke volume, SV) as gold standard and from PVI were recorded before and after fluid challenges (250 ml of crystalloids). Fluid responsiveness was defined as an increase in SV (ΔSV) of 10% or greater. Subgroup analyses were performed for the first fluid challenge.
Results and Discussion: 194 fluid challenges were realized. 3 patients were excluded for unavailable data for PVI or SV, and 43 challenges due to a Perfusion Index (PI) < 4%[2]. 64 challenges (42%) were considered as responders to fluid challenge. Fluid challenge was associated with a significant decrease in PVI in overall cases (11 [7-16] vs 8 [6-14], $p< 0.001$), but PVI at baseline was not able to discriminate responders (11[8-15] vs 9 [5-15] , $p=0.33$) and non responders (10 [6-16] vs 8 [5-14], $p=0.07$). Area under the ROC (Receiver Operating Characteristic) curve for PVI was not different from 0.5 for overall challenges and for the first fluid challenges. A baseline PVI value of 13 had 62% sensitivity and 36% specificity for predicting a 10% SV increase.
Conclusion: PVI was not an accurate predictor of fluid responsiveness during renal transplantation. Goal directed fluid therapy in that context can better rely on esophageal Doppler.
References:
1. Cannesson *et al. Br J Anaesth* 2008;101(2):200-206
2. Broch *et al. Acta Anaesthesiol Scand* 2011;55(6):686-93

3AP3-8

Comparison of optimised stroke volume and fluid responsiveness measurements from commonly used technologies for perioperative goal directed fluid therapy

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Background and Goal of Study: Goal directed therapy using cardiac output monitoring has been shown to improve postoperative outcomes in surgical patients.
We prospectively compared perioperative stroke volume and preload responsiveness measurements from different cardiac output measurement technologies against concurrent measurements from the oesphageal Doppler.
Material and Methods: Twenty ASA 3 patients undergoing major surgery were fluid optimised using a standard Doppler protocol of 250ml of colloid administered until stroke volume no longer increased by >10%, and again when the measured stroke volume decreased by 10%.
Simultaneous readings of stroke volume (SV), stroke volume variation (SVV) and pulse pressure variation (PPV) from the LiDCO rapid, and SVV from the

Flotrac/Vigeleo were compared to the ODM measurements. The pleth variability index was also recorded.
Patients were classified as responders if a 10% increase in $SV_{Doppler}$ was observed following the administration of a fluid bolus.
Agreement, concordance and correlation of two methods of measuring cardiac output through arterial waveform analyses were assessed against measurements derived from the oesophageal doppler, and we also examined the ability of SVV, PPV, and PVI to predict fluid responsiveness.
Results and Discussion: No correlation was seen in percentage stroke volume change as measured by either the Lidco (r=0.05, p=0.616) or Flotrac (r=0.09, p= 0.363) systems compared to the ODM. Correlation was present between the LiDCO and FloTrac (r=0.515, p< 0.0001). Concordance between the systems was poor as shown on concordance plots.
Percentage error compared to the ODM was 81% for the FloTrac and 90% for the LiDCO. SVV measured by LiDCO differed for responders and non responders (10% vs. 7%. p=0.021), and area under the curve AUC for ROC analysis to predict a 10% rise in stroke volume was 0.57 (95% CI 0.43-0.72) $SVV_{FloTrac}$, 0.64 (95% CI 0.52-0.78) SVV_{LiDCO}, 0.61 (95% CI 0.46 -0.76) PPV and 0.59 (95% CI 0.46 -0.71) PVI.
Conclusions: Stroke volume measurements from the FloTrac and LiDCO rapid systems do not correlate with the ODM. They have poor concordance, and a clinically unacceptable percentage error. The predictive value of the fluid responsiveness parameters is low. Only SVV measured by the LiDCO rapid has clinical utility replicating a Doppler optimisation protocol.

3AP4-1

Monitoring hemodynamic changes following pneumoperitoneum in infants using non-invasive AESCULON impedance

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Background: The AESCULON monitor (Osypka Medical) is a non-invasive method for measuring various haemodynamic parameters continuously using electrical velocimetry. This study measured the haemodynamic changes with pneumoperitoneum in infants using an AESCULON monitor.
Methods: Ten infants younger than 3 years old, scheduled for laparoscopic inguinal hernia repair were enrolled. The following haemodynamic parameters were measured using an AESCULON before (P0) and 1 (P1) and 5 (P5) minutes after pneumoperitoneum: heart rate (HR), mean blood pressure (BP), cardiac index (CI), stroke volume index (SVI), and stroke volume variant (SVV). The operation was performed under general and spinal anaesthesia after slow induction, with tracheal intubation. The anaesthesia was maintained using inhalation agents and propofol infusion without neuromuscular blockade and opioid. The duration of pneumoperitoneum was recorded; the pneumoperitoneum pressure was 8 cmH_2O and the Trendelenburg position (8-degree angle) was used.
Statistics: The baseline characteristics are given as median values and the hemodynamic parameters as mean values. The t-test was used to compare median values before and after pneumoperitoneum. A P-value < 0.05 was considered significant.
Results: The ten infants had a median age of 7.5 (range 6.9-32.7) months. The mean BP was 49, 53, and 55 at P0, P1, and P5, respectively, and differed significantly between P0 and P1 (P=0.046) and P5 (P=0.016). With the AESCULON, SVV was 10, 8, and 8% at P0, 1, and 5, respectively, and decreased significantly between P0 and P1 (P=0.034) and P5 (P=0.039). HR, SVI, and CI did not differ significantly between P0 and P1 or P5.
Discussion and conclusion: The increase in mean BP without an increase in CI confirmed that the systemic vascular resistance increased. And the increase in SVV is thought to be due to increased vascular blood volume, although this is not certain as the central venous pressure was not monitored. It was considered to be due to vascular compression and blood squeezed out of the splanchnic circulation. In a prospective study, few adverse cardiopulmonary effects occurred in infants during pneumoperitoneum. The results in this study were identical to previous reports. This non-invasive device can be used for an objective assessment of hemodynamic trends.

3AP4-2

Real-Time 3D TEE - a tool for experts only? Mitral valve evaluation in a multicenter study

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Background and Goal of Study: Real-Time three-dimensional (3D) transesophageal echocardiography (TEE) has been claimed to provide more information than two-dimensional (2D) TEE in the localization of mitral valve prolapse (MVP). The studies have all been performed by one or two experienced echocardiographers without accounting for individual differences in training or expertise.
This multicenter study has been designed to assess the reproducibility of 3D TEE examinations and to explore differences between experts and inexperienced echocardiographers in localizing MVP using 2D and 3D TEE.
Materials and Methods: 36 observers from ten institutions in Germany and Switzerland interpreted the same intraoperatively acquired 2D and 3D TEE images from six patients, which were selected to represent a large spectrum of MVP diversity. Informed patient consent and permission of the local ethics committee were obtained. Surgical findings served as reference. Individual performance in the prediction of pathology was scored. Agreement was analysed by applying a mulit-rater kappa statistic. Differences between 15 experts and 21 beginners in TEE were assessed and the benefits conferred by 3D TEE were compared.
Results and Discussion: The accuracy of both experts and beginners was significantly higher when interpreting 3D TEE compared to 2D TEE images ($p \leq 0.001$). The experts were superior in 2D MVP localization ($p \leq 0.001$), a difference which diminished with 3D TEE (p=0.41).
The benefit from using 3D TEE images for MVP localization was greater for inexperienced echocardiographers compared with the experts (p< 0.001). Interobserver reproducibility of MVP evaluation with 3D TEE was substantial (κ>0.6) for both study groups, and stronger than reproducibility of 2D TEE interpretations.
Conclusions: By evaluating the agreement among 36 echocardiographers, we can confirm that the previously reported diagnostic advantage of 3D TEE over 2D TEE in MVP assessment is reproducible. The gain in accuracy can be extended from experts to inexperienced echocardiographers, who benefit from the 3D images to a greater extent than their expert colleagues. 3D TEE should supplement 2D TEE in both training and clinical pratice in order to improve spatial orientation.
References:
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3AP4-3

Validation of cardiac output monitoring using radial artery waveform with transpulmonary thermodilution technique during off-pump coronary artery bypass grafting

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Background: Cardiac index (CI) is a key hemodynamic parameter that can be monitored by thermodilution methods or by minimally invasive techniques including pulse contour analysis (PCA). Recently, a novel system for CI monitoring (ProAQT, Pulsion Medical Systems, Germany) based on PCA without thermodilution calibration has been developed, requiring validation in different clinical settings. The aim of our study was to evaluate the accuracy of CI monitoring from the radial artery based on the ProAQT technique against transpulmonary thermodilution (TPTD) using the femoral artery in off-pump coronary artery bypass grafting (OPCAB).
Materials and Methods: Eleven patients with an ejection fraction > 35 % undergoing elective OPCAB were enrolled into a prospective ongoing study. All patients received catheterization of the radial artery for the measurement of CI both with autocalibration ($CI_{AutoCal}$) and without autocalibration using PCA (CI_{PCA}) (Pulsioflex, Pulsion). In parallel, the femoral artery was canulated for the CI_{TPTD} monitoring (PiCCO2, Pulsion).
The measurements were performed after induction of anesthesia, after sternotomy, at the restraint of the heart, after restoration of coronary blood flow, at the end of surgery, and at 2, 4, 6 and 24 hrs postoperatively. The agreement between methods of CI monitoring and the hemodynamic trends (CI) were

assessed using correlation (Pearson's or Spearman's tests where appropriate) and Bland-Altman analysis with percentage error calculation.
Results and Discussion: In total 99 pairs of data were analyzed. There was a significant correlation of CI_{TPTD} with $CI_{AutoCal}$ (r = 0.803) and CI_{PCA} (rho = 0.664) ($p < 0.01$). According to Bland-Altman analysis, the mean bias between CI_{TPTD} and $CI_{AutoCal}$ was -0.11 L/min/m2, 1.96 SD: ± 0.86 L/min/m2 with percentage error of 30.9%.
The mean bias between CI_{TPTD} and CI_{PCA} was -0.15 L/min/m2, 1.96 SD: ± 1.13 L/min/m2 with percentage error of 40.6%, respectively. Trends of absolute changes in CI measured by TPTD (ΔCI_{TPTD}) and autocalibration ($\Delta CI_{AutoCal}$) also demonstrated better correlation (rho = 0.604) compared with the relationship between ΔCI_{TPTD} and ΔCI_{PCA} (r = 0.548) ($p < 0.01$).
Conclusion: In coronary surgery, CI obtained by automatic calibration from the radial artery waveform correlates well with CI obtained by the thermodilution technique. Due to an increased percentage error, CI measured by PCA during OPCAB should be calibrated before hemodynamic optimization.

3AP4-4

Assessment of a new continuous capnodynamic method for CO estimation in a porcine lung injury model

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Background and Goal of Study: It is of great importance to monitor cardiac output (CO) during high-risk surgery and in critically ill patients, and there is a need for reliable and feasible methods for CO estimation. We have developed a continuous capnodynamic method (CO_{EPBF}) based on an alternating breathing pattern in the ventilator, showing excellent trending ability during hemodynamic interventions in lung healthy pigs[1].
We wanted to further assess CO_{EPBF} in a porcine model of lung injury.
Materials and Methods: The test method was evaluated in 10 pigs (30-39 kg). Lung injury was induced with repeated lung lavages[2]. CO and other hemodynamic data were recorded at baseline, and during caval occlusion and dobutamine infusion at PEEP levels of 5 and 12 cm H_2O. An ultrasonic flow probe placed around the pulmonary artery was used as the reference method. Agreement and trending ability were determined using Bland Altman and four quadrant plot methodology.
Results and Discussion: Baseline CO was 3.6 L/min, and varied from 1.6 to 5.8 L/min during interventions. CO_{EPBF} had a tendency to underestimate CO at PEEP 5, and to overestimate CO at PEEP 12. Mean difference between methods (bias) varied from - 0.6 to 1.8 L/min at different hemodynamic conditions and PEEP levels, and the percentage errors were 46-70%. Trending ability was reliable with a concordance rate of 97 % (n=31, with a 15 % exclusion zone of central data applied).
Conclusion(s): The new capnodynamic method showed poor agreement for absolute CO values in a setting of lavage induced lung injury, probably due to an increase in pulmonary shunt blood flow. However, trending capacity remained reliable with a high concordance rate between methods.
References:
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3AP4-5

A validation study of a novel continuous capnodynamic method for cardiac output assessment during mechanical ventilation

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Background and Goal of Study: It is important to be able to monitor cardiac output (CO) during high risk surgery and in critically ill, mechanically ventilated patients. Pulmonary Artery Catheter (PAC) thermodilution has been the gold standard method in these patients, but due to its invasiveness, its use has declined. There is a need for less invasive, validated and feasible methods for CO monitoring. CO could be determined from endogenous carbon dioxide (CO_2) measurements, applying the differential Fick method.
We have developed this concept by inducing an alternating breathing pattern in a ventilator, causing periodic variations in end-tidal carbon dioxide, from which the effective pulmonary blood flow (EPBF) could be derived by analysing data from a sequence of breaths.
Materials and Methods: The new method (CO_{EPBF}) was investigated in 10 healthy pigs during hemodynamic alterations, i.e. changes in preload (caval occlusion and volume loading), afterload (infusion of vasopressor and vasodilator), CO increase (dobutamine) and decrease (bleeding). An ultrasonic flow probe placed around the pulmonary artery was used as reference method. PAC (boluses method) was also tested in this study (CO_{PAC}). CO and other hemodynamic data were recorded before and during each intervention. Bias and agreement for absolute values, as well as its accuracy to track changes in CO were determined using Bland Altman and polar plot methodology.
Results and Discussion: CO was altered from 1.2 to 4.9 (mean 2.6) L/min. CO_{EPBF} and CO_{PAC} showed equally good agreement, with a tendency to overestimate CO with a mean difference (bias) ranging from -0.44 to 0.07 l/min. The percentage error for CO_{EPBF} ranged from 24 to 68 %, with the lowest values seen during dobutamine infusion. The concordance for tracking changes in CO for CO_{EPBF} and CO_{PAC} was 97% and 95% respectively, with an exclusion zone of 15 % and radial limits of ± 30°.
Conclusion(s): CO_{EPBF} showed excellent trending abilities and high concordance rates, equivalent to CO_{PAC}. CO_{EPBF} also showed an acceptable mean bias in a variety of hemodynamic states. Further studies in animal models of lung injury, and in high risk surgery patients are warranted.

3AP4-6

Validation of the novel recursive method of non-invasive cardiac output monitoring based on the reverse Fick's principle

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Background and Goal of Study: Accurate noninvasive monitor of cardiac output is highly desirable. Pulmonary artery catheter thermo-dilution (COTD) is considered to be clinical "gold standard" but it is highly invasive.
We developed a novel, automated, continuous and noninvasive CO monitor (CONI) based on the respiratory "reverse Fick's" principle. Our goal was validation of CONI against COTD in experimental model of liver transplant (LT).
Materials and Methods: This study was approved by the animal care committee, and was conducted according to the Canadian Council on Animal Care guidelines. We studied 8 pig undergoing LT under general anesthesia without using V-V bypass.The computer controlled gas blender (RespirAct™, Thronhill Research Inc., Toronto; Canada) was interposed into the inspiratory limb of the ventilator circuit. RespirAct™ administered a precise bolus of carbon dioxide (CO2) into the inspired gas to increase stepwise VCO2. A single breath bolus of CO2 was administered to elevate the end-tidal partial pressure of CO2 (PETCO2).
An estimated value of CO was used to calculate (according to the "reverse Fick's" principle) the inspired fraction of CO2 required to maintaining the increment in PETCO2 for three subsequent breaths (before "recirculation"). If PETCO2 rose stepwise and remained unchanged for three subsequent breaths, the estimate CO was correct. If PETCO2 drifted (up or down), the estimated value of CO is refined based on the magnitude and direction of the drift. The gas challenge had been automatically repeated each minute until the estimate of CO converged to the actual value. Simultaneously COTD measurements were obtained as the average of 4 consecutive boluses of ice-cold saline. Outstanding TDCO curves were excluded. COTD was measured each 5 minutes and CONI and other hemodynamic data continuously during the dissection, un-hepatic, and reperfusion phases of LT.
Results and Discussion: Total of 165 paired measurements were obtained. Linear regression revealed the equation CONI = 0.69·COTD + 0.65 with a correlation coefficient of 0.89. Bland-Altman plot showed a bias of -0.20 L/min with 95% limits of agreement -1.09 to 0.69 L/min. Results of our study showed that comparing to COTD the studied CONI demonstrated clinically acceptable bias and precision in wide range of changes of CO during LT.
Conclusion: CONI might be considered to using interchangeable with COTD. Further validation is required in different animal and clinical setups.

3AP4-7

Traditional monitoring of cardiac output with pulmonary artery catheter vs. PiCCO during liver transplantation: interchangeable?

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Background and Goal of Study: Liver transplantation (LT) implies regular hemodynamic instability, making invasive monitoring of cardiac output (CO) mandatory. Intermittent thermodilution with *Pulmonary Artery Catheter* (PAC-Edwards Lifesciences) remains the Gold Standard to measure CO. The agreement of results between PAC and new measurement methods in LT needs to be further investigated. The aim of our study is to clarify whether Cardiac Index (CI) measurements with *PICCO2* (Pulsion Medical Systems) or *Vigilance II* (Edwards Lifesciences) devices agree sufficiently with those performed intermittently with PAC to be considered interchangeable in LT.
Materials and Methods: We studied prospectively hemodynamic parameters of 63 consecutive patients undergoing LT. Each CI was obtained simultaneously with three different techniques: intermittent *(PACi)* and continuous *(PACc)* pulmonary artery thermodilution with PAC, and transpulmonary thermodilution with PiCCO2 *(PCCI)* in 8 key moments of the procedure (base values, 10 minutes after portal clamping, 10 minutes before and after inferior vena cava clamping, 10 minutes before and after reperfusion, 60 minutes after reperfusion, and at the closure of the abdomen). 1171 paired measurements were obtained. Only patients undergoing retransplantation were excluded. Data was analyzed with SPSS ver.17, and to assess agreement we used *Intraclass Correlation Coefficient (ICC)* and *Bland Altman* method.
Results and Discussion: The analysis of agreement between *PACi* and *PCCI* measurements (n=409 paired measurements) showed Intraclass Correlation Coefficient (ICC)=0.74, bias=0.46 l/min/m^2 with 95% confidence interval (IC_{95}) from 0.37 to 0.54, and agreement limits (AL) from -1.30 to 2.21. *PACi-PACc* comparisons (n=373) showed ICC=0.65, bias=0.068 l/min/m^2 (IC_{95}: -0.18 to 0.04) and AL from -2.03 to 2.17. The analysis of *PCCI and PACc* (n=389) revealed ICC=0.63, a bias of 0.37 l/min/m^2 (IC_{95}: 0.26 to 0.49) and AL from -2.59 to 1.84. These results demonstrated that *PCCI* has good statistical agreement with *PACi* and moderate agreement with *PACc*, while statistical agreement between *PACi* and *PACc* is moderate.
Conclusions: Monitoring cardiac index in patients undergoing liver transplantation can be performed both with PAC for intermittent pulmonary artery thermodilution, as well as with PiCCO2. Therefore, clinical decision on monitoring choice should be based on the rest of parameters provided by each device.

3AP4-8

Assessing accuracy of a non-invasive monitor for cardiac output, compared to the LiDCOrapid: the polar plot method

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Background and Goal of Study: Recently we assessed the agreement between two minimally invasive monitors for Cardiac Output (CO), using a new method based on plotting the data in a polar chart, and comparing the results with the classic Bland-Altman method. We are repeating the experience now, comparing a minimally invasive CO monitor to a non-invasive one.
Materials and Methods: After obtaining informed consent, patients submitted to microvascular flap reconstruction were contemporaneously monitored with Lidco Rapid (LiDCOr), an uncalibrated pulse contour-based device, and estimated continuous cardiac output (esCCOTM) derived from pulse wave transit time (PWTT), a complete non-invasive method. Measurements were registered before and after standardized interventions (volume loading, vasoconstrictor or vasodilator infusion, epidural infusion, etc). Pairs of measurements were evaluated by Bland-Altman analysis and percentage error (PE) was calculated. Polar plot method was applied as well; the central zone limit was set to 0,3 l/min/m2 because Cardiac Index (CI) instead of CO was considered. CI and θ angle (θ) are expressed as mean(±standard deviation(95%limits of agreement)).
Results and Discussion: 5 consenting patients were included in the analysis. The number of recorded measurements was 62. Mean CI was 2,78 (±0,65(2,62-2,94)) l/min/m2 for LiDCOr and 2,92 (±0,63(2,76-3,08)) l/min/m2 for esCCOTM. Mean bias was 0,14 (±0,53(0,4-0,66)) l/min/m2. PE was 23% for LiDCOr and 21% for esCCOTM. PE between monitors was 31,6%. A total of 31 ΔCI was calculated for each monitor. After building the polar plot, 12 pairs of ΔCI were discarded, being the correspondent mean value < 0,3 l/min/m2. 16 of the remaining 19 pairs presented a θ angle < 30º from the line of identify. Mean θ was 24,05(±29,2(10,9-37,2))º.
Conclusion(s): According to Bland-Altman analysis, the PE between LiDCOr and esCCOTM is almost acceptable, although we reported a lower accuracy of LIDCOr. According to polar plot, results were even better, presenting a mean θ angle abundantly under 30º, although variability was marked.
References:
1. R. Schiraldi, et al. Eur J Anaest 2012; 29 suppl. 50:38.
2. Critchely LA, et al. J Cardiothorac Vasc Anesth 2011; 25(3):536-46.

3AP5-1

Metahemoglobinemia detected during general anesthesia - a case report

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Background: Methemoglobinemia is a hereditary or adquired disorder characterized by the presence of higher than normal levels of methemoglobin ([Fe^{3+}] rather than ferrous [Fe^{2+}] hemoglobin in the blood. Methemoglobinemia may occur as an idiosyncratic reaction to an exposure to drugs such as nitrites.
Case report: We present this case of a 38-year-old man who had to have emergency surgery due to traumatic colonic perforation. On examination the patient had a “blue” skin colour, normal blood pressure and heart rate and a respiratory rate of 18/min. Pulse oximetry revealed an oxygen saturation (SpO2) of 85% even after a 36% FIO2. Chest x-ray was normal. After tracheal intubation and controlled ventilation with FiO2 50% an arterial catheter was placed for continuous hemodynamic monitoring and arterial blood gas analysis. The first arterial blood sample had a chocolate brown colour and the CO-Oximeter showed a methemoglobin level of 31%. Methylene blue (1 mg/kg over 3 minutes) was administrated. The methemoglobine level dropped to 13,6%. A second dose of methylene blue was give achieving a further reduction and the cyanosis disappeared. Pulse oximetry revealed an increase in saturation to 100% (table 1). The operation was completed without any decrease in oxygen saturation and no other complications. One day after the surgery, we asked the patient for the causative agent of his metahemoglobinemia and we found out that he had taken amyl nitrite.
Discussion: Methemoglobinemia should be suspected in patients with cyanosis and low pulse oximetry reading with no apparent respiratory or cardiovascular problems which could explain the oximetry. The pulse oximeter uses 2 wavelengths, 660 nm and 990nm, to calculate oxygen saturation because the absorbance difference between oxyhemoglobin and deoxyhemoglobin is maximized. Methemoglobin has the same extinction coefficient as oxyhemoglobin and deoxyhemoglobin so it may affect oxygen saturation measurements by pulse oximeter. Co-oximetry has the ability to measure light absorbance at four different wavelengths, and therefore distinguishing between the different hemoglobin types (desoxyhemoglobin, oxyhemoglobin, carboxyhemoglibin and methemoglobin). Apart from the removal of the drug, the treatment of choice is the iv administration of methylene blue.
References:
Laura Hunter. Methaemoglobinaemia associated with the use of volatile nitrites:a review BJCP2011.
Learning points: Understanding pulse oximetry,SpO2 concepts.

3AP5-2

Influence of peripheral perfusion index on accuracy of noninvasive hemoglobin monitoring (SpHb)

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Background and Goal of Study: Noninvasive hemoglobin monitoring (SpHb) allows continuous measurement of hemoglobin concentration, facilitates earlier detection of hemorrhage and guides decisions on transfusion. However, this monitoring method does not accurately represent serum hemoglobin levels when pulse oximetry perfusion index (PI) is low, as in severely injured trauma patients or cardiovascular intensive care unit patients.
Spinal anesthesia is the preferred technique for trans-urethral resection of the prostate (TUR-P). However, together with TUR-P irrigation it causes intraoperative hypothermia, which added to bleeding-related hypovolemia, leads to impaired tissue perfusion.
We aimed to test the hypothesis that SpHb values collected from a toe with higher PIs than those collected from a finger more accurately match total hemoglobin (tHb) concentrations of the venous blood collected during TUR-P under spinal anesthesia. The accuracy of SpHb measurements with different peripheral PIs was evaluated by comparison of SpHb values with tHb values measured by laboratory CO-Oximetry.

Materials and Methods: Twenty adult patients undergoing TUR-P under spinal anesthesia were enrolled. SpHb and peripheral PI were monitored at a finger and a toe using the Masimo Radical 7 Pulse Co-Oximeter. Venous blood samples were analyzed using a laboratory CO-Oximeter. SpHb and tHb data were collected before and after the TURP operation. SpHb-tHb differences were compared between the finger group and the toe group. PI values obtained at the time of each the hemoglobin bias (SpHb-tHb) measurement were compared and correlation between them was also studied.
Results and Discussion: Finger SpHb displayed a significant positive bias during TUR-P under spinal anesthesia. The toe SpHb bias was significantly lower compared to the finger SpHb bias when the finger PI finger was low (< 2). The strongest correlation between SpHb and tHb values was observed in patients with adequate peripheral perfusion suggesting that low tissue perfusion affects accuracy of SpHb monitoring.
In patients undergoing spinal anesthesia, the accuracy of SpHb measurements appears to be better for toe than for finger due to higher peripheral PIs at the lower extremity.
Conclusion(s): The differences between SpHb and tHb were smaller when perfusion index was higher. For accurate SpHb measurements areas with higher perfusion indexes should be selected.

3AP5-3

In-vivo visualization of pulmonary capillary perfusion using probe-based confocal laser scanning endomicroscopy in pigs

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Background and Goal of Study: In-vivo imaging of pulmonary perfusion such as positron emission tomography, single photon emission computed tomography or computed tomography demand the use of radiation. Probe-based confocal laser scanning endomicroscopy (pCLE) is already being used in clinical settings as a real-time in-vivo imaging tool for alveolar structures. The goal of this study was to visualize pulmonary capillary perfusion using pCLE through an endotracheal access.
Material and methods: A pCLE, providing an excitation wavelength of 488nm and a collection bandwidth of 500 to 650nm, was used in 5 pigs (CellVizio®, Mauna Kea Technologies, France). The field of view is 600μm in diameter at a temporal resolution of 9 frames per second. All animals were anesthetized and controlled ventilation was provided through tracheotomy. The pCLE was placed via a bronchoscope in three pre-defined lung areas (ventral, middle and dorsal lobe) and a selective bronchoalveolar lavage with 20ml of sodium-chloride solution was performed to reduce intraalveolar mucus. Fluoresceine isothiocyanate (FITC) dextran (SigmaAldrich, Austria) and FITC-labeled red blood cells were injected into the pulmonary circulation to visualize capillary blood flow. Repetitive videos were recorded during a lung protective ventilatory (LPV) regimen as well as during continous positive airway pressure (CPAP) of 10 mbar.
Results and Discussion: Pulmonary arterioles, capillaries, and venules could be vizualized in-vivo in pre-defined lung regions. A perfusion index and capillary vessel to lung tissue ratio was calculated for each region. During LPV regimen, capillary blood flow increased during expiration and decreased during inspiration. During CPAP, pulmonary capillary blood flow stopped or oscillated in some lung areas.
Conclusion: Pulmonary capillary perfusion can be visualized using fluorescent agents that match the excitation and collection wavelength of pCLE. This promising approach may allow for in-vivo dynamic assessment of pulmonary microcirculation during mechanical ventilation using a non-invasive endotracheal approach.
Further procession of the acquired images needs to be done to investigate possible clinical and/or fundamental research applications.

3AP5-4

The ultrasonographic assessment of optic nerve sheath diameter during robot-assisted laparoscopic prostatectomy: a preliminary study

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Background and Goal of Study: The steep Trendelenburg position and pneumoperitoneum during Robot-assisted laparoscopic prostatectomy (RALP) have the potential to cause an increase of the intracranial pressure. Previous studies have proposed that ultrasonographic measurements of the optic nerve sheath diameter (ONSD) correlate with signs of elevated ICP. Therefore, the purpose of this study was to confirm the increased ICP by ultrasonographic measurement of ONSD after the steep Trendelenburg position and pneumoperitoneum during RALP.
Materials and Methods: The ultrasonographic measurements of ONSD were performed before anesthesia induction (T0), 10 minutes after anesthesia induction (T1), 10 (T2) and 30 (T3) minutes after steep trendelenburg position and pneumoperitoneum, and 10 minutes after supine position and CO2 desufflation (T4). A thick layer of gel was applied on the upper closed eyelid. The linear 13- to 6-MHz ultrasound probe was then placed in the gel, without exerting pressure on the eye. For each optic nerve, four measurements were taken: two in the transverse plane with the probe being horizontal and two in the sagittal plane with the probe being vertical. The final ONSD was the mean of the eight values obtained for each patient (transverse and sagittal plane for both eyes)
Results and Discussion: Fifteen patients were examined by ultrasound. All patients showed changes of ONSD after steep trendelenburg position and pneumoperitoneum. The mean values of ONSD in T2 and T3 were significantly increased when comparing with that in T0 [5.3 ± 0.3 mm (T2) and 5.3 ± 0.2 mm (T3) vs 4.5 ± 0.3 mm (T0), p = 0.005 and p = 0.003].
Conclusion(s): In this preliminary report, the elevated ICP after the steep Trendelenburg position and pneumoperitoneum during RALP was confirmed by ONSD enlargement.

3AP5-5

Noninvasive hemoglobin monitoring: absolute and trend accuracy and impact on blood management

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Background and Goal: The aim of this study was to determine the absolute and trend accuracy of continuous, noninvasive hemoglobin monitoring by Pulse CO-Oximetry (SpHb) compared to laboratory measurements (tHb) and to evaluate SpHb monitoring impact on red blood cell (RBC) transfusions in high blood loss surgery.
Methods: Controlgroup (n =61) received typical anesthesia care including estimated blood loss (EBL) assessment and intraoperative Hb measurements from the central lab. Blood samples were taken when EBL was ≥15% of total blood volume. RBC transfusion was initiated if Hb was ≤10 g/dL and continued until the EBL was replaced and Hb >10g/dL was confirmed.SpHb group (n = 45) was monitored with a Pulse CO-Oximeter and SpHb sensor (Radical-7,ver 7748, R2-25 adult ReSposable sensor rev “E”, Masimo, Irvine, CA) and the same transfusion practice was followed except the anesthesiologist was guided by the addition of SpHb. Lab values were taken pre and posttransfusions. Bias ±SD of SpHb compared to tHb was calculated. Scatterplot of consecutive changes in SpHb to tHb was used to assess trend. The mean±SDof the% of patients transfused, amount of blood transfused per patient, change from pretransfusiontHb to post transfusion tHb and time to transfusion after the need was established (transfusion delay) were calculated. Potential cost saving resulting from reduced blood usage per 1000 surgeries was estimated.
Results: Bias±SD from 83 SpHb-tHb data pairs was 0.03±0.8 g/dL. Trend plot had a R^2 of 0.96 demonstrating excellent trend accuracy. There was no difference in the number of patients transfused (p=0.700) or in pretransfusiontHb values (p=0.385), but the difference in the average units transfused in all patients (0.9units; p< 0.001) and transfused patients (1.6 units; p=0.004) and the change in tHb pre to post transfusion(0.75 g/dL; p=0.02) differed significantly. The transfusion delay was 50.2±7.8min in the Control group and 9.2±0.7 min in SpHb group (p< 0.001). Using activity based costs[1], our hospital could save between $469,800 -$1,064,700 per 1000 surgeries performed.
Conclusions: SpHb monitoringshowed excellent trending compared to lab measurements and when added tostandard practiceresulted in a significant decrease in the amount of RBCs transfused. Based on the RBC reduction shown, SpHb monitoring could improve patient care and safety and significantly reduce costs.
Reference:
1. Shander et al. *Transfusion*. 2009;**50**:753-65.

3AP5-6

Non-invasive detection of hemoglobin concentration by pulse CO-oximetry in severely traumatized patients

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Background and Goal of Study: Using transcutaneous spectrophotometry the Masimo Radical-7 (Masimo Corp., USA) Pulse CO-Oximeter non-invasively computes hemoglobin concentration (SpHb)[1]. SpHb was compared to Co-Oximiter readings (tHb) of arterial samples in trauma surgery patients.
Materials and Methods: Twenty six patients were enrolled. Masimo R1 25L (Revision F) adult adhesive sensors were attached to the ring finger of the hand where the arterial canula was placed. Before start and every 30 min until end of surgery SpHb and corresponding tHb values were documented. Linear regression and Bland Altman Plot analysis was performed to determine correlation and agreement between the two methods. Sensitivity and specificity of changes in SpHb to predict changes of Hb were calculated. Multivariate regression analysis was performed to identify significant predictors of SpHb bias.
Results and Discussion: A total of 102 data points were analyzed. Simple regression analysis for correlation showed a correlation coefficient (r) of 0.85 and a coefficient of determination (r^2) of 0.73. The mean difference of tHb and SpHb was -0.9 g/dL with a standard deviation of 1.13g/dL. Bland Altman analysis showed a mean bias (with limits of agreement) of -0.9 (+1.36; -3.16) g/dl (Fig 1). Sensitivity and specificity to detect changes of tHb was 0.50 and 0.74 and 0.59 and 0.83 for changes over 0.5g/dL. The correlation coefficient for trend accuracy was 0.57 and r^2 0.32 (Fig 2). Removal of clinically irrelevant changes < 0.5 g/dL resulted in an r value of 0.65 and an r^2 of 0.43. Significant predictors ($p < 0.05$) for the bias were CVP ($r = 0.534$; $p < 0.0001$) and subject position (supine, prone) with $p = 0.045$.
Conclusion(s): SpHb strongly correlated with tHb values, but agreement was moderate with considerable overestimation the Hb by SpHb, which could be corrected with the new in vivo adjustment feature. Trend accuracy was moderate but significant and improved with removal of clinically irrelevant changes in reference values below 0.5 g/dL. Additional refinements to the current technology are necessary to further improve performance of noninvasive Hb measurement.
References:
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3AP5-7

Cerebral oximetry probes-associated skin burns in pediatric patients

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Background: This article, aims to present two pediatric cases who endured skin burn complications while monitoring cerebral oxygen with In Vivo Optical Spectroscopy (INVOS) the skin probes being used in these two cases were being for the second time.
Case report:
Case 1
A 50-day old baby boy weighing 3 kg with left hypoplastic heart syndrome and being followed in the intensive care unit (ICU) ; however, as there were no disposible electrodes remainining in the facility and due to the urgentcy of the situation electrodes that were used once previously were applied for use a second time. The nurse soon identified first degree burns around the area surounding the electrodes.
Case 2
A 5.5 month-old baby boy weighing 4.3 kg. Complete atrio-ventricular septal defect and double outlet right ventricle were detected. Doctors who were not aware of the first case applied a previously used probe to the pediatric patient for cerebral oxygen monitoring. Upon noticing a burning smell, an intensive care unit nurse identified a first degree burn around the right frontal region were the electrode was attached to this skin.
Discussion: Cerebral oximetries are newly introduced devices to anesthesia practice and have gained increasing popularity in recent years. Although some studies conducted with INVOS© cerebral oximetries exist, we were unable to locate reportings of skin burns caused by electrodes. While the INVOS user's manuel reportes that pressure sores can occur as a result of the application of tight bandages, skin burns are not mentioned as possible complications.The burns identified in our cases may have been due to the infants' susceptibility to injury resulting from their low cardiac output, poor peripheral circulation and poor heat dissemination. Because both our patients had congenital heart anomalies and poor peripheral circulation and were using inotropic agents, it can be concluded that such factors may participet to the formation of skin burns. Skin burns may result various causes and in our opinion the reuse of previously used electrodes may be one of them. Based on our experiences with these two cases, it is possible to say that at most care must be taken in dealing with patients suffering from such kind conditions.
Learning points: In our opinion, the reuse of already used probes especially in the case of children who have less subcutaneous adipose tissue than adults can be hazardous.

3AP5-8

Post-operative imaging of the intestinal microcirculation

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Background and Goal of Study: Sidestream Dark Field (SDF) imaging was introduced recently to study the sublingual microcirculation in humans. Patients with ileostomies offer a unique access to the intestinal microcirculation. To date, no reference ranges for standard microcirculatory parameters of the gut are available. Therefore, the aim of our study was to establish a database for postoperative microcirculatory parameters for ileostomies.
Materials and Methods: For this observational prospective cohort study 77 patients were screened. In total, 165 SDF measurements could be obtained. All patients included had bowel surgery for chronic inflammatory bowel disease or intestinal malignancies and received an ileostomy. Patients were excluded if they had signs of local infection or bleeding, or if they were admitted to ICU for sepsis or peri-operative complications. The SDF device was gently inserted into the stoma at a depth of 3-4 cm, and five real time images were recorded. All videos recorded were analyzed off-line using AVA® software (Microvision Medical, Amsterdam). The following parameters were quantified: microvascular flow index (MFI), total vessel density (TVD), perfused vessel density (PVD), and proportion of perfused vessels (PPV). Patients were followed 3 days post surgery with 5 images captured every day.
Results and Discussion: We were able to capture clear images of the small intestine microvasculature. Distinct villi were visible with a dense network of microvessels (diameter: 6-17 micrometers). Mean TVD (± 2SD) was 19.3 (± 1.0) mm/mm2, PVD: 18.5 (± 1.1) mm/mm2, PPV: 94.5 (± 5) % and MFI: 2.8 (± 0.1). Patients age, sex and co-morbidity had no significant impact on post-operative micro-vascular parameters. No significant changes of the micro-vascular parameters were observed during the first 3 post-operative days.
Conclusion(s): SDF imaging is a feasible, non-invasive bed side method to study the post-operative intestinal microcirculation. The established reference ranges are useful for early detection of post-operative local complications and studies of microcirculatory changes induced by systemic pathologies, e.g. in sepsis.
Acknowledgements: This project was funded by NSHRF, Nova Scotia, Canada

3AP5-9

Monitoring of regional oxygen saturation during carotid endarterectomy

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Background and Goal of Study: Cerebral oximetry monitoring based on near-infrared spectroscopy (NIRS) seems to be a promising technique for detection of cerebral ischaemia during carotid endarcterectomy (CEA). However, NIRS has not been validated yet for use in CEA patients and evidence for clear threshold to detect hypoperfusion of the brain is limited. The aim of this study was to assess the ability of regional cerebral tissue oxygen saturation (rSO_2) to predict the development of cerebral ischemia during CEA.
Materials and Methods: 38 consecutive patients undergoing CEA uder deep cervical plexus block were studied. rSO_2 was monitored with INVOS 5100c above both frontal lobes in all patients. Patients were retrospectively assigned to one of two groups: with (Gdef) or without (Gabs) change in neurological status. Baseline value (rSO_2bl), average (rSO_2avg) and minimal (rSO_2min) values during 3 minutes after clamping, and rSO_2 drop after clamping (ΔrSO_2avg and $\Delta rSO_2$2min) were compared between both groups. The influence of contralateral carotid artery stenosis on rSO_2 was assessed by correlation. Data are presented as median (IQR).
Results and Discussion: Neurologic deterioration occurred in 4 patients (Gdef). There was no difference in baseline values on operated side: rSO_2bl was 79 (75-87) in Gabs and 79 (64-90) in Gdef ($p=0.84$). Values of rSO_2 dur-

ing 3 minutes after carotid artery cross clamp were also comparable: $rSO_2$was 74 (65-81) in Gabs and 75 (59-90) in Gdef (p=0.70), the calculated drop ΔrSO_2min was 6 (2-13) in Gabs and 2 (0-6) in Gdef (p=0.15). rSO_2avg and Δ rSO_2avg did not differ between groups either. Similarly, there was no difference between groups on contralateral side. No influence of non-operated (contralateral) carotid artery stenosis on rSO_2 was proved.
Conclusion(s): Neither absolute rSO_2 values nor rSO_2 drop after carotid artery cross clamp differed between patients with and without neurological deficit. rSO2 was not reliable in prediction of cerebral ischemia during CEA.

3AP6-1

Calibrated vein diameter measurement using vein illumination technology

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Background and Goal of Study: Of all invasive medical procedures, venipuncture is the most common but attempts can fail. Difficult draws include those from babies, dark-skinned and obese patients. Hemoglobin in the blood absorbs infrared light. When a vein illumination device such as the AccuVein AV300® (Accuvein Inc Huntington, NY) is held above the skin, veins appear noticeably different than the surrounding tissue aiding in vein location. The goal of the study was to quantitatively assess the vein diameter with and without the AccuVein technology.
Materials and Methods: Digital images of 77 human forearms (ventral side) plus calibration chart were taken using a digital camera, with and without the Accuvein device. All images were planimetrically and colorimetrically calibrated as previously published[1]. During calibration, using uniform illumination and a reference chart as part of the image of interest. The calibration provides a means of transforming the acquired images, to a standard, well-defined colour space i.e. SRGB. Vein diameters were measured using ImageJ, (NIH). Comparison of the two methods were statistically assessed using Passing and Blalock regression and illustrated by a Bland and Altman plot.[2,3]
Results and Discussion: Passing and Blalock regression reveiled a regression equation of: y=-0.09111+1.2593x with a 95% CI of intercept A between -0.2641 and 0.0120 and a 95% CI intercept B between 0.9000 and 1.7727. A Cusum test for lineairity demonstrated no significant deviation from lineairity (P>0.05).
Conclusion(s): Although perceived as a visual aid during puncture, no significant difference of vein diameter was measured. Future research could investigate the influence of different skin colours on the visibility of veins and the success rate of punctures using the AccuVein device.
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3AP6-2

Inspired O_2 concentrations when O_2/N_2O and O_2/N_2 fresh gas mixtures are used at the oxygen ratio controller limits of the Zeus® anesthesia machine

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Background and Goal: The S-ORC hypoxic guard of the Zeus® (Dräger, Lübeck, Germany) is more stringent than required by existing standards. We measured the inspired O_2 fraction (F_IO_2, in %) that resulted from using O_2/N_2O or O_2/N_2 (= air) mixtures in conventional mode with the delivered FO_2 (F_DO_2, in %) set at the S-ORC limit across a wide fresh gas flow FGF range.
Materials and Methods: After IRB approval, 16 ASA I-II patients received sevoflurane in either O_2/N_2O (n=8) or O_2/N_2 (n=8). After using an 8L/min FGF with F_DO_2 = 25% for 10 min, the following S-ORC limits were tested for 4 min each: 0.3[85]; 0.4[65]; 0.5[50]; 0.7[36]; 0.85 [30]; 1.0[25]; 1.25[25]; 1.5 [25]; 2 [25]; 3[25]; 5[25];8 [25]; first number = total FGF (L/min), second number in between brackets =F_DO_2(%). Between combinations, 8L/min FGF with 25% O_2 was used for 4 min. The sequence was studied once with O_2/ N_2, but twice in the same patient with O_2/N_2O (to examine the effect of decreasing N_2O uptake over time), resulting in 3 groups: early N_2O, late N_2O, and N_2 group. If F_IO_2 remained ≥ 21% in all the patients for a particular ORC limit (=FGF [F_DO_2] pair), we report the F_IO_2 after 4 min for that pair. If F_IO_2 became < 21% in even a single patient in a particular FGF[F_DO_2] group, we report the % of patients with F_IO_2< 21%, and the time (min) after which this F_IO_2 % was reached in this subset of patients. Data are presented as average ± standard deviation.
Results and Discussion:

	Early N_2O		Late N_2O		N_2	
ORC limit: FGF[F_DO_2]	Incidence of F_IO_2<21% within 4'	Δt to F_IO_2<21%	Incidence of F_IO_2<21% within 4'	Δt to F_IO_2<21%	Incidence of F_IO_2<21% within 4'	Δt to F_IO_2<21%
L/min[%]	% of pts	min	% of pts	min	% of pts	min
0.3 [85]	0		0		0	
0.4 [65]	0		0		0	
0.5 [50]	0		0		0	
0.7 [36]	0		0		17	3.3 *
0.85 [30]	0		38	3.4 (0.5)	25	2.3 (1.4)
1 [25]	88	2.2 (0.7	100	1.6 (0.5)	100	2.1 (0.8)
1.25 [25]	100	2.1 (0.9)	100	1.4 (0.5)	100	1.6 (0.3)
1.5 [25]	100	2.2 (0.8)	100	1.7 (0.8)	100	2 (0.7)
2 [25]	63	2.7 (0.5)	75	2.3 (0.6)	38	1.5 (0.3)
3 [25]	0		13	3.2 *	0	
5 [25]	0		0		0	
8 [25]	0		0		0	

*[Figure 1. Legend: * = 1 patient only]*

The overall F_IO_2-FGF relationship in the 3 groups was similar (Figure 1): after using a particular FGF for 4 min, F_IO_2 (1) was highest with the lowest FGF (0.3 L/min) [not presented]; (2) progressively decreased when a higher FGF was used [not presented]; (3) became < 21 % in some patients with a 0.7 to 3.0 L/min FGF and < 21 % in all patients with a 1 and 1.25 L/min FGF; and (4) gradually approached F_DO_2 with FGF > 1.25 L/min. In the late N_2O and N_2 groups, F_IO_2 became < 21% faster, and over a wider FGF range. Differences between the late N_2O and N_2 groups were small.
Conclusion: Even a hypoxic guard more stringent than required cannot prevent the formation of hypoxic inspired mixtures.

3AP6-3

Preliminary development and evaluation of a support system for care of mechanically ventilated patients (SCMVP)

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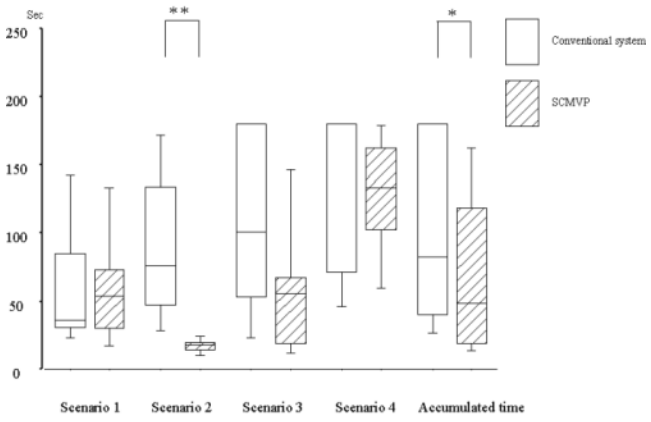
Background and Goal of Study: To ease identification of the site of a respiratory circuit leak, we have developed a novel alarm system, the support system for care of mechanically ventilated patients (SCMVP), which provides graphical information on the site of the leak. We preliminarily evaluated usefulness of the SCMVP prototype in a mechanically ventilated manikin.
Materials and Methods: The SCMVP prototype consists of several components, including a personal computer and sensors for gas flow, CO_2, pressure, and misconnection of respiratory circuits. Integrated information from these sensors is displayed on a panel to indicate the site of leakage. Fifteen registered nurses were recruited to evaluate the respiratory circuit with SCMVP (SCMVP system) and without SCMVP (Conventional system). A manikin was mechanically ventilated in a volume control mode. Its trachea was intubated and lungs were insufflated with CO_2. We developed four leakage scenarios based on near-miss/adverse event reports [1]. The scenarios included a leak at tracheal tube cuff, unplanned extubation. We randomly assigned two scenarios to the Conventional system and the other two scenarios to the SCMVP for each participant. Time to identify the site of leak was measured and compared between two systems using the Wilcoxon signed-rank test.
Results and Discussion: The SCMVP system showed significantly shorter time for troubleshooting in one of four scenarios, a leak at the Y-connector, and shorter accumulated time for troubleshooting compared with the Conventional system. SCMVP resulted significantly more frequent incidences of troubleshooting within 30 sec (43.3% (13/30) with SCMVP vs. 14.4% (4/30) with Conventional). It also showed significantly less frequent incidence of troubleshooting of >180 sec (6.7% for SCMVP vs. 30% for Conventional).



[Comparison of troubleshooting time]
*p<0.05, **p<0.01, vs the Conventional system

Conclusion(s): Our results supported the hypothesis that SCMVP can facilitate rapid and successful recognition of the site of leak in a simulation environment.

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3AP6-4

The importance of the anaesthesia machine and fresh gas flow to provide the highest oxygen concentration as soon as possible without pushing the emergency oxygen button

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Background: During anesthesia care, we do not normally use high concentrations of oxygen in mixed inhaled gas. High oxygen concentration may be necessary in some circumstances. The usual way is to push the emergency oxygen button, but some times it is possible not to have time to. The aim of this study is to know the delay introduced by two ananesthesia machine brands at four different fresh gas flow (FGF) to deliver a inspiratory fraction (FiO2) of oxygen of 100% without emergency oxygen.

Material and methods: Three Dräger Primus (Dräger, Sweden) and three General Electric Avance (General Electric, Finland) machines were used. After self check, the ventilators were connected to an 1L artificial lung, and to a sidestream monitor (Cardiocap s/5 monitor, General Electric, Finland). Controlled mechanical ventilation was started, with a tidal volume of 500 mL and 12 breaths/min. 30% oxygen in nitrous oxyde was set (3 L/min O2 and 7L/min N2O). After five minutes and when oxygen end tidal (ETO2) was 30%, the FiO2 was increased to 100% (increasing FGF to 3, 6, 9 or 12L/min O2, without N2O). Time to obtain a ETO2 =1 and 95% of ETO2=1 (3 time constants, ETO2=95%). The same test was repeated 5 times for each FGF and ventilator. Student's t test was used for between ventilators comparisons. Analysis of variance (Bonferroni post hoc analysis) was used for within ventilator comparisons. A p< 0.05 was considered statistically significant.

Results: Forty runs were recorded. Results are shown in Table 1. At all runs ETO2=1 was reached. Faster ETO2 was obtained as FGF was increased to 9 L/min, while 12L/min did not improve time.

	TIME TO OBTAIN 95% MAXIMUM FIO2 (3TIME CONSTANTS) (SECONDS)				TIME TO OBTAIN FiO2=1 (SECONDS)			
FGF (L/MIN)	3	6 (**)	9(**)	12(**)	3(**)	6(**)	9(**)	12(**)
AVANCE	264 3 ± 16 (*)	87.4 ± 5.3 (*)	37.8 ± 1.1 (*)	39 ± 4.1	495.3 ± 52.1 (*)	112.2 ± 15.1 (*)	52.8 ± 2.3 (*)	49.4 ± 2.3
PRIMUS	271.3 ± 50.8 (*)	97.4 ± 1.1 (*)	70.2 ± 1.8 (*)	67.2 ± 0.8	1206.3 ± 214.5 (*)	223.8 ± 13.3 (*)	101.8 ± 4.4 (*)	102.8 ± 6.1

[Table 1.p<0.05(*)within or(**)between ventilator]

Conclusions: General Electric Avance is faster then Dräger Primus. Setting a FGF=12 L/min is not useful to reach high ETO2 concentrations faster than 9 L/min.

3AP6-5

Validation of a new respiratory monitor

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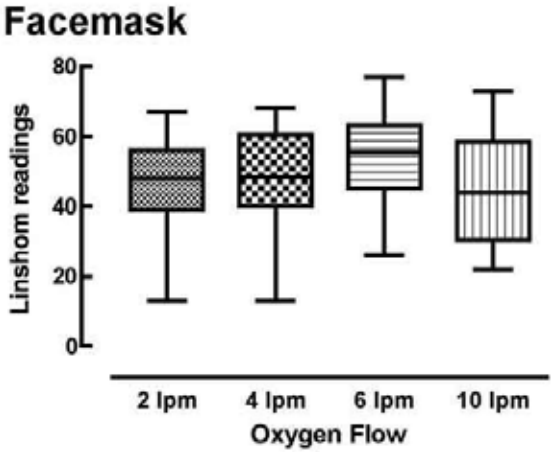
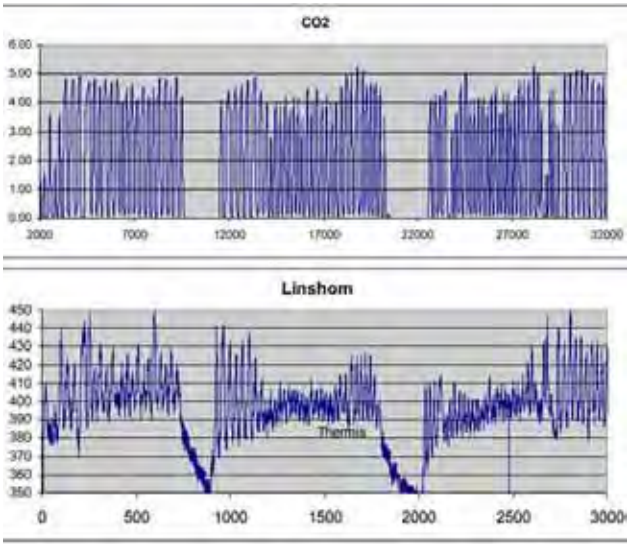
Background and Goal of Study: Capnography is the gold-standard for monitoring respiration. The purpose of this investigation was to validate a non-invasive respiratory monitor (RM) that we developed for measuring respiratory rate and tidal volume.

Materials and Methods: Preliminary validation studies were conducted by the inventors. Institutional review board approval was not required. In the first study, one of the authors breathed oxygen through facemask with fresh gas flows that varied between 2 and 10 liters per minute. The facemask was an open mask that permitted the entrainment of room air. The RM thermal sensor was affixed to the inside of the mask, across from the volunteer's mouth/nose. Sidestream capnography was used to validate the respiratory rates. The volunteer breathed normal tidal volumes at normal respiratory rates with 5-15 second pauses periodically to simulate apnea. Respiratory rates and the incidence of apnea as measured with capnography and the RM were compared.

Results and Discussion: Gas flow did not affect the RM measurements (see Figure 1). Respiratory rate and apnea as detected by the RM correlated with Capnography (see Figure 2).



[Figure 1]



[Figure 2]

Conclusions: This new thermal-based RM non-invasively tracks respiratory rate including apnea and may be effective for monitoring respiration in and outside of critical care settings.

Patent Pending: US patent #13/553,070

3AP6-6

How closed can automated closed circuit anaesthesia be with the Zeus®?

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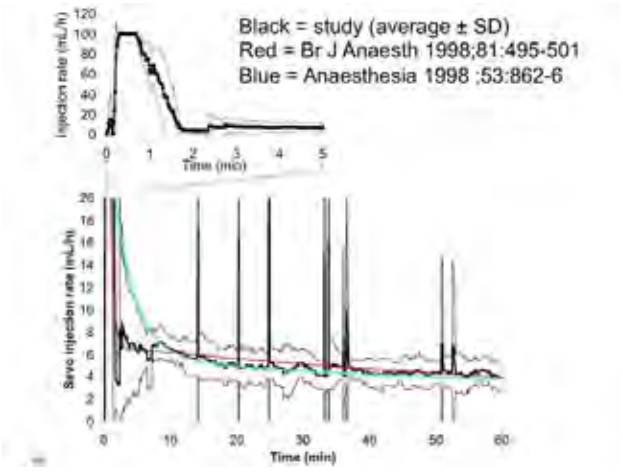
Background and Goal of Study: The initial algorithms of the Zeus® (Lübeck, Dräger) that steer fresh gas flows (FGF) and agent usage failed to provide true closed circuit anesthesia (CCA) conditions: agent usage exceeded the amount needed to prime the breathing system and lungs and to replace patient uptake [1]. We examined whether the latest software version SW 4.03 MK 04672-00 provides CCA conditions.
Materials and Methods: After IRB approval and informed consent, anesthesia in 8 ASA I-III patients was maintained with the Zeus® using O_2/air with a target inspired O_2 (F_IO_2) and end-expired sevoflurane % (F_{Asevo}) of 50 and 1.8%, respectively. The sevoflurane injection rate (= $Vinj_{sevo}$) was determined by filming the control screen that displays numerical $Vinj_{sevo}$ values in mL liquid sevo/h, which itself is the average of several very precisely (3 to 50 μL) dosed liquid "pulses" injected per second. Integration of $Vinj_{sevo}$ over time yielded cumulative sevoflurane usage during early (0-1min) wash-in (CD_{sevo}0-1), late (1-5min) wash-in (CD_{sevo}1-5), and an arbitrary 55 min maintenance period (=CD_{sevo}5-60). $Vinj_{sevo}$ was compared with published uptake data [2,3]. Data are presented as average ± standard deviation.
Results and Discussion:



[Figure 1.]

Age, height, and weight were 58±13 years, 164±9 cm, and 77±15 kg, respectively. F_{Asevo} was 1.8% within 101±23 sec. $Vinj_{sevo}$ matches previously published uptake data (Figure 1). CD_{sevo}0-1 could not be exactly quantified because between 15±2 and 46±6 sec $Vinj_{sevo}$ was > 100 mL/h, a rate above which values are no longer being displayed. But because the maximum $Vinj_{sevo}$ = 300 mL/h, CD_{sevo}0-1 must have ranged between 1.2±0 and 1.6±0.1 mL. CD_{sevo}1-5 was 0.8±0.4 mL, and CD_{sevo}5-60 4.6±0.9 mL.
The $Vinj_{sevo}$ "spikes" in figure 1 occurred after high FGF "bursts" used to fill the breathing bag or to increase F_IO_2. These injection "spikes" lasted 12±9sec and accounting for 0.17-0.31 mL sevoflurane "waste" per patient.
Conclusion(s): Under the conditions specified in this study, the Zeus approaches CCA conditions.
References:
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3. Anaesthesia 1998 ;53:862-6

3AP6-7

Effectiveness of a computer-driven weaning protocol after major orthopedic surgery in children

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Background and Goal of Study: Major orthopedic surgery in children needs an optimal postoperative outcome. Duration of weaning from mechanical ventilation may be reduced by the use of a systematic approach (1). We tried to assess effectiveness of a computer-driven weaning (CDW) protocol in comparing with usual care (UW) in patients after traumatic spine surgery.
Materials and Methods: After obtaining written informed consent and local ethic committee approval 42 children (aging 10-13, ASA II-III) scheduled for surgical correction of scoliosis were randomly allocated to the CDW and UW group (each 21 patients). In both groups propofol 2 $mgkg^{-1}$-fentanyl 1 μgkg^{-1}were used for induction, sevoflurane %3-4 for maintaining anesthesia. $ETCO_2$, P0.1 and weaning duration until successful extubation were the primary endpoints. Reintubation rate was assessed. *Data were processed unpaired t-test with Statistica 6.0 (StatSoft Inc., Tulsa, OK, USA); p< 0.05 significant. Data are means ±SD.*
Results and Discussion: *Sex ratio and ASA scores were similar.* Weaning duration was reduced in the computer-driven group from a median of 85.1±5.9 to 129.1±9.7 min ($p < 0.05$). $ETCO_2$ was higher in CDW group in compare with UW group (38,7±1.9 mm Hg vs 33.1±1.7 mm Hg, $p < 0.045$). The parameter P0.1 was lower in group with a physician-controlled weaning than in patients in the computer-driven group (1.7±0.3 cm H_20 vs 3.2±0.4 cm H_20, $p < 0.05$). Reintubation was not in both groups.
Conclusion(s): The specific computer-driven system used in this study can reduce mechanical ventilation duration as compared with a physician-controlled weaning process after major orthopedic surgery in children.
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3AP6-8

Development of original tracheal model to measure tracheal wall pressure

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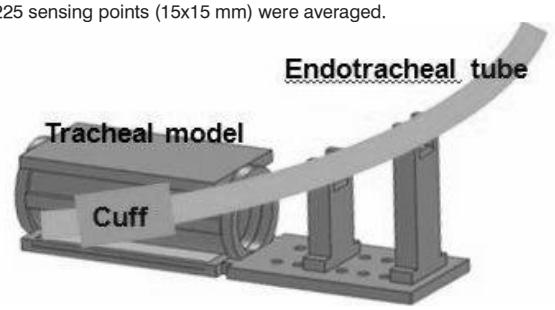
Background: The pressure exerted on the tracheal wall by an inflated endotracheal tube cuff influences the risk of complications associated with mechanical ventilation. An important point to adjust cuff volume is the sealing pressure onto the tracheal wall to prevent aspiration and to maintain positive pressure ventilation. On the other hand, the excessive high pressure may cause tracheal mucosal ischemia. Clinically, endotracheal tube cuff volume has been adjusted by the intra-cuff pressure. Theoretically, adjusting cuff volume guided by the tracheal wall pressure seems to be more reasonable than guided by intra-cuff pressure. However, measuring tracheal wall pressure in vivo is technically difficult. The laboratory model to investigate the relationship between intra-cuff pressure and wall pressure is required to determine the optimal cuff volume.
The purpose of this study was to set up the original tracheal model to measure the tracheal wall pressure and intra-cuff pressure simultaneously.
Materials and Methods: Thin pressure sensor sheet (0.1 mm-thickness, Nitta Corporation) was installed in the cylindrical rigid tracheal model (inner diameter 18 mm). Spatial resolution of pressure sensor sheet was 1 mm^2. Every sensing point output values from 0 to 250 in linear proportion to pressure. Three different endotracheal tubes (inner diameter 8 mm) cuff shapes (normal type, high volume type, and taper type) were intubated into the tracheal model. Intra-cuff pressure and tracheal wall pressure were measured when tracheal tube cuffs were inflated by 1 to 8 ml of air. Tracheal wall pressures of 225 sensing points (15x15 mm) were averaged.



[Schematic drawing of the tracheal model]

Results and Discussion: Intra-cuff pressure of taper type was more steeply increased than the other two types with increasing intra-cuff volume. However, tracheal wall pressure of taper type was not higher than the other two types. The size of the contact area of the cuff with the tracheal wall and the pressure distribution over the wall were speculated to be the factors influencing the observed difference between the tracheal wall pressures and intra-cuff pressures.
Conclusion: We successfully measured the tracheal wall pressure.

3AP6-9

Automatic acquisition of anaesthesia quality indicators in a data warehouse

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Background and Goal of Study: The University Hospital of Lille has developed a Data Warehouse (DW) in which anaesthesia and hospital stay data are stored. Per operative adverse events have been shown to predict postoperative complications [1]. The goal was to test the feasibility of an automatic acquisition system of adverse events, defined according to duration time and severity thresholds.
Materials and Methods: The DW contains the data of more than 50 000 anaesthetic procedures each year. Each procedure contains about 4 000 measurements, e.g. Heart Rate (HR) and Mean Arterial Pressure (MAP). For each predetermined quality indicator, threshold values and duration of time outside a predefined range are established beforehand, the total time outside this range is calculated and the quality indicator is triggered when it reaches the duration threshold.
Results and Discussion: The quality indicators have been calculated on data recorded during a test period of two weeks: 2010 anaesthetic procedures corresponding to patients older than 18 yrs have been identified, 1942 of which contained sufficient data for the calculation of the indicators: 344 (17.7%) anaesthetic procedures presented with a cumulated time spent with MAP< 60mmHg for at least 5 minutes. Table 1 presents the definition and results of various quality indicators analyzed on the test period. Further studies performed on data recorded over longer periods should allow to assess different threshold values and duration times for each indicator, in order to find the most relevant parameters related to postoperative complications.

Clinical relevance	Threshold	Minimal duration (min.)	Anaesthetic procedures N (%)
Hypertension	> 100 mmHg	5	572 (29.5%)
Long hypertension	> 100 mmHg	20	125 (6.4%)
Hypotension	< 60 mmHg	5	344 (17.7%)
Long hypotension	< 60 mmHg	20	51 (2.6%)
Tachycardia	> 110 bpm	2	317 (16.3%)
Long tachycardia	> 110 bpm	20	65 (3.3%)
Bradycardia	< 40 bpm	2	84 (4.3%)
Severely decreased SpO2	< 90 %	2	189 (9.7%)
Decreased SpO2	< 95 %	10	137 (7.1%)

[Quality indicators analyzed over two weeks]

Conclusion(s): The automatic acquisition of Anesthesia Quality Indicators, defined by threshold values and duration time of adverse events, as hypotension, is applicable to a large population of patients.
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3AP6-10

Monitoring tracheal tube cuff pressure reduces postoperative sore throat symptoms

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Background and Goal of Study: The endotracheal tube (ETT) cuff is inflated with air to create an airtight seal to allow PPV and to prevent passage of pharyngeal or gastric contents into the airway. However, overinflation of the cuff, exceeding the tracheal capillary pressure of 27-40 cm H_2O, affects blood flow supply to the tracheal mucosa and carries risk for serious injury, especially with prolonged intubation. It is shown that even short procedures can have postoperative respiratory complications related to endotracheal intubation such as: sore throat, cough and hoarseness. That is why the ETT cuff pressure should not be higher than 20 to 30 cm H_2O.
The most common practice for determination the cuff pressure is pilot baloon palpation. Cuff pressure measurement with manometer during anaesthesia is not widely practiced. In our study, we evaluated postprocedural respiratory complications after short-term operations with and without cuff pressure measurement.
Materials and Methods: Sixty ASA physical status I-II patients, 18 years or older sheduled for elective surgery under general anaesthesia were included in this prospective, observational study. They were devided in two groups, depending on whether cuff pressure was assesed by baloon pilot palpation or measured with manometer and than adjusted to 20 to 30 cm H_2O.
Patients were observed for endotracheal intubation-related complications: sore throat, cough and hoarseness for a period of 24 hours after extubation. Patients who were sheduled for head and neck surgery, who experienced difficult intubation or repeted intubation or who had cough and sore throat before operation, were excluded.
Results and Discussion: The incidence of endotracheal intubation-related complications were lower in the group with ETT cuff pressure measured and adjusted. In this group, average values of cuff pressure prior to correction were notably higher than recommended.
Conclusion(s): Routine ETT cuff pressure measurement should be recommended, for it can reduce postprocedural endotracheal intubation-related complications.

Clinical and Experimental Circulation

4AP1-1

Neuroprotective effect of volatile induction and maintenance of the anesthesia (VIMA) vs. total intravenous anesthesia (TIVA) during on-pump coronary artery bypass grafting (CABG)

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Background and Goal of Study: To study the influence of VIMA with sevoflurane on metabolic (protein S100b) and functional (neuro-mental status) changes of the central nervous system (CNS) in the post-operative period after on-pump CABG.
Materials and Methods: 168 patients over 65 years old undergoing on-pump CABG were investigated. After obtaining informed consent patients were randomized to group1: VIMA with sevoflurane and fentanyl (n=81) or group 2: TIVA with propofol and fentanyl (n= 83) Protein S100b content in blood was examined in a subgroup of 42 patients (n= 23 group1; n= 19 group2) on four fixed steps:
1. Induction;
2. End of surgery;
3. 24 hrs. postoperatively;
4. 48 hrs. postoperatively.

Before operation all patients passed the neuro-psychological test using MMSE [1] и MoCA [2] scales. To recognize Postoperative Delirium (PD) the MMSE test were repeated on the second day after surgery; MoCA - test used on the 6-th day after surgery for the verification of Postoperative Cognitive Dysfunction (POCD). For comparing arrays were used both parametric (Anova), and nonparametric (Wilcoxon-Mann-Whitney test) criteria differences between samples.
Results and Discussion: There were significant differences between groups in content of protein S100b on the 3- d and 4-th stages: in the TIVA group this indicator exceeded the corresponding value of the VIMA group to 149% ($p = 0,001$) and 99,7% ($p = 0,002$), respectively. On the second day of the postoperative period 37 % of TIVA patients had less than 26 points on the MMSE scale, as compared to 19% in the VIMA group ($p < 0,01$). On the sixth day scores on the MoCa scale was lower than 26 points in 20 % of patients of the TIVA group versus 8 % in the VIMA group ($p < 0,01$).
Conclusion(s): VIMA with sevoflurane protects CNS against perioperative metabolic and functional injury in CABG surgery.
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4AP1-2

Atorvastatin-induced cardioprotection of human myocardium is mediated by the inhibition of mitochondrial permeability transition pore opening via TNF-alpha and JAK/STAT pathway

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Background and Goal of study: Statins exert cardioprotection against ischemia-reperfusion injury, but the mechanisms involved in this effect are partially elucidated. The aims of the present study were to evaluate the role of TNF-alpha, the pro-survival JAK/STAT pathway and mitochondrial Permeability Transition Pore (mPTP) in atorvastatin-induced cardioprotection.
Material and methods: After the approval of local medical ethics, right atrial appendages were obtained during cannulation for CPB from patients scheduled for cardiac surgery. Isometric force of contraction (FoC) of human right atrial trabeculae was recorded during 30-min hypoxia and 60-min reoxygenation (Control group) and in the presence of atorvastatin 1μM. In early reoxygenation, a TNF-alpha inhibitor, AG490 (inhibitor of JAK/STAT pathway), or atractyloside (mPTP opener), were administered.
Cyclosporine A (inhibitor of mPTP opening) was administered during the first min of reoxygenation alone or in presence of atorvastatin and TNF-alpha inhibitor or AG490. The force of contraction at the end of 60-min reoxygenation period (FoC_{60}; expressed in % of baseline) was compared (mean $\pm$ Standard Deviation) between the groups (n=6 in each group). Protein expression of JAK/STAT pathway was measured 5 min after the start of reoxygenation using Western immunoblotting. Statistical comparaison was made by analysis of variance.
Results and Discussion: Atorvastatin (85±5% of baseline) and Cyclosporine A (87±10%) improved the recovery of FoC_{60}, as compared with Control (50±3%; P< 0.001). The enhanced recovery of FoC_{60} following atorvastatin administration was abolished by TNF-alpha inhibitor (53±8%), AG490 (56±7%) and atractyloside (48±8%). Cyclosporine A restored the atorvastatin-induced cardioprotection abolished by TNF-alpha inhibitor (87±6%; P=0.73 *vs.* Atorvastatin) and AG490 (83±9%; P=0.62 *vs.* Atorvastatin); suggesting that mPTP opening was downstream of TNF-alpha and JAK/STAT activation. Atorvastatin significantly increased the phosphorylation of JAK-2 (+72% in Atorvastatin *vs.* Control; P< 0.001) and STAT-3 (+171% in Atorvastatin *vs.* Control; P< 0.001), TNF-alpha inhibitor abolished the enhanced phosphorylation of JAK-2 (P=0.66 *vs.* Control) and STAT-3 (P=0.23 *vs.* Control) by atorvastatin.
Conclusions: In human myocardium *in vitro*, atorvastatin-induced cardioprotection involved the inhibition of the mPTP opening via the activation of TNF-alpha and the JAK/STAT pathway, in early reoxygenation.

4AP1-3

Remote ischemic preconditioning (RIPC) does not confer additional cardioprotection to sevoflurane in on-pump coronary surgery with intermittent crossclamping

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Background and Goal of Study: In coronary surgery, the use of volatile anesthetic agents has been shown to reduce the extent of myocardial ischemia-reperfusion (IR) injury compared to the use of a total intravenous anesthetic regimen.[1] Similarly, RIPC has been advocated as a strategy to reduce the extent of IR injury. At this moment it is unclear whether the combination of both protective strategies results in additional cardioprotection.[2] We hypothesized that the combination of both strategies would confer additional cardioprotection in coronary surgery patients.
Materials and Methods: After ethical approval and informed consent on pump coronary surgery patients were randomly assigned to either a control or a study group. The control group (n=20) received standard care with a sevoflurane/remifentanil based anesthesia and the study group (n=20) received additionally a RIPC protocol. The RIPC protocol consisted of a tourniquet application on the upper arm, which was inflated during 3 cycles of 5 minutes, interspersed by 5 min deflation before cardiopulmonary bypass.
Postoperative (PO) troponin I levels and hemodynamic data were collected and analyzed using a two-way analysis of variance for repeated measurements. A $p < 0.05$ was considered statistically significant.
Results and Discussion: Data are summarized in the following tables: data are mean with standard deviation.

troponine I (ng/ml)	preoperative	0h PO	2h PO	12h PO	18h PO	36h PO
Control Group (n=20)	0.02 ± 0.05	2.59 ± 1.76*	3.58 ± 2.16*	5.48 ± 8.46*	5.48 ± 7.78*	3.52 ± 3.44*
Study Group (n=20)	0.01 ± 0.051	2.95 ± 1.45*	4.33 ± 2.07*	3.90 ± 4.78*	3.48 ± 5.13*	2.76 ± 4.07*

[Troponin I]

Postoperatieve troponin I levels increased transiently in a similar way in both groups. (* = significant vs pre-operative)

cardiac index (L/min/m2)	0h PO	2h PO	12h PO	18h PO
Control Group (n=20)	2.95 ± 0.73	3.13 ± 0.57	3.02 ± 0.46	2.98 ± 0.33
Study Group (n=20)	2.95 ± 0.58	3.04 ± 0.66	3.08 ± 0.64	3.27 ± 0.45

[Cardiac Index]

No differences were observed between groups in postoperative CI. Incidence of atrial fibrillation (35% vs 15%, p = 0.273), need for inotropic support (30% vs 10%, p = 0.235) and hospital length of stay (8±2 days) also did not differ between groups.
Conclusion: In coronary surgery patients, anesthetized with sevoflurane, the implementation of a RIPC protocol does not confer additional cardioprotection.
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Acknowledgements:
- First 2 authors both have contributed equally to the study
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4AP1-4

Western diet feeding protects against myocardial ischaemic injury, but abolishes sevoflurane-induced cardioprotection in rats

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Background and Goal of Study: Reducing caloric intake is an intervention against the adverse impact of western diet feeding on glycaemic control and cardiovascular function. In the perioperative period, the volatile anaesthetic sevoflurane is known for its cardioprotective effects that are blunted in the presence of diabetes. This study investigated whether a reduction in caloric intake affects sevoflurane-induced cardioprotection against ischaemic injury in diabetic rats.
Materials and Methods: Male Wistar rats were exposed to a western diet (WD) or control diet (CD). A third group of WD fed rats reversed after 4 weeks to CD for 4 consecutive weeks. After 4 and 8 weeks, rats underwent an oral glucose tolerance test and echocardiography followed by a myocardial infarction with or without sevoflurane (2%) exposure.
Results and Discussion: Compared to controls, 4 and 8 weeks of WD feeding resulted in obesity, mild hyperglycaemia, hyperinsulinaemia, hyperlipidaemia and glucose intolerance (all p< 0.05). Myocardial systolic and diastolic function were impaired as shown by decreased fractional shortening and prolonged E deceleration time (both p< 0.05). WD feeding reduced infarct size (-40%, p< 0.05) compared to CD fed rats. Moreover, sevoflurane reduced infarct size in CD fed rats (-59%, p< 0.001), but not additionally in WD fed rats. Reversion of WD to CD normalized WD-induced phenotype (all p< 0.05). Myocardial function improved as shown by increased fractional shortening (+27%, p< 0.05) and shortened E deceleration time (-20%, p< 0.05) as compared to WD fed rats. Additionally, reducing caloric intake did not affect infarct size and the effect of sevoflurane.
Conclusion(s): Reducing caloric intake improved myocardial function in diet-induced diabetic rats. Unexpectedly, WD feeding had a protective effect against ischaemic injury, which was not affected by reducing caloric intake or sevoflurane anaesthesia.
These results imply that further research is warranted on the interaction of dietary intake and anaesthesia-related effects on perioperative myocardial function.

4AP1-5

Helium induced-cardioprotection and inflammatory cytokines in reperfused rat myocardium *in vivo*

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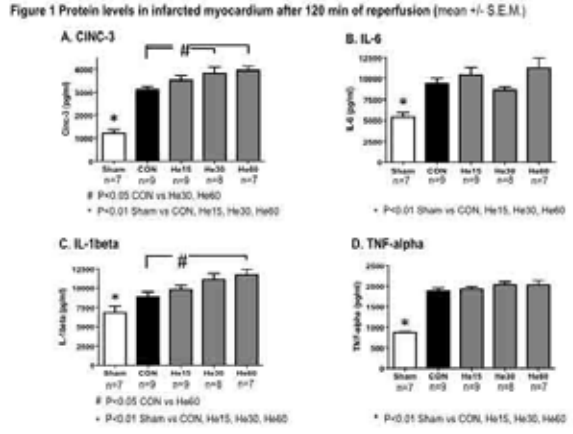
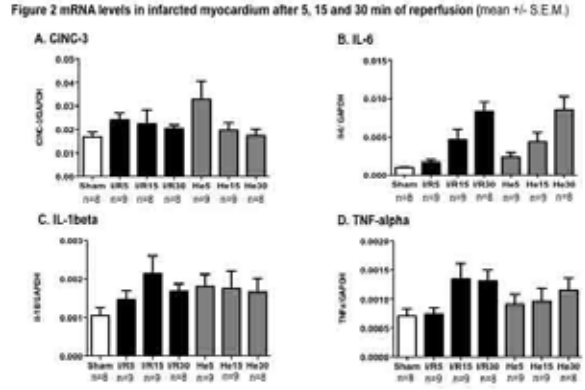
Background and Goal of Study: Recently it was shown that 15 minutes of helium inhalation during early reperfusion reduces myocardial infarct size in rats, whereas 30 or 60 minutes did not [1]. Ischemia and subsequent reperfusion provoke a sterile immune response, in which proinflammatory cytokine overdrive can threaten normal organ function [2]. In a pig model of acute lung injury, helium inhalation reduced interleukin (IL)-8 [3]. We hypothesize that helium-induced cardioprotection is achieved by a reduction of the cytokine overdrive during early reperfusion.
Materials and Methods: After thoracotomy and reversible occlusion of a major branch of the left coronary artery, rats were subjected to 25 min of ischemia and 120 min of reperfusion, except for sham animals. Controls were not further treated (CON), He15, He30 and He60 groups inhaled 15, 30 and 60 min of 70% helium during early reperfusion. After 2 h of reperfusion the heart was excised and the area at risk separated. Inflammatory cytokines TNF-alpha, IL-1beta, IL-6 and cytokine induced neutrophil chemoattractant-3 (CINC-3) were measured by ELISA. For RT-PCR measurements of mRNA, rats received 5, 15 or 30 min of reperfusion without (I/R5, I/R15, I/R30) or with helium postconditioning (He5, He15, He30). Statistical analysis was performed by ANOVA/Tukey correction.
Results and Discussion: I/R increased protein levels of CINC-3, IL-6, IL-1beta and TNF-alpha in infarcted myocardium (Figure 1). Thirty and 60 min of helium increased CINC-3, and 60 min of helium increased IL-1beta after 120 min of reperfusion in comparison to control (Figure 1). CINC-3, IL-1beta and TNF-alpha mRNA levels did not differ between groups, whereas mRNA levels of IL-6 increased with increasing reperfusion time (Figure 2).



[Figure 1 Protein levels in infarcted myocardium after 120 min of reperfusion (mean +/- S.E.M.)]



[Figure 2 mRNA levels in infarcted myocardium after 5, 15 and 30 min of reperfusion (mean +/- S.E.M.)]

Conclusion(s): After thoracotomy, I/R increases IL-6, IL-1beta, TNF-alpha and CINC-3 in infarcted myocardium. Prolonged helium inhalation increased CINC-3 and IL-1beta levels. Helium did not affect mRNA levels of IL-6, IL-1beta, TNF-alpha and CINC-3 in infarcted myocardium.

References:
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4AP1-6

The δ-opioid receptor antagonist Naltrindole improves myocardial perfusion in pigs undergoing cardiopulmonary bypass

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Background and Goal of Study: Previous studies suggest that δ-opioid receptor agonists have cardioprotective properties [1]. There is also evidence that δ-opioid receptor antagonists (DORA) improve splanchnic perfusion [2,3]. Therefore, we investigated how the DORA Naltrindole (NTI) affects myocardial perfusion (MP) in pigs undergoing cardiopulmonary bypass (CPB).
Materials and Methods: Ethics approval was obtained from the Bezirksregierung Muenster. 21 pigs (mean weight 35 kg) were anaesthetized and intubated and received invasive hemodynamic monitoring. Regional myocardial perfusion was measured using fluorescent microspheres infused via a fluid filled catheter positioned in the left atrial appendage. Following baseline measurements either placebo or 4 mg/kg NTI were infused (compound). Following establishment of CPB pigs were exposed to electrically induced VF and cardioplegia as well as hypothermia (28°C for 90 min, ischemia)). After re-establishment of normal body temperature the animals were reperfused for 30 minutes. Pigs were euthanized 30 min after successful weaning from CPB (end). Mean arterial pressure (MAP), central venous pressure and cardiac output (CO) were maintained constant according to algorithms using fluid resuscitation, norepinephrine and dobutamine. Time points used to measure MP post application of FMS were baseline, compound, ischemia and end. Post mortem myocardial tissue samples were obtained from epi- and endomyocardial LAD, RCX and RCA and analyzed for retained FMS content.
Results and Discussion: Hemodynamic parameters such as MAP, heart rate and CO were comparable. There were also no significant differences in amounts of fluids and catecholamines required. NTI improves MP during and especially post CPB.

	Baseline		Compound		Ischemia		End	
	Placebo	NTI	Placebo	NTI	Placebo	NTI	Placebo	NTI
LAD endo	0,82	0,82	0,23	0,32#	0,01	0,02	0,59	1,65#
LAD epi	0,71	0,80	0,31	0,32	0,02	0,02	0,69	1,76#
RCX endo	0,57	0,85#	0,21	0,30#	0,02	0,04#	0,49	1,52#
RCX epi	0,67	0,79	0,23	0,32	0,01	0,04#	0,58	1,76#
RCA endo	0,58	0,62	0,24	0,29	0,02	0,03	0,61	1,56#
RCA epi	0,62	0,69	0,26	0,29	0,02	0,04#	0,58	1,58#

[Table - Placebo vs. NTI (#=p<0.05),(ml/g/min)]

Conclusion(s): NTI improves MP in pigs undergoing CPB. This effect is most obvious after successful weaning from CPB and independent of hemodynamics. How this relates to the postulated cardioprotective effects of δ-opioid receptor agonists has to be further investigated.

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4AP1-7

Effects on myocardial perfusion of naltrexone and naltrexone-methiodide in pigs during extracorporeal circulation

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Background and Goal of Study: Previous studies have demonstrated an improved myocardial perfusion and reduction of stunning with the use of Naloxone [1,2]. This study aims to elucidate the effects of unselective opioid receptor antagonists on myocardial perfusion (MP) in pigs undergoing extra-

corporeal circulation (ECC). To differentiate between central and peripheral effects of opioid receptor antagonists we used Naltrexon (NTX) and the solely peripheral acting Naltrexone-Methiodide (NTX-M).

Materials and Methods: Ethics approval was obtained from the Bezirksregierung Muenster. 31 pigs (mean weight 35 kg) were randomized. The anaesthetized and intubated animals were hemodynamically monitored invasively. A fluid filled catheter was placed in the left atrial appendage to determine regional MP via infusion of fluorescent microspheres (FMS).

After baseline measurements animals received either NTX (2,0 mg/kg), NTX-M (2,56 mg/kg) or placebo (compound). Following induction of ECC pigs were exposed to VF and cardioplegia as well as hypothermia (28°C for 90 min, ischemia). After re-establishment of normal body temperature animals were reperfused for 30 min. Pigs were euthanized 30 min after successful weaning from ECC (end). During the study a constant haemodynamic state was maintained according to a standardized protocol using fluid resuscitation, norepinephrine and dobutamine. Time points used to measure MP post application of FMS were baseline, compound, ischemia and end. Post mortem myocardial tissue samples were obtained from epi- and endomyocardial LAD, RCX and RCA and analyzed for retained FMS content.

Results and Discussion: Hemodynamic parameters were comparable as well as amounts of fluids and catecholamines.

	Baseline			Compound			Ischemia			End		
	Plc	NTX	NTX -M	Plc	NTX	NTX -M	Plc	NTX	NTX -M	Plc	NTX	NTX -M
LAD endo	0,82	0,56#	0,75	0,23	0,29	0,26	0,01	0,01	0,01	0,59	0,32#	0,72
LAD epi	0,71	0,61	0,75	0,31	0,32	0,26	0,02	0,01	0,02	0,69	0,33#	0,72
RCX endo	0,57	0,61	0,77	0,21	0,28#	0,27	0,02	0,01	0,03	0,49	0,36	0,65#
RCX epi	0,67	0,59	0,76	0,23	0,25	0,30	0,01	0,01	0,02	0,58	0,36#	0,78#
RCA endo	0,58	0,71	0,69#	0,24	0,28	0,24	0,02	0,02	0,64#	0,61	0,36#	0,79
RCA epi	0,62	0,58	0,73	0,26	0,25	0,32	0,02	0,02	0,03	0,58	0,34#	0,75

[Table - Placebo (Plc) vs compound (#=p<0.05), (m/g/min)]

NTX decreases MP after weaning from ECC, while NTX-M improves MP, at least in the RCX area.

Conclusion(s): These results suggest that the effects of opioid receptor antagonists on MP are centrally mediated. However, the results are in contrast to the results from previous studies using models of chronically instrumented dogs [1,2].

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4AP1-8

Is there a cardiomyoprotection from chronic metformin therapy in patients undergoing coronary artery bypass surgery ?

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Background: Metformin is a biguanide used in the treatment of type 2 diabetes. Chronic metformin therapy appears to exert additional cardioprotective effects, thereby reducing cardiovascular mortality (1, 2). Experimental studies have shown that short term metformin pretreatment reduces ischemia-reperfusion injury and may have a direct protective effect on cardiomyocytes (3). We investigated the cardioprotective efficacy of preoperative metformin treatment and its influence in short-term outcome in patients undergoing coronary revascularization surgery (CABG).

Material and methods: We included 341 patients in a retrospective cohort study (years 2006 to 2012). 195 were allocated to 3 equal groups, following matching for gender, age, body mass index, EuroSCORE II and number of grafts. Metformin treated (gr 1), nonmetformin treated (gr. 2) and non-diabetic patients group (gr. 3). Global mortality, ICU and hospital length of stay (days), cardiovascular, infectious and renal morbidity were compared. Lactate at ICU admission (T0) and creatinine kinase MB (CKMB) at T0, 8 (T8h) and 18 (T18h) hours in ICU were also assessed. Results were analyzed using: Wilcoxon rank, ANOVA, Tukey and Pearson's Chi-square tests ($p < 0.05$ significant).

Results: Low mortality (n=2) was statistically irrelevant, however deaths were recorded in non-diabetics. Comparison of ICU (4.31 *vs* 4.39, *vs* 3.98, p=0.804) and hospital length of stay (18.04 *vs* 17.58 *vs* 17.23, p=0.908) were not statistically different. Overall in-hospital morbidity was found similar. Plasma lactate levels at ICU admission were significantly lower in metformin compared to nonmetformin treated patients (13.32 *vs* 17.24, p=0.041), whereas similar compared to non-diabetics (13.32 *vs* 14.42, p=0.77). Plasma CK-MB levels at T0 were significantly lower in the metformin compared to gr. 2 (21.06 *vs* 28.99, p=0.001), and not different to gr. 3 (21.06 *vs* 21.66, p=0.96). Statistical significance was also recorded between groups 2 and 3 (28.99 *vs* 21.66, p=0.003). T8 and T18h levels did not differ (p=0.22, p=0.76).

Conclusions: Data suggest that chronic treatment with metformin before CABG is associated with lower lactate and CKMB levels at ICU admission, which may be beneficial to the myocardium. Short-term outcome seems to be preserved.

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4AP1-9

Protective effect of sevoflurane in organ blood flow during mechanical circulatory assist device support. Experimental study in pigs

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Background and Goal of Study: Studies have reported organ blood flow responses to the administration of different anesthetics (1), but this effect during mechanical circulatory assist device (MCAD) support remains unclear. The aim of the study is to compare the organ blood flow responses to the administration of two anaesthetics (sevoflurane and propofol) during a mechanical circulatory assist device support as a continuous centrifugal pump.

Materials and Methods: Nine healthy minipigs were divided into 2 groups on the basis of the anesthetic received (propofol n=5, sevoflurane n=4). A Biomedicus centrifugal pump was implanted. MCAD was instituted by cannulation of the apex of the left ventricle and the ascending aorta. Once the MCAD is established, a first (basal) injection of yelow microspheres in the left atrium is performed, and after one hour of MCAD support, a second injection of violet microspheres is performed. Finally, the animal is sacrificed and tissue samples of both cerebral hemispheres, left and right ventricles, liver, lung and kidneys are obtained to measure organ blood flow based on the number of microspheres counted in each sample.

Results and Discussion: There was an increase of blood flow in cerebral hemispheres (P=0.018), liver (P=0.004), right ventricle (P=0.006), and left ventricle (endocardium P= 0.016 and epicardium P=0.013) in the sevoflurane group. However, no statistically significant differences were found in pulmonary blood flow (P=0.44) and kidney blood flow (P=0.11) between both groups.

Conclusion: We demonstrated that sevoflurane increases blood flow of some organs (brain, liver and heart) during MCAD support. To date, no studies have demostrated which anesthetic is better to maintain adequate organ blood flow during MCAD support.

Reference:

1. Crawford MW, Lerman J, Saldivia V, Carmichael FJ. Hemodynamic and organ blood flow responses to halothane and sevoflurane anesthesia during spontaneous ventilation. Anesth Analg. 1992;75(6):1000-6.

4AP1-10

Propofol-induced cardioprotection depends on timing and dose administered, in isolated human myocardium

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Background and Goal of study: We tested the hypothesis that 1) propofol-induced cardioprotection depends on the timing and the dose of application; and 2) whether propofol-induced cardioprotection was mediated by opening of mitochondrial adenosine triphosphate-sensitive potassium channels (mito-K_{ATP}) and nitric oxide synthase (NOS) activation.

Material and Methods: After the approval of local medical ethics and written informed consent, right atrial appendages were obtained during cannulation for cardiopulmonary bypass from patients scheduled for cardiac surgery. Isometric force of contraction of human right atrial trabeculae was recorded during 30-min hypoxia and 60-min reoxygenation (Control, n=6). In 9 separate groups (n=6 in each group), propofol 10^{-7}M, 10^{-6}M and 10^{-5}M was administered: 1) during hypoxia-reoxygenation (continuous administration), or 2) administration during 5-min before hypoxia, or 3) during the reoxygenation. In

2 other groups, effects of propofol 10^{-5}M during reoxygenation was examined in presence of 500 mM 5-hydroxy-decanoate, a mitoK_{ATP} antagonist, and 200 μM L-NAME, a NOS inhibitor. The force of contraction at the end of 60-min reoxygenation period (FoC_{60}; expressed in % of baseline) was compared (mean ± Standard Deviation) between the groups by a variance analysis.
Results and Discussion: At 60 min reoxygenation, FoC_{60} was 50±9% of baseline in Control. Continuous administration of propofol 10^{-7}M (FoC_{60}: 58±9%), 10^{-6}M (60±12%) et 10^{-5}M (58±11%) did not significantly modify the FoC_{60} in comparison to Control (P>0.05). Brief pre hypoxia administration of propofol 10^{-7}M (53±13%), 10^{-6}M (56±12%) et 10^{-5}M (53±10%) did not significantly modify the FoC_{60} in comparison to Control (P>0.05). Propofol administration during reoxygenation at 10^{-7}M (59±8%), 10^{-6}M (50±10%) did not significantly modify the FoC_{60} in comparison to Control (P>0.05). Propofol administration during reoxygenation at 10^{-5}M (82±6%) significantly enhanced the FoC_{60} (P< 0.001 *vs.* Control). 5-hydroxy-decanoate (53±8%) and L-NAME (57±6%) abolished the effect of propofol 10^{-5}M (P< 0.001).
Conclusions: Our results suggested, that the cardioprotective effect of propofol was dependant of concentration and the timing of the administration. We showed, in human myocardium *in vitro*, that propofol 10^{-5}M administered during reoxygenation is able to induce cardioprotection. And, this cardioprotective effect is mediated by the opening of mitoK_{ATP} channels and activation of NOS.

4AP2-1

Cardiac troponin T release patterns after off-pump coronary bypass surgery

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Background: Cardiac troponin T (cTnT) is used as a specific marker for myocardial ischaemia, although its value remains ill-defined in off-pump coronary surgery (OPCAB). The present retrospective observational study aimed to determine the release patterns of cTnT after OPCAB and relate these to electrocardiographic changes.
Methods: After ethical committee approval and informed consent, data from 131 OPCAB patients were retrieved from a database of which 57 patients were excluded for further analysis because of missing data. cTnT samples were measured preoperatively, at arrival at the intensive care unit (ICU), and 6, 12, 24 and 48 hours afterwards. 12-lead ECGs were recorded preoperatively, at arrival at ICU, 1, 2 and 5 days postoperatively. cTnT levels were analysed using one-way and two-way analysis of variance for repeated measurements as appropriate. Data are expressed as mean ± standard deviation. A p-value < 0.05 was accepted as statistically significant.
Results: Three different postoperative cTnT levels could be identified: group 1 (6/74) showed an important increase of cTnT > 1 from which 3/6 patients developed a new Q-wave infarction. In group 2 (20/74) cTnT levels remained below 0.2.

	T1	T2	T3	T4	T5	T6	p
Group 1	0.01 ±0.00	0.65 ±0.91	0.81 ±0.61	1.56 ±0.98	2.25 ±1.16	2.53 ±1.61	< 0.001
Group 2	0.01 ±0.00	0.06 ±0.04	0.09 ±0.04	0.10 ±0.04	0.08 ±0.04	0.08 ±0.05	< 0.001

[data are mean±SD]

In the remaining group (group 3; 0< cTnT< 1) three distinct patterns could be identified: pattern A (8/39) manifested as a gradual increase of cTnT levels during the first 48 hours, pattern B (9/39) as an early peak at arrival and pattern C (22/39) demonstrated a peak value between 6-12 hours postoperatively.

	T1	T2	T3	T4	T5	T6	p
Pattern A	0.01 ±0.00	0.13 ±0.10	0.25 ±0.18	0.35 ±0.14	0.42 ±0.20	0.50 ±0.17	< 0.001
Pattern B	0.01 ±0.00	0.38 ±0.16*	0.31 ±0.17	0.24 ±0.17	0.16 ±0.16*	0.12 ±0.11*	< 0.001
Pattern C	0.01 ±0.00	0.27 ±0.12*	0.43 ±0.19*	0.37 ±0.20	0.24 ±0.13*	0.18 ±0.12*	< 0.001
p	n.s.	< 0.05	< 0.05	n.s.	< 0.05	< 0.05	

*[mean±SD; * = significantly different vs pattern A]*

Interestingly, the incidence of electrocardiographic diagnosis of myocardial infarction was significantly higher in the groups showing a transient peaking pattern (pattern B and C) than in those who showed a progressive rise in postoperative troponins (pattern C) (12/31 vs 0/8; p = 0.0471).
Conclusion: Different magnitudes of cTnT release could be identified after OPCAB surgery. In the patients with moderate cTnT release between 0 and 1 three different release patterns could be identified: gradual increase over 48 hours, a peak at arrival and those peaking between 6 and 12 hours.

4AP2-2

The choice of the optimal perfusion flow rate during surgical correction of combined valvular diseases

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Background and Goal of Study: Cardiac output during cardiopulmonary bypass (CPB) is defined by perfusion flow rate, which is calculated by multiplying the perfusion index (PI) on the body surface area. To date, there is no clear definition of an optimal PI. Thus, the aim of our study was to determine the optimal perfusion flow rate during surgical correction of combined valvular diseases.
Materials and Methods: We enrolled 60 adult patients with combined valvular diseases requiring surgical correction and randomized them into two groups. Induction and maintenance of anesthesia in both groups were conducted by midazolam, propofol and fentanyl. For CPB, we used Jostra HL 20 (Maquet, Sweden). In the group PI 2.5 (n = 30), CPB was performed using PI 2.5 L min^{-1} m^{-2}. In the group PI 3.0 (n = 30), patients were operated under CPB at a flow rate, calculated on the basis of PI 3.0 L min^{-1} m^{-2}. During perioperative period, we used monitoring of hemodynamics and oxygen transport (PiCCO2, Pulsion Medical Systems, Germany) followed by goal-directed optimization protocol. In all patients, hemodynamics and blood gases as well as the details of therapy and the length of intensive care unit (ICU) and hospital stay were recorded. Statistical analysis was performed using the software package SPSS 15.0.Data are presented as median (25^{th}-75^{th} percentiles).
Results and Discussion: Patients of both groups were comparable regarding their demographic data and hemodynamic parameters. Duration of surgery, CPB and aortic cross clamping did not differ as well. Intraoperatively, patients of the PI 3.0 group received more fluids by 17% that was accompanied by a decrease in hematocrit and oxygen delivery (p < 0.05 compared with the PI 2.5 group). Duration of mechanical ventilation did not differ significantly between the groups. However, duration of ICU stay was significantly lower in the group PI 2.5: 24 (24 – 42) hrs *vs.* 34 (28 – 51) hrs (p = 0.013). Length of hospital stay tended to be lower also in the group PI 2.5: 14 (11 – 19) days *vs.* 18 (14 – 21) days; p = 0.069).
Conclusion: Perfusion at a flow rate, calculated on the basis of PI 2.5 L min^{-1} m^{-2}, provides more stable oxygen transport and reduces the time of ICU stay in comparison with PI 3.0 L min^{-1} m^{-2}.

4AP2-3

Combination of rocuronium and sugammadex decreased postoperative partial pressure of carbon dioxide in patients undergoing off-pump coronary artery bypass graft (OPCAB)

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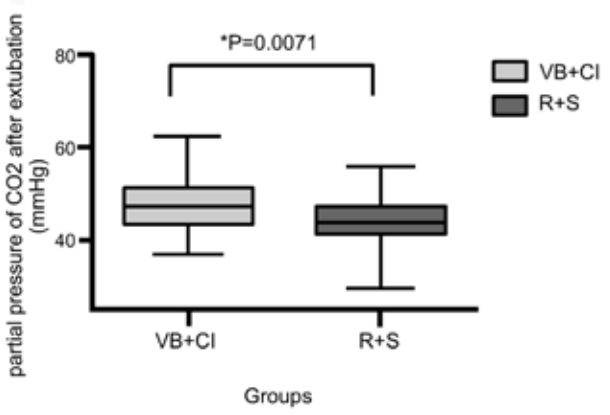
Background and Goal of Study: Sugammadex is a novel agent, which can reverse neuromuscular blockade by encapsulating selectively steroidal neuromuscular blocking agents without any side effects. Decreasing residual effect of neuromuscular blockade is crucially important especially in the setting of OPCAB for fast track anesthesia, which facilitates early tracheal extubation that may decrease length of hospitalization in the intensive care unit (ICU) and postoperative ward. However, no literature has been ever reported about the effect of sugammadex on immediately after extubated patients. We assumed that reversal with sugammadex administration improves respiratory muscle function, and thus contributes to sufficient respiration, and may decrease reintubation rate immediately after OPCAB. Therefore we conducted retrospective analysis to evaluate the relationship between sugammadex administration and blood gas analysis immediately after extubation in patients underwent OPCAB.
Materials and Methods: A data of 77 OPCAB patients who were extubated in the operating theater from December 2007 to July 2012 in Kanazawa university hospital were retrieved by using an electronically recorded anesthetic charts. Thirty-two patients were given vecuronium and cholinesterase inhibitor (VB+CI), while 45 patients were given rocuronium and sugammadex_(R+S).

Blood gas analysis, which was conducted immediately after extubation and rate of re-intubation was analyzed.
Results and Discussion: Patients' demographic data were not different between groups. R+S showed significantly lower partial pressure of carbon dioxide compared to VB+CI. (Fig.1 **P=0.0071,* unpaired t test). There were no significant differences of partial pressure of oxygen and re-intubation rate between groups.



[Fig.1]

Conclusion(s): Administration of sugammadex before extubation decreased partial pressure of carbon dioxide immediately after extubation in OPCAB patients who were given rocuronium and sugammadex compared to those given vecuronium and cholinesterase inhibitor. Combination of rocuronium and sugammadex may facilitate fast track anesthesia in OPCAB.

4AP2-4

Perioperative glucose management in patients undergoing cardiac surgery: effectiveness of the university of Ghent Insulin Protocol

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Background: Several insulin infusion protocols have been developed to maintain glycaemia levels within normal limits during and after cardiac surgery with cardiopulmonary bypass (CPB). These protocols are often complicated requiring regular adjustments using sophisticated algorhitms[1]. We developed an easy applicable protocol (University of Ghent Insulin Protocol or UGIP) for achieving a glucose level between 70 and 180 mg/dL during cardiac surgery. In this protocol, a continuous infusion of insulin is started after induction of anaesthesia at a calculated rate in units per hour. The infusion rate is calculated from the baseline glycaemia divided by 75 in non-diabetic patients and divided by 50 in diabetic patients. This maintenance dose is doubled when rewarming is started during CPB and the initial dose is reinstituted after protamine administration. In this study we evaluate the applicability of this protocol.
Methods: Perioperative glycaemia data of 776 patients who were treated with UGIP were analyzed using analysis of variance for repeated measurements. This was followed by a separate analysis in patients with and without pre-existing diabetes mellitus. Data are expressed as mean ± standard deviation. A $p < 0.05$ was considered as statistically significant. Effectiveness was assessed by comparing baseline glycaemia values to the values at the end of surgery. Backward stepwise regression analysis was used to identify the independent variables associated with deviation of baseline glycaemia values.
Results: Perioperative glycaemia data are summarized in the table. (* = $p <$ 0.05 vs induction)

	Induction	CPB 15min	CPB 30min	CPB 60min	End of surgery
all patients (n=776)	110±45	100±23*	108±23*	118±26*	116+30*
non-diabetics (n=665)	105±44	97±21*	105±21*	117±25*	115±29*
diabetics (n=111)	142±39	117±27*	121±29*	123±35*	122±32*

[Perioperative glycaemia data]

Difference between baseline induction glycaemia and glycaemia at the end of the operation was 6 ± 50 mg/dL (110 ± 45 vs 116 ± 30, p = 0.001). The following variables were identified as independent risk factors for changes in perioperative glycaemia: age > 70 years (p = 0.025), use of corticosteroids (p = 0.002) and the presence of diabetes mellitus ($p < 0.001$).
Conclusion(s): UGIP preserved perioperative blood glucose levels within narrow limits. Risk factors for important deviation of pre-induction glycaemia were the presence of diabetes mellitus, the use of corticosteroids and age > 70 years.
Reference:
1. Lecomte P et al. Anesth Analg. 2008;107:51-8.

4AP2-5

Perioperative glucose management in patients undergoing cardiac surgery

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Background and Goal of Study: Various insulin infusion protocols have been developed to avoid perioperative hypo- and hyperglycaemic events during cardiac surgery with cardiopulmonary bypass (CPB)[1]. We aimed to identify the risk factors associated with such events when using the University of Ghent Insulin Protocol (UGIP) for achieving a glucose level between 70 and 180 mg/dL. In this protocol, an infusion of insulin is started after induction of anaesthesia at a calculated rate in units per hour. The infusion rate in non-diabetic patients is calculated from the baseline glycaemia divided by 75, or, in diabetic patients from the baseline glycaemia divided by 50. This maintenance dose is doubled when rewarming is started during CPB and the initial dose is reinstituted after protamine administration.
Methods: Data from 776 cardiac surgery patients were retrieved from the institution database. Relative risk for the development of perioperative hyperglycaemic (> 180 mg/dL) and hypoglycaemic (< 70 mg/dL) events were calculated for the following variables: Redo operation, CPB duration > 60 min, age > 70 years, gender, temperature on CPB < 32°C, nadir haematocrit < 24%, inotropic and/or vasoactive support, corticosteroids, and diabetes mellitus. The statistically significant variables were included in a multiple regression analysis to identify the independent risk factors.
Results: Sixteen patients (2%) developed a perioperative hyperglycaemic event. Male gender (RR = 0.34; 95% CI: 0.13 - 0.90; p = 0.029), inotropic support (RR = 3.81; 95% CI: 1.40 - 10.37; p = 0.01), and perioperative corticosteroids (RR = 5.83; 95% CI: 1.96 - 17.30; p = 0.008) showed a significant association with such events but only corticosteroids (p = 0.006) and inotropic support (p = 0.019) were identified as independent risk factors. Thirteen patients (1.7%) developed a perioperative hypoglycaemic event. Inotropic support (RR = 4.87; 95% CI: 1.40 - 17.09; p = 0.035), and diabetes mellitus (RR = 4.87; 95% CI: 1.23 - 11.13; p = 0.028) showed a significant association with such events but only diabetes (p = 0.013) was identified as an independent risk factor.
Conclusion: Independent risk factors for developing perioperative hyperglycaemia when using the UGIP are corticosteroids and inotropic agents, while diabetes mellitus seems to be only independent risk factor for hypoglycaemic events.
Reference:
1. Lecomte P et al. Anesth Analg 2008,107: 51-8.

4AP2-6

Ultra-fast-track cardiac anesthesia

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Background and Goal of Study: Fast-track cardiac anesthesia (FTCA) with tracheal extubation within one to six hours after arrival to the intensive care unit (ICU), hasn't been demonstrated to increase postoperative morbidity, and mortality. By here comes the idea of our study that has as purpose the evaluation of the impact of ultra-fast track anesthetic technique (UFTA: extubation on the operating room) on cardiac surgery.
Materials and Methods: A retrospective study was performed, including 80 patients, divided into two groups: UFTA group (n=40), and standard anesthesia group (control: n=40) . Anesthesia was conducted with etomidatepropofol, remifentenil, cisatracrium, and spinal analgesia in UFTA group and etomidate, fentanil, cisatracrium in the control group. In the post operative period a physician was following up hemodynamic condition, chest drain loss, respiratory conditions, intensive care unit length of stay, and total hospital stay. Our results are executed by U de Mann Whitne test.
Results and Discussion: In UFTA group, we didn't note any complication related to the use of morphine. For blood gases: PaO2 (98,5±19,70 in UFTA group versus 279,5±12,70 in control group; p=0,05), PCO2 (44±0,8 in UFTA

group versus 34±5,8 in control group; p=0,113) for hemodynamic conditions such as mean arterial pressure (PAM) (77,07 ± 9,11 in UFTA group versus73 ± 2,83 in control group; p=0,529). Patients in UFTA group had a shorter intensive unit length of stay and were discharged earlier than control group. This study affirms also less postoperative respiratory complications. The cost of anesthesia was similar in both groups: in control group 221DT and 192DT in UFTA group P = 0.3. The duration of ICU stay was significantly higher in control group 5.9 days± 2.5 versus 3.9 days ± 1.2 (P < 0.05). The cost of ICU stay was higher in control group: 354DT vs 234DT (P = 0.05).

Conclusion(s): The combination of anesthesia with remifentanil and spinal analgesia with morphine and clonidine produces effective analgesia after cardiac surgery. This allows to an immediate extubation that can be considered as an important progress in cardiac anesthesia and that can lead to less post operative complications, an accelerating recovery, shorter ICU, shorter hospital stays that have an important benefit in terms of financial costs and resources.

However, data is lacking on the impact of these protocols on high risk patients based on an objective scoring system.

4AP2-7

Utility of temporary pacing following cardiac surgery

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Background: Utility of temporary epicardial pacing wires (TEPW) following cardiac surgery is subject to debate. If it is incontestable after valvular surgery as complete heart block incidence can reach 9.6%, only 2.6% of patients undergoing isolated on-pump coronary surgery require temporary pacing. The utility of temporary wires must be analyzed against wires removal complications which can be life-threatening.

Objectives: To prospectively quantify conduction disorders following cardiac surgery, temporary pacing use and wires removal complications.

Materials and Methods: observational prospective monocentric study, including all adult patients having heart surgery with epicardial wire insertion, except those undergoing transplantation or having permanent pacemaker. Statistical analysis consisted in descriptive statistics.

Results: 236 patients were enrolled. All had ventricular and only 142 (60%) both ventricular and atrial unipolar FEP15, Ethicon epicardial wires. The most frequent conduction disorder was type I AV block. Complete heart block on day 0 was observed in 5% of all patients (6.4% after valvular surgery, 10.5% after combined surgery and only 1.4% following on-pump coronary bypass). Temporary pacing was employed for 16% of patients on day 0, mainly for accelerating sinus or junctional bradycardia. Six patients (2.5%) required permanent device insertion (5 pacemakers, all following valvular surgery and 1 defibrillator following coronary disease). Severe complications after wire removal occurred in 0.8% (1 tamponade, 1 hemothorax).

Discussion: Temporary epicardial pacing (TEP) is frequently used in the immediate postop period (16%), mainly for accelerating correction of bradycardia. Severe conduction disorders are more common following valvular or combined surgery. These abnormalities, mostly temporary, may sometimes require permanent pacemaker (2.5% in our study). On the contrary, patients undergoing isolated coronary bypass, even on-pump, rarely require postoperative pacing (1.4% of temporary complete heart block and no permanent pacemaker). Only 0.8% of serious complications were recorded and benefit-risk assessment seems in favour of temporary epicardial wires use, at least for valve/combined surgery.

Conclusion: Given the benefits of TEP and the low incidence of severe complications, this method is still the best way to treat conduction abnormalities following valve surgery. The utility of TEPW after coronary bypass remains unclear.

4AP2-8

Natural evolution of temporary epicardial wires following cardiac surgery

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Background: Natural evolution of temporary epicardial wires thresholds following cardiac surgery is a major concern. The few publications on this subject report significant elevation of capture thresholds after the 4th postoperative day and significant deterioration of sensitivity after the 2nd postoperative day, with no predictive factors identified.

Objectives: to prospectively investigate the natural evolution of temporary epicardial wires thresholds.

Materials and Methods: observational prospective monocentric study, including all adult patients having heart surgery with epicardial wire insertion, except those undergoing transplantation or having permanent pacemakers. Thresholds were measured daily until wires removal or permanent device insertion. When used, temporary pacemaker settings were recorded. Descriptive statistics and analysis of variance (ANOVA) method were performed with p< 0.05 as significance threshold.

Results - 236 patients were enrolled. All had ventricular and only 142 (60%) both ventricular and atrial unipolar FEP15, Ethicon epicardial wires. Capture thresholds increased significantly by the first (atrial wires) and by the second (ventricular wires) postoperative day. Both atrial and ventricular sensitivity deteriorated significantly by the 2nd postoperative day. Ten percent of epicardial wires lost their capture function by the 4th postoperative day, while 17% remained functional beyond the 10th postoperative day. Temporary pacing was used for 16% of patients on day 0 with a median energy output of 17.5 mA (atrial) and 20 mA (ventricular).

Discussion: In our study, evolution of temporary epicardial wires capture thresholds was different from that described in earlier studies, with significant increase by the 1st and 2nd postoperative day until the 5th day. Two opposite profiles were also noticed: rapidly nonfunctional vs. long-lasting wires. Sensitivity evolution was similar to the literature, with significant deterioration by the 2nd day. When required, temporary epicardial pacing applied high pacemaker energy output regardless of measured capture thresholds. This could partially explain the early significant increase of capture thresholds observed in our study.

Conclusion: Temporary epicardial wires natural history appears to be insufficiently known. Predictive factors of different threshold evolution profiles need be identified in other prospective multicentric studies, to better define epicardial wire reliability.

4AP2-9

Phosphodiesterase 3 inhibitor is associated with perioperative atrial fibrillation

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Background and Goal of Study: Perioperative atrial fibrillation (PAF) is the most frequentcomplication that occurs after cardiovascular surgery. The incidence of cardiovascular events, such as cerebral infarction and heart failure, increases by twofold in the presence of chronic atrial fibrillation (AF). Conventional viewpoints suggest that PAF is less likely to affect the survival of patients when compared with chronic AF, although it does slightly prolong the duration of hospital stay. However, reports suggest that PAF is associated with a significant incidence of various complications, including cardiovascular events, renal failure, infection, and cerebral infarction. Beta-blockers have been associated with a reduced the risk of developing PAF. Otherwise, inotropic drugs are commonly used perioperatively to support ventricular function. This study tested the hypothesis that the use of inotropic drugs is associated with postoperative AF.

Materials and Methods: We evaluated perioperative risk factors in 221 patients who underwent elective coronary artery bypass graft or valvular surgery and are in sinus rhythm. The primary end point of the study is the occurrence of ECG-confirmed AF at any time after the end of surgery until hospital discharge. Patients were monitored continuously on telemetry throughout the postoperative period until discharge.

Results and Discussion: Seventy-one patients (32.1%) developed AF a mean of 2.5+/-2.2 days after surgery. Phosphodiesterase 3 inhibitor associate with an increase risk of postoperative AF (45.6% versus 21.2% in nonusers; P< 0.001). Older age (67.3+/-8.7 versus 52.3+/-11.0 years; P< 0.001), body mass index > 30 (P=0.01), and mitral valve surgery (P=0.03) also were associated with postoperative AF. In multivariable logistic regression, age (P< 0.001), and milrinone use (odds ratio, 3.92; 95% confidence interval, 2.21 to 7.35; P< 0.001) independently predicted postoperative AF. Adding other potential confounders or stratifying analysis by mitral valve surgery did not change the association of Phosphodiesterase 3 inhibitor use with postoperative AF.

Conclusion(s): Phosphodiesterase 3 inhibitor is an independent risk factor for postoperative AF after cardiac surgery.

4AP3-1

Influence of age and cardiopulmonary bypass on cerebral autoregulation in pediatric cardiac surgery by using near-infrared spectroscopy

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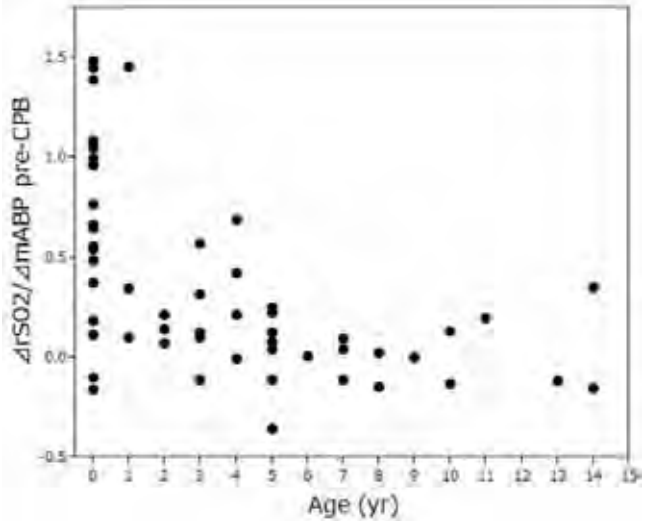
Background and Goal of Study: Knowledge of cerebral autoregulation in children during cardiac surgery is limited. Therefore, we attempted to evaluate the impact of age and cardiopulmonary bypass (CPB) on cerebral autoregulation in pediatric cardiac surgery by using near-infrared spectroscopy.
Materials and Methods: This retrospective study was conducted with 53 children aged between 1 month and 14 years who were scheduled for closure of atrial or ventricular septal defects with CPB for the recent 1 year 10months. Mean arterial blood pressure (mABP) and regional cerebral oxygenation index (rSO_2 from INVOS 5100™) values of the patients were simultaneously collected at one-minute intervals by our automated anesthesia recording system. The regression coefficient ($\Delta rSO_2/\Delta mABP$) for each patient was calculated by simple regression analysis. The relationship between age and regression coefficients was assessed on the basis of the assumption that higher regression coefficients indicated less functional cerebral autoregulation (Br J Anaesth 2004:92:662). We also divided the patients into 2 groups—younger children (0-4 years) and older children (5-14 years)—and analyzed the variations in regression coefficients before, during, and after CPB by using one-way repeated measures ANOVA with subsequent post-hoc tests if the variations were statistically significant.
Results and Discussion: We observed that the regression coefficients were frequently more than 0.5 among younger children (Figure), suggesting that the cerebral autoregulation in these children was immature. Regression coefficient values in younger children remained high before and during CPB (0.52 ± 0.49, mean ± SD). In contrast, the values in older children increased significantly during CPB (0.02 ± 0.17 to 0.54 ± 0.45, $p < 0.01$) and decreased significantly after CPB (0.23 ± 0.28, $p < 0.01$), suggesting that cerebral autoregulation was dysfunctional during CPB even in older children.
Conclusions: Cerebral autoregulation in younger children is immature. Moreover, it does not work during CPB even in older children, and clinicians must ensure careful management of perfusion pressure during CPB for pediatric patients.



[The relationship between age and ΔrSO2/ΔmABP]

4AP3-2

The influence of ventricular morphology in the perioperative period during the Fontan operation

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Background: Patients with a single-ventricle physiology can be classified using ventricular morphology. The functional prognosis of the heart is greater with left single ventricle than right single ventricle. As few studies have examined the influence of ventricular morphology on the preoperative period during the Fontan operation, we investigated this.
Methods: We retrospectively reviewed 30 patients who underwent the Fontan operation only under cardiopulmonary bypass (CPB) without aortic cross-clamping. Patients with atrioventricular or aortic valve regurgitation, or a fenestrated Fontan operation were excluded. The patients were divided into two groups based on ventricular morphology: those with dominant right (Group RV, 11 patients) or left (Group LV, 19 patients) ventricles. We collected pre- and postoperative data from the patient records and compared the groups using the χ^2 test or *t*-test. Data are expressed as the mean±SD. A *p*-value < 0.05 was considered statistically significant.
Results: The mean age of the children was 1.9 (range 1.1-5.3) years and their mean weight was 9.8 (7.7-14.2) kg. The preoperative B-type natriuretic peptide (BNP), mean pulmonary artery pressure (mPAP), and central venous pressure (CVP) were significantly higher in Group RV. On intensive care unit (ICU) admission, the mean atrial pressure was significantly lower in Group RV, while the hematocrit (Hct), dose of vasoactive agents, and mPAP were comparable in the two groups. Postoperatively, the duration of catecholamine support and length of ICU stay were significantly longer in Group RV. No significant difference in adverse events was found between the groups.
Conclusions: The cases in this study had relatively good cardiac function and the operation itself was relatively less invasive because there was no intracardiac procedure. Although our study found no difference in adverse events between the two groups, there were significant differences in the preoperative BNP, CVP, and duration of catecholamine support. We concluded that patients with a dominant right ventricle are at higher risk in the perioperative periods compared with those with a dominant left ventricle.

4AP3-3

Cardiopulmonary exercise testing in young adults with surgically closed ventricular septal defects and healthy, matched control subjects: a long-term follow-up

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Background and Goal of Study: Ventricular septal defects (VSDs) are generally closed in early childhood, and the patients are generally believed to be as healthy and fit as their peers although data to support the belief is missing. With the purpose to evaluate long-term functional outcome in VSD patients, we exercise tested a cohort of patients and a group of healthy age- and gender-matched adolescents.
Materials and Methods: We tested cardiopulmonary exercise capacity in 30 VSD operated adolescents, age 21.1 (±3.1 years) and age 2.6 (±1.5 years) at surgery, and 30 healthy control subjects, age 21.2 (±2.5 years), on an ergometer cycle. Pulmonary ventilation and gas exchange were simultaneously measured breath by breath with Jaeger MasterScreen CPX®. Each test was performed as a maximal incremental test. The graded cycling test protocol was chosen individually to ensure test time to be approximately the same for all participants. During the test session respiratory gas exchange was measured along with heart rate, blood pressure, and EKG. Endpoints were: maximal oxygen uptake, maximal workload, and anaerobic ventilatory threshold. For the last-mentioned both absolute and relative thresholds were measured using V-slope. Before each test FVC, FEV_1 and PEF were measured using spirometry.
Results and Discussion: Compared with controls, VSD operated adolescents had a markedly, impaired maximal oxygen uptake; mean 38.0 (±8.2 ml O^2 $kg^{-1}min^{-1}$) vs. 47.9 (±6.5 ml O^2 $kg^{-1}min^{-1}$) in control subjects, $p < 0.01$. Furthermore, absolute threshold was reduced in VSD patients; mean 25.3 (±7.8 ml O^2 $kg^{-1}min^{-1}$) vs. 35.2 (±7.7 ml O^2 $kg^{-1}min^{-1}$) in controls, $p < 0.01$. Relative threshold was not statistically significant from control group; 66.8 (±14.1%) vs. 73.3 (±11.8%), respectively, $p=0.06$. Lastly, maximal workload was significantly reduced; mean 3.3 (±0.7 W kg^{-1}) vs. 4.0 (±0.5 W kg^{-1}) in the control group, $p < 0.01$. In summary, findings include both effort-dependent and -independent measurements.
Conclusion: Patients with a surgically closed VSD had a markedly reduced cardiopulmonary exercise capacity compared with healthy controls.

4AP3-4

Differentiation of cardiovascular effects of phenylephrine by noninvasive advanced hemodynamic monitoring

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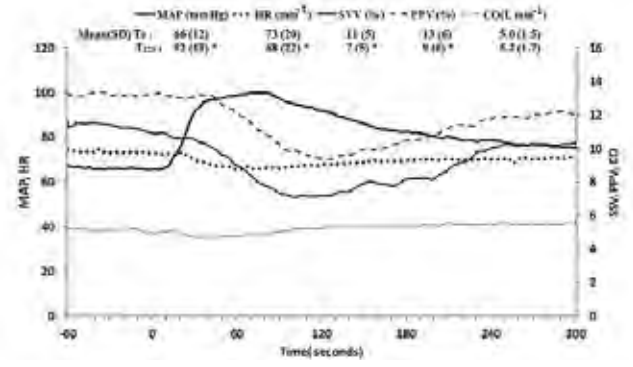
Background and Goal of Study: Phenylephrine(PHE) is a pure α-adrenergic agonist, which is widely used to treat hypotension. PHE acts mainly via an increase of the peripheral arterial vascular resistance, which often induces reflex bradycardia thus decreasing cardiac output. On the other hand, venous vasoconstriction by PHE may improve venous return, increase cardiac preload and thus partly compensate for abovementioned hemodynamic suppression. We therefore performed a beat-to-beat analysis of blood pressure(MAP), heart rate(HR), cardiac output(CO) , stroke volume variation(SVV) and pulse pressure variation(PPV) obtained noninvasively with the Nexfin® device (Edwards Lifesciences) to differentiate these cardiovascular effects.
Materials and Methods: After local IRB approval, hemodynamic variables of 15 patients under general anesthesia for ophthalmic surgery were recorded. Euvolaemia was pursued (500ml colloids) and methylatropine 500μg was administered in anticipation of vagal stimulating ophthalmic interventions. If the MAP decreased below 80% of baseline value for >1 minute, PHE 100μg was administered.
Results and Discussion: The figure shows the evolution of the average curves from 60 seconds before to 300 seconds after (T_{300}) PHE administration and mean(SD) values at T_0 and at T_{120} (*p< 0.05).



[Hemodynamic effects of Phenylephrine]

A single bolus of PHE in these euvolemic, atropinised patients resulted in a significantly increased MAP with preserved CO and HR. A significant decrease in SVV and PPV together with a preserved CO convincingly reflects an increased preload due to increased venous return. The maximal effect on MAP (reflecting arterial vasoconstriction) occurred at T_{70}, while the maximal effect on SVV and PPV (reflecting venoconstriction) occurred at T_{120}.
Conclusions: PHE has the potential to increase venous return and thus cardiac preload and render increased blood pressure with preserved cardiac output in a selected patient population. The time delay of maximal effects after a single administration reflects different effect sites of PHE within the circulation. The availability of noninvasive continuous advanced haemodynamic monitoring allows for superior haemodynamic management.

4AP3-6

Propofol anesthesia enhances the systemic arterial pressor response and attenuates the pulmonary arterial pressor response to intravenous phenylephrine

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Background and Goal of Study: Propofol potentiates phenylephrine-induced contraction in pulmonary artery smooth muscle in vitro (1). However, the effect of propofol on vasoconstriction induced by phenylephrine has not been described in humans. We studied the effects of propofol anesthesia on phenylephrine-induced systemic and pulmonary arterial pressure changes.
Materials and Methods: Ten patients without systemic disease with normal left ventricular function scheduled for elective coronary artery bypass graft surgery were studied. The study protocol was approved by our local ethics committee. A pulmonary artery catheter was inserted while awake, and during inhalation of 2.5 L/min O_2 by nasal cannula. After obtaining baseline measurements, all patients received iv phenylephrine at progressively increasing infusion rates (25, 50, 75, 100 mg/kg/min; for 2 min at each dose), until systolic blood pressure increased by more than 20 mmHg from baseline values. At the end of each infusion period, hemodynamic data were collected. After hemodynamic variables returned to baseline, anesthesia was induced with fentanyl (5 μg/kg) and propofol (1 mg/kg). Following tracheal intubation, facilitated by iv rocuronium (1 mg/kg), anesthesia was maintained with propofol infusion at a rate of 6 mg/kg/h and oxygen-air mixture (fraction of inspired oxygen=0.33). Mechanical ventilation was performed to maintain Et-CO_2 at 35 mmHg. After a stable hemodynamic state was obtained, data was collected in the same way as when the patient was awake. Data were expressed as mean±SD. Student's t-test was used for comparisons between groups, with P< 0.05 being significant.
Results and Discussion: During propofol anesthesia, baseline value of mean systemic arterial pressure (mSAP) was significantly lower as compared with control awake value (65±10 vs. 97±14 mmHg), but baseline mean pulmonary arterial pressure (mPAP) did not change (15±4 vs. 15±2 mmHg). The mSAP increase induced by 0.75 mg/kg/min phenyrephrine was greater during propofol infusion than in the awake state (12±11 vs. 7±5 mmHg, P< 0.05). The mPAP increase induced by 0.75 mg/kg/min phenyrephrine was smaller during propofol infusion than in the awake state (1±2 vs. 4±3 mmHg, P< 0.05).
Conclusion(s): Propofol anesthesia enhances the pressor response of systemic arterial pressure and attenuates the pressor response of pulmonary arterial pressure to intravenous phenylephrine.
References:
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4AP3-7

Effects of tachycardia, increased afterload and contractility on right ventricular myocardial oxygen balance in acutely instrumented pigs

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Background and Goals: The importance of right ventricular (RV) failure in the perioperative setting has become established but our understanding of RV pathophysiology remains incomplete. While baseline differences in coronary perfusion and oxygen extraction exist between the left and RV, it is not clear how the RV adapts to changes in oxygen demand.
We assessed the relative role of right coronary blood flow (rCBF) versus oxygen extraction ratio (OER) during hemodynamic conditions associated with increased RV oxygen demand as they may occur perioperatively.
Materials and Methods: In pigs we imposed hemodynamic challenges, using a cross-over design. Atrial pacing produced tachycardia, an adjustable pulmonary artery band (guided by arterial elastance) increased afterload, and contractility was augmented with dobutamine (DBT). The combination of selective RV coronary venous and systemic arterial blood gas analysis with rCBF data allowed calculation of RV myocardial oxygen consumption ($RVMVO_2$) and supply. Data were analysed using MatLab® software, and paired student's t-testing was performed.
Results and Discussion: An increased heart rate (100 to 140 bpm, n=9) resulted in a change in $RVMVO_2$ from 1.98 to 2.93 $mlO_2.min^{-1}$ (p=0.002). Oxygen delivery was provided by an increase in rCBF from 32.6 to 40.9 $ml.min^{-1}$ (p=0.033) as well as a rise in OER from 50.9 to 64.8 % (p=0.012). When arterial elastance was tripled (n=7), $RVMVO_2$ increased from 1.98 to 3.08 $mlO_2.min^{-1}$ (p=0.0041). There was a rise in OER (50.9 to 70.7%, p=0.001), but no significant change in rCBF (32.6 versus 36.2 $ml.min^{-1}$, p=0.11). DBT (6 $\mu g.kg^{-1}.min^{-1}$, n=5) showed a significant increase in $RVMVO_2$ (1.98 to 3.28 $mlO_2.min^{-1}$, p=0.009). This was provided by an increased rCBF, which doubled to 65.1 $ml.min^{-1}$ (p=0.0009), whereas OER remained stable (50.9 versus 50.2%, p=0.28).
Conclusions: In contrast to the LV, the RV can rely on an oxygen extraction reserve to cope with increases in myocardial oxygen demand.
However, this is maximal in the presence of increased RV afterload, presumably because intramural RV pressures oppose a rise in rCBF. Tachycardia was associated with higher OER (hence less favourable oxygen kinetics) as compared to DBT induced positive ino- and chronotropic stimulation.
This finding is counter-intuitive since heart rate changes should not affect the duration of coronary perfusion in the RV. This suggests a direct coronary vasodilatory effect of DBT and deserves further investigation.

4AP3-8

The effects of nursing on fractal features of heart rate and blood pressure variability

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Background and Goal of Study: In the Intensive Care Unit (ICU), patients are usually monitored by electrocardiogram and continuous arterial blood pressure. Nursing has been a part of routine care in the ICU, much remains to be learned about the effects on the autonomic nervous function. Therefore, we investigated them in the real-time monitoring of heart rate and blood pressure variability.
Materials and Methods: From October to December in 2012, 27 patients were selected who hospitalized in our ICU. The exclusion cases were with arrhythmia or pacemaker or other additional treatment during measure time.
The fractal features of heart rate and blood pressure variability were recorded using autonomic nervous system analyzer (MemCalc/Tonam16C; Suwa Trust, Tokyo, Japan).
The spectral bands were 0.04 to 0.15 Hz (low frequency: LF), 0.15 to 0.40 (high frequency: HF) and others.
These parameters were obtained from a log-log scale of frequency (*f*) versus power spectral (*P*) amplitude. The β value was based on the formula '$P = f^{-\beta}$'. LF, HF and β value were analyzed in heart rate (HR) and systemic blood pressure (SBP). HR-HF component has been as an indicator of parasympathetic balance, HR-LF/HF and HR-β has reflected sympathetically. SBP-LF and SBP-β has been shown to increase during sympathetic activation.
We measured the HR, HR-HF, HR-LH/HF, HR-β, SBP, SBP-LF, and SBP-β. We compared them between before and after nursing. Nursing contained usual cleaning care like wiping body or washing hair, hand, foot or oral care. The Wilcoxon signed-ranks test was used to compare the differences. A p value of less than 0.05 was considered statistically significant.
Results and Discussion: Although the HR-HF and HR-LF/HF were not significantly changed, the HR-β was significantly increased ($p < 0.05$). In contrast, the SBP-β was not significantly changed, the SBP-LF was significantly increased ($p < 0.01$). Other parameters were not significantly changed.
Conclusion(s): We investigated the autonomic nervous system between before and after nursing in 27 patients in our ICU. The data based on the increase of the HR-β and the SBP-LF indicate that nursing increased the sympathetic nerve function, but other data do not suggest them.
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Goto Y, Komatsu T, Nakagawa T, et al. A new index of the autonomic nervous balance and its clinical usefulness; A power law 1/f like scale of a spectral analysis of the heart rate variability. J Clin Monit Comput 2007; 21: 21-30.

4AP3-9

Cerebral perfusion correlations between NIRS and lactate levels during CPB in complex cardiac pathology children

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Background and Goal of Study: Near infrared spectroscopy (NIRS) is a noninvasive monitoring technique for cerebral oxygen saturation. Complex cardiac pathology children are susceptible to cerebral ischemia, emboli, and inflammatory responses and most of the studies indicated that NIRS should be used routinely during cardiopulmonary bypass (CPB)(1). In our study we aimed to point out if there was an inverse correlation between lactate levels and NIRS measurements.
Materials and Methods: 41 patients with complex congenital cardiac pathologies (*RC3:n=17, RC4:n=24), scheduled for corrective surgeries, were prospectively evaluated. During the surgery besides routine cardiac monitoring, NIRS values and lactate levels were measured simultaneously (at induction, during cannulation, on CPB, cross clamp on, cross clamp off and off CPB). Hemodynamic parameters, arterial blood gas analyses, amount of used blood products, tracheal extubation and discharge times from intensive care unit (ICU) and hospital were also recorded.
Results and Discussion:
No inverse correlations between lactate and NIRS levels were found at induction, during cannulation, on CPB, cross clamp on, cross clamp off times. However, a significant inverse correlation was indicated at the end of CPB ($p < 0.05$). Also discharge times from ICU were significantly longer in patients with higher lactate levels.High lactate levels indicated low cerebral perfusions.
Conclusion(s): Further studies are needed in larger series of complex cardiac pathology patients in order to evaluate correct correlations between NIRS and lactate levels.
References:
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Acknowledgements: *RC:Risk Category

4AP3-10

Phenylephrine for intraoperative assessment of left-ventricular end-systolic elastance

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Background and Goal of Study: Left-ventricular end-systolic elastance (Ees), the slope of the end-systolic pressure-volume relation, is an index of cardiac contractility that might be valuable for intraoperative assessment of cardiac function. The slope of the pressure-volume relation is frequently determined by provoking a preload reduction by compression of the inferior vena cava (IVC). This intervention is however highly invasive, and not suitable in a large part of the surgical population. This contributes to the limited use of Ees in perioperative care.
Therefore, we investigated whether a phenylephrine-induced afterload increase provides an alternative loading intervention for intraoperative assessment of Ees.
Materials and Methods: In 21 patients, age 61 ± 9 years, undergoing open abdominal (n=7) or cardiac surgery (n=14) the Ees was assessed from invasive and non-invasive (ccNexfin, Edwards Lifesciences BMEYE, Amsterdam) continuous arterial blood pressure measurements in combination with left-ventricular volume determinations by transoesophageal echocardiography. Preload reduction was achieved by clamping the IVC, and afterload was increased by bolus administration of phenylephrine (100 μg). The agreement between invasive and non-invasive Ees and between IVC compression and phenylephrine stimulation was investigated using Bland-Altman plots.
Results and Discussion: Median invasive Ees determined with phenylephrine estimated 1.05 (0.59 - 1.21) mmHg/mL and with IVC compression 0.58 (0.31 - 1.13) mmHg/mL.
Bland-Altman analysis revealed a bias of -0.03±0.12 mmHg/mL (limits of agreement -0.27 - +0.21 mmHg/mL) between Ees determinations using invasive and non-invasive blood pressure measurements. The bias between IVC compression or phenylephrine obtained Ees values was -0.15±0.69 mmHg/mL (limits of agreement -1.21 - +1.51 mmHg/mL). We found no intrinsic effect of phenylephrine on Ees values ($p=0.28$).
Conclusion(s): It is feasible to determine Ees from the combination of continuous non-invasive arterial blood pressure measurements and left-ventricular volume determinations with transoesophageal echocardiography. However, from these results we conclude that phenylephrine is no alternative for IVC compression as a loading intervention for intraoperative assessment of Ees. Our data indicate that this is not due to an intrinsic effect of phenylephrine on Ees.

4AP4-1

Prevention of acute kidney injury by erythropoietin in patients undergoing thoracic aorta surgery with hypothermic circulatory arrest

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Background and Goal of Study: Acute kidney injury (AKI) has been reported to have a high incidence up to 55% in patients who undergo thoracic aorta surgery requiring hypothermic circulatory arrest. AKI is associated with high morbidity and mortality. Erythropoietin (EPO) has recently been shown to exert a protective effect against tissue ischemia.
The aim of this preliminary study is to assess the effect of EPO in preventing AKI during thoracic aorta surgery due to acute dissection.
Materials and Methods: After the approval of the institutional review board, 63 patients undergoing thoracic aorta surgery with hypothermic circulatory arrest (target temperature 28˚C) randomly received 500 U/kg of EPO (group E) or the same amount of normal saline (group S) intravenously before surgery. AKI was defined according to the RIFLE criteria during the postoperative 7 days [Risk ≥ 1.5-fold increase in serum creatinine (sCr) or ≥ 25% reduction in estimated glomerular filtration rate (eGFR), Injury ≥ 2-fold increase in sCr or ≥ 50% reduction in eGFR, Renal failure ≥ 3-fold increase in sCr or baseline sCr

> 4 mg/dL or acute rise 0.5 mg/dL or ≥ 75% reduction in eGFR].
Vasopressor dependence was defined as a requirement ≥ 72 h for 1 or more vasopressors.
Results and Discussion: There were no differences between the two groups with regard to patients', operative, and anesthetic characteristics. Two groups did not show any differences in the incidence and severity of AKI (Table 1). Also, there were no differences in postoperative outcomes between the two groups (Table 2).

Incidence of AKI	Group E (n = 31)	Group S (n = 32)	p value
Total	17 (55%)	12 (38%)	0.17
Risk	9 (29%)	7 (22%)	0.51
Injury	5 (16%)	2 (6%)	0.21
Renal failure	3 (10%)	3 (9%)	0.97

[Table 1. Acute kidney injury (AKI).]

	Group E (n = 31)	Group S (n = 32)	p value
Renal replacement therapy	2 (7%)	3 (11%)	0.67
Vasopressor dependence	0 (0%)	5 (16%)	0.05
Postoperative transfusion (mL)	529 ± 906	563 ± 798	0.88
Intubation time (hours)	50 ± 74	113 ± 450	0.45
Intensive care unit stay (days)	3.4 ± 3.7	6.8 ± 18.6	0.32
Hospitalization (days)	15.1 ± 8.7	21.1 ± 18.2	0.12
Mortality	3 (12%)	2 (6%)	0.65

[Table 2. Postoperative outcomes.]

Conclusion: This study suggests that the prophylactic administration of EPO in patients undergoing thoracic aorta surgery requiring hypothermic circulatory arrest does not decrease the risk of AKI.

4AP4-2

Anesthesiologic management of patients with chronic pulmonary arterial hypertension (PAH) undergoing surgical implantation of infusion pumps for continuous i.v. delivery of Treprostinil

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Introduction: Chronic PAH is a severe disease with high mortality and poor quality of life requiring lifelong and regularly administered medication. Recently, the surgical implantation of a gas driven, refillable pump (LENUS PRO™) to switch from s.c. to continuous i.v. administration of Treprostinil has been introduced to improve outcome and quality of life. However, the anesthesiologic management for this procedure remains controversial: the hemodynamic status of PAH patients would require invasive monitoring, but implantation surgery is short and non-invasive. Moreover, interventions to intraoperatively control PAH are limited.
Methods: We report a series of 20 patients (60±16 yrs., 14f/6m) with PAH (mPAP 55±11 hmmHg) undergoing implantation of a LENUS PRO™ pump. For general anesthesia, we used midazolam 0.25mg/kg, fentanyl 0.025mg/kg, etomidate 0.3mg/kg and rocuronium 5mg/kg, after intubation sevoflurane 1.0 MAC and target-controlled remifentanil infusion. Patients were monitored with pulse oxymetry, ECG, end tidal CO2, arterial line, non-invasive cardiac output (Vigileo™, CardioQ™; data not shown). Pressure-controlled ventilation was performed to target $ETCO_2$ ≤ 35 mmHg, FiO_2 0,55. Adequate hemodynamic conditions were maintained using norepinephrine and dobutamin.
Results: After induction, the preoperatively low SpO2 increased, hemodynamic parameters were kept within safe limits throughout surgery (tab 1). All patients could be extubated in the OR and showed stable hemodynamic and respiratory conditions postoperatively, no adverse events were observed. All patients survived and were succesfully discharged from the hospital. ProBNP decreased from 2118±1417 preop to 1672±1465 pg/ml postop (P< 0.05), 6 Minute Walk Test from 339±110 to 402±128m, resp. (P< 0.05).

mean ± SD	pre induction	5 min	15 min	end of surgery	arrival recovery room	2h recovery
BP sys (mmHg)	121±18	100±12	90±11	107±14	136±17	116±14
BP dia (mmHg)	69±13	59±9	53±7	62±9	75±11	69±16
MAP (mmHg)	87±14	70±9	64±6	76±10	96±11	84±12
Heart Rate (1/min)	81±14	74±16	75±21	72±8	83±12	82±10
SpO2 (%)	88±7	93±6	96±3	96±2	92±5	92±5

[Table 1]

Discussion: General anesthesia for the surgical implantation of Treprostinil pumps is a safe, convenient method providing efficient control of hemodynamic and respiratory parameters and good postoperative outcome in patients with end-stage PAH. Further studies evaluating different anesthesiologic approaches and advanced non-invasive hemodynamic monitoring techniques are warranted.

4AP4-3

Forearm tissue oxygen saturation in a model of hypovolaemia and pain

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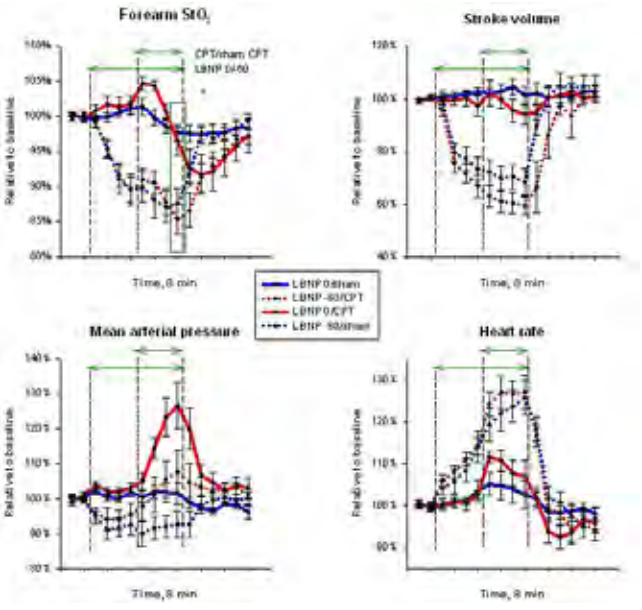
Background and goal of study: Hypovolaemia in the lower body negative pressure model (LBNP) reduces forearm oxygen saturation (StO_2)[1]. Thus, StO_2 may diagnose early bleeding in trauma patients. Both LBNP and cold pressor test (CPT), a model of acute pain, reduce blood flow in the brachial artery.[2] As pain is frequent in trauma patients, it is important to explore if pain itself affects StO_2. In this study, we explore the separate and combined effects of LBNP and CPT on forearm StO_2.
Materials and Methods: Nine healthy volunteers were exposed to LBNP levels of 0 and -60 mmHg and CPT and sham-CPT in a 2x2 fashion. After 1 min baseline registration, LBNP 0 or -60 mmHg was applied for 4 min. Two min into the LBNP sequence, CPT or sham-CPT was applied, lasting 2 min as the right hand was placed in ice-cold water or not (sham). Five min into the series, both interventions were terminated simultaneously. Stroke volume measured by suprasternal Doppler, mean arterial pressure by Finometer and forearm StO_2 by Invos cerebral/somatic oximeter with the probe attached over the brachioradial muscle of the left arm. Comparisons between groups the last ½ min of the interventions (green box, fig 1) were performed by paired t-tests.



[Fig1]

Results and Discussion: Forearm StO_2, stroke volume, mean arterial pressure and heart rate relative to baseline registrations are presented in fig 1. Compared to LBNP 0/sham conditions, forearm StO_2-values were reduced

during LBNP -60 both with CPT and sham ($p< 0.001$ and $p=0.001$, respectively). The reductions were not significantly different ($p=0.26$). During LBNP 0, there was no difference between CPT and sham ($p=0.41$). However, there seems to be a biphasic response in StO_2 to CPT, and 1 min after ending CPT (asterisk in fig 1), StO_2 is reduced ($p=0.014$ compared to sham).
Conclusion: Hypovolaemia reduces forearm StO_2 both with and without pain. However, pain seems to affect StO_2 during normovolaemia in a biphasic pattern. This might be of importance when evaluating a potential role of forearm StO_2 to diagnose hypovolaemia in trauma patients.
References:
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4AP4-4

The role of mannitol in the protection of renal function during EVAR: a randomized controlled trial

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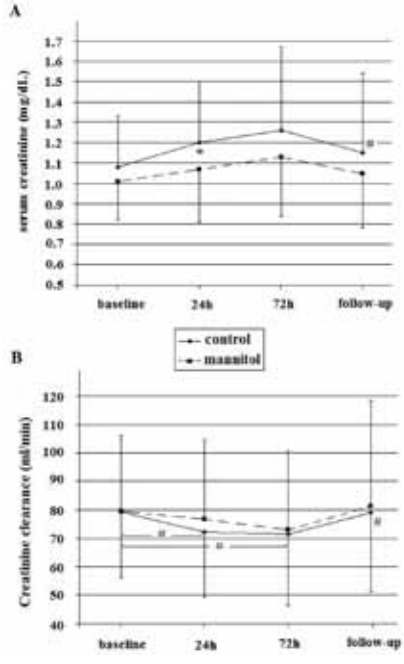
Background and Goal of Study: Endovascular aortic aneurysm repair (EVAR) results in deterioration of renal function in a significant number of patients. Mannitol has renovascular protective properties.
Materials and Methods: After written informed consent, 100 patients undergoing elective EVAR surgery were enrolled in this randomized, controlled prospective study. Randomization was performed with the method of the closed envelop. Exclusion criteria included patient refusal, end-stage renal failure (haemodialysis therapy) or one kidney, severe heart failure (left ventricular ejection fraction < 25%), emergency surgery, unstable hemodynamic status, known allergy to local anaesthetics or mannitol, impaired coagulation or other contraindication to regional anaesthesia, preceding angiography, embolism and embolectomy and known renal artery stenosis or occlusion. Patients received hydration alone or hydration plus mannitol (0.5 gr/kg) during surgery under regional anaesthesia. Serum creatinine, serum cystatin-C, urine neutrophil-gelatinase-associated lipocalin (NGAL), albuminuria and serum urea were measured 24, 72 hours postoperatively. Serum creatinine was also measured at the follow-up. One-way analysis of variance, repeated-measures one-way analysis of variance, Kruskal-Wallis, Mann-Whitney *U* tests, Friedman's test, cross-tabulation nd Spearman's coefficient of correlation were used for statistical analysis.
Results and Discussion: Serum creatinine (Fig A) ($p=0.036$) and cystatin C ($p=0.019$) were lower in mannitol group 24 hours postoperatively, but not 72 hours ($p=0.149$, 0.343 respectively). Creatinine clearance (Fig B) decreased in control group both at 24h and 72h, whereas in mannitol group it did not change at a statistically significant degree. Overall change of creatinine ($p=0.001$) and creatinine clearance ($p=0.001$) with time was significant in controls, but not in mannitol group.



[Serum creatinine and creatinine clearance]

Conclusion(s): We found that mannitol plus hydration offers protection against renal dysfunction after EVAR compared to hydration alone.

4AP4-5

Perioperative increase in B-type natriuretic peptide level associates with episodes of tachycardia and peripheral blood shunting

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Background and Goal of Study: Preoperative as well as postoperative B-type natriuretic peptide **(**BNP) and N-terminal pro-BNP levels are independently associated with adverse cardiac outcome[1, 2]. Perioperative increase of these hormones concentration reflects the dynamic consequences of anesthesia and surgery and was shown to be greater in patients sustaining cardiovascular events as compared with those events free [3]. With this study, we aimed to determine the factors associated with increase in BNP level during surgery.
Materials and Methods: Forty five consecutive patients, American Society of Anesthesiologists status II or III, scored as 2 or 3 on the Revised Cardiac Risk Index**,** scheduled to undergo major abdominal surgery were included in the study. Heart rate and noninvasive arterial pressure were recorded every 5 minutes throughout the procedure. Venous blood samples were drawn before the procedure and at the end of surgery and then analysed for BNP, troponin I, glucose levels, blood gases (pH, PO_2, PCO_2 and O_2 capacity) and standard bicarbonate concentration. A logistic regression model was performed to evaluate predictors of perioperative increase in BNP level. Data were entered as dichotomous variables using cutoffs obtained with receiver operating characteristic analysis.
Results and Discussion: Using logistic regression, only four variables were significantly and independently associated with increase in BNP level at the end of surgery in comparison with preoperative concentration: episodes of tachycardia (HR>90 beats/min) (odds ratio (OR), 8.42; 95% confidence interval (CI), 1.78-40.31, p value < 0,001), bicarbonate concentration (>22,45 mmol/l) (OR, 20.57; 95% CI, 4.00-105.72, p value < 0,001), preoperative BNP concentration (< 235 pg/ml) (OR, 34.97; 95% CI, 7.15-170.92, p value < 0,001) and oxygen capacity (>13,85 mg%) (OR, 42,7; 95% CI, 6.0-312.5, p value < 0,001).
Conclusion(s): High preoperative BNP concentration was associated with diminished likelihood of further increase in this hormone level. Elevation in BNP level during abdominal surgery was associated with tachycardia and peripheral blood shunting.
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4AP4-6

Moderate and deep hypothermia produce hyporesponsiveness to phenylephrine

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Background and Goal of Study: This study was designed to determine whether moderate (25°C) and deep hypothermia (18°C) influence physiologic responses to phenylephrine (Phe) and compare the degree of hyporesponsiveness to Phe after the completion of rewarming after hypothermic cardiopulmonary bypass in cardiac or aortic surgery.
Materials and Methods: After checking endothelial integrity, the temperature of the organ bath containing with rat aortic rings was maintained at 18°C for 1 hour, and rewarmed gradually for 2 hours. After the completion of rewarming, we checked Phe (10^{-9}- 10^{-5}M) dose-response relationships in endothelium-intact and -denuded rings. The same experiment was performed in rings pre-exposed with 25°C. To determine the involvement of endothelium-derived hyperpolarizing factor (EDHF) on hyporesponsiveness to Phe after exposure of deep hypothermia (18°C), some rings were pretreated with nitric oxide synthase inhibitor, NG-nitro-L-arginine methyl esther (L-NAME, 10^{-4}M) and cyclooxygenase inhibitor, indomethacin (10^{-5}M) for 30 minutes before checking bradykinin ($3x10^{-10}$- 10^{-5}M) dose-response relationships.
Results and Discussion: In endothelium-intact rings, rings pretreated with deep hypothermia (18°C) and 2 hours rewarming significantly decreased (*P*

< 0.05) sensitivity and the maximal response to Phe compared with control rings at 38°C. However, these hypothermic effects did not appear in endothelium-denuded rings. Phe dose-response relationships in endothelium-intact rings at 25°C were not different to those of 18°C. Maximal relaxation to bradykinin in endothelium-intact rings pretreated with L-NAME and indomethacin at 18°C significantly decreased ($P < 0.05$) as compared with non-pretreated rings. However, these effects were not defferent between 18°C and 38°C.
Conclusion(s): Moderate and deep hypothermia produce hyporensponsiveness to Phe. Hyporesponsiveness to Phe after the completion of rewarming is mediated by endothelium-dependent mechanisms. However, EDHF-mediated relaxation may be not involved in hyporesponsiveness to Phe. The degree of hyporesponsiveness to Phe after moderate hypothermia (25°C) was not different to that of deep hypothermia (18°C).
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4AP4-7

Evaluation of systemic endothelial microvascular function during cardiopulmonary bypass using single point laser-Doppler perfusion monitoring in the skin

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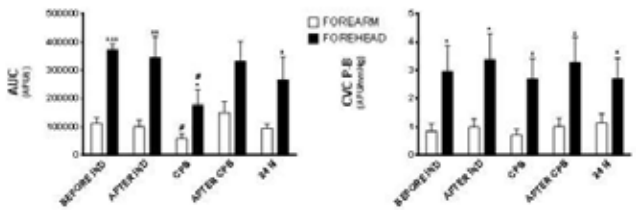
Goal of Study: We investigated the effects of cardiopulmonary bypass (CPB) on skin microvascular flow and reactivity in the forearm (FA) and forehead (FH) of patients undergoing coronary artery bypass grafting (CABG) at normothermic CPB.
Material and methods: Microvascular flow was evaluated using a double-channel single-point laser-doppler perfusion monitoring (LDPM) before and after induction (IND) of anesthesia, during and after CPB and 24 h after the end of the surgery. This observational study included 15 patients aged 61 ± 6 years; hemoglobin mean values before and after CPB were 13.4 ± 1.5 and 8.8 ± 1.4 and mean temperature 35 ± 1.1 °C. LDPM was coupled with local stimulation of the skin using a physiological provocation (thermal hyperemia, TH), consisting of 20-minute periods of local heating to 44°C. TH is considered to reflect endothelial microvascular function. Microvascular vasodilator responses to TH were evaluated by area under the curve (AUC) and by the difference from peak to baseline (P-B) cutaneous vascular conductance [CVC, expressed in arbitrary perfusion units (APU)/ mean arterial pressure (mmHg)]. Results were expressed as mean ± SEM and analyzed using one way ANOVA.
Results: AUC and CVC P-B basal values were significantly higher in the skin of the FH compared to the FA (P< 0.001). AUC values were significantly reduced during CPB both in the skin of the FA and FH (P< 0.05), and returned to baseline values after termination of CPB and 24 h after end of the surgery. There were no significant variations in microvascular flow expressed either in AUC or CVC P-B after induction of anesthesia. There were no significant variations in P-B CVC throughout the recording periods.
Conclusions: Microvascular flow is significantly higher in the FH than in the FA skin during CPB and skin microvascular flow is maintained during CPB in normothermic conditions. When expressed as absolute arbitrary units of flow, there is an apparent reduction of microvascular reactivity during CPB. Nevertheless, when mean arterial pressure is integrated in the calculation of skin microvascular flow responses, microvascular reactivity does not change significantly during CPB.



[AUC x CVC]

4AP4-8

The effects of nicardipine on rocuronium-induced neuromuscular blockade

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Background and Goal of Study: Calcium channel blockers are known to potentiate neuromuscular blockade. Nicardipine, a short acting parenteral calcium channel blocker, is used during the perioperative period to control blood pressure. The aim of this study was to identify the effects of nicardipine on the onset time of neuromuscular blockade and changes in intubating conditions with a dose known to attenuates cardiovascular responses during endotracheal intubation.
Materials and Methods: In a randomized, double-blinded, controlled trial, 78 patients (ASA I-II) undergoing elective surgery were intravenously given either a bolus of 20mcg/kg nicardipine (group N, n=39) or a comparable volume of normal saline (group C, n=39) before intubation. Using a TOF-watch, the onset time of rocuronium was defined as the time measured from the point when rocuronium was first injected to when the forth response of four consecutive stimuli disappeared. Intubation was performed one minute after rocuronium administration by a skilled anesthesiologist unaware of the administered drug. Status of intubating conditions were assessed and graded as either excellent, good, or poor.
Mean blood pressure (MBP) and heart rate(HR) were each measured from baseline, one minute before induction, one minute after induction, and every minute for five minutes after endotracheal intubation. Rate-pressure product(RPP) values were also calculated.
Results and Discussion: Intubating conditions were significantly improved in Group N. The onset time of rocuronium in group N was significantly faster than that of group C. MBP and HR were statistically higher after intubation in group C. There were no statistical differences of RPP values. Complications such as hypotension did not occur during the study.
Conclusion(s): 20 μg/kg of nicardipine, a dose known to attenuates cardiovascular responses due to tracheal intubation, provides better clinically acceptable intubating conditions. Also, pretreatment of 20 μg/kg nicardipine shortens the onset time of rocuronium.
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4AP4-9

Postoperative low aspirin response in vascular surgery: a pilot study

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Background and Goal of Study: The efficacy of Aspirin (ASA) in primary and secondary prevention of vascular diseases has been widely documented. However, patients taking ASA may show low response to treatment, related to genetic polymorphisms, poor compliance or other factors that are not yet fully understood. Patients undergoing vascular surgery are at risk of myocardial infarction in the perioperative period because of the high prevalence of risk factors. The goal of our study was to measure the efficacy of ASA after major aorta and peripheral vascular surgery by using whole blood impendance aggregometry (IA) (Multiplate® analyzer). Our hypothesis is that surgical trauma, postoperative inflammation and thrombocytosis may reduce the efficacy of ASA, partially explaining the increased incidence of postoperative myocardial infarction in this population.
Materials and Methods: We performed a monocentric, observational, cohort study. Patients presenting for elective abdominal aorta or peripheral vascular surgery, chronically treated by ASA were included. Blood samples for platelet count and IA measurements were collected on the morning of surgery (baseline) and once daily until the fifth postoperative day (POD). The primary outcome measure was platelet response expressed in AU in the Aspi-test using the Multiplate® analyzer. The Aspi-test specifically measures platelet response to ASA. Low aspirin response (LAR) was defined as an impedance of less than 50 UA. Secondary outcomes were postoperative thrombotic and hemorrhagic complications on POD 30. Baseline and postoperative values were compared

using paired student-t test. The fraction of patients showing LAR was compared using Fisher's test.
Results and Discussion: 17 patients were included. Mean baseline platelet count was 256 G/l and decreased in the postoperative period (188 G/l at POD2). LAR increased from 12% at baseline (2/17 patients) to 41 % (5/17) postoperative (p=0.3) Mean preoperative platelet reactivity was 23 ± 18 AU compared to 45 ± 22 AU postoperative (p=0.003). 4 patients suffered peripheral thrombosis, 2 of whom showed postoperative LAR. No patient had cardiac or cerebral ischemic complication. One patient had a hemorrhagic complication related to surgery.
Conclusion: We observed a postoperative increase in LAR in patients undergoing vascular surgery. Large clinical trials need to evaluate whether postoperative LAR is correlated to an increased incidence in thrombotic complications.

4AP4-10

Role of vasoactive intestinal peptide receptor 2 in monocrotaline-induced pulmonary hypertension in rats

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Background and Goal of Study: Pulmonary hypertension (PH) is associated with significant perioperative risk of major complications, including cardiac arrest and death. Vasoactive intestinal peptide (VIP) and its related peptide, pituitary adenylyl cyclase activating peptide (PACAP) have a potent vasodilatory effect and a positive inotropic and chronotropic effects on cardiac contractility via three receptors, VPAC1, VPAC2, which possess a similar affinity for both peptides and PAC1, PACAP-preferring receptor. VIP has been expected to be promising treatment option for PH, however the treatment with VIP is still not established. It has been reported that expressions of VPAC1 and VPAC2 were up-regulated, reflecting a response due to the decreased VIP in PH in patients and animal model. In addition, specific agonists of the receptors have not been investigated for PH treatment. In this study, we investigated whether the up-regulated receptors in PH could enhance vasodilatory responses of pulmonary vessels to exogenous VIP/PACAP agonists and which receptor might be involved in vasodilation in PH.
Materials and Methods: Firstly we investigated the expression of VIP/PACAP mRNA by quantitative real-time PCR, and VPAC1, VPAC2 and PAC1 protein by western blot analysis. Secondly, we examined effect of intravenous injection of VPAC1, VPAC2 specific agonists, VIP, and PACAP on systemic and right ventricular pressures (RVP) and cardiac output. Eight-week-old SD rats were divided into the two groups: MCT, administered 60mg/kg of MCT subcutaneously to induce PH; and control.
Results and Discussion: Decreased expression of VIP and PACAP were accompanied with increased VPAC1, VPAC2, and PAC1 in the lung from PH rats. Injection of VPAC2 agonist decreased RVP and improved cardiac output in the PH rats, while not affecting those in normal. VIP also, but not VPAC1 agonist produced smaller decrease in RVP and increase in cardiac output. Therefore, VPAC2 may be involved in pulmonary vasodilation and improvement of cardiac output. In addition, these enhanced responses to VPAC2 agonist in PH may be due to up-regulated VPAC2 expression compared to in normal.
Conclusion: VPAC2 agonist improved right ventricular pressure and cardiac output in MCT-induced PH rats. The agonist could be an alternative and more promising treatment for PH than VIP.

4AP5-1

Cerebral and systemic tissue oxygen saturation are more dependent on flow than on pressure maintenance

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Background and Goal of Study: Although both pressure and flow are considered important determinants of regional organ perfusion, the relative importance of each is less established. The aim of the present study was to evaluate the impact of variations in flow and/or pressure on cerebral (ScO_2) and systemic (SvO_2) tissue oxygen saturation. We choose cardiopulmonary bypass (CPB) as the model to test our hypothesis, since flow and pressure can be independently modified on CPB.
Materials and Methods: After ethical committee approval and informed consent, 34 patients undergoing elective cardiac surgery on CPB were included. Patients with history of cerebrovascular disease or significant carotid artery stenosis (>60%) and patients necessitating vasopressor or inotropic therapy before surgery were excluded.
Using a randomized cross-over design, 4 different haemodynamic states were simulated during CPB: 1) 20% flow decrease, 2) 20% flow decrease with phenylephrine to restore baseline pressure, 3) 20% pressure decrease with sodium nitroprusside (SNP) under baseline flow, and 4) increased flow with baseline pressure.
The effect of these changes on ScO_2 and SvO_2 was evaluated. Data were assessed by within- and between-group comparisons. Data are expressed as mean ± standard deviation.
Results and Discussion: 9 female and 25 male subjects were enrolled. Decrease in flow was associated with a decrease in ScO_2 (from 64 ± 7 to 62 ± 8%, $p< 0.001$). When blood pressure was restored with phenylephrine during low flow, ScO_2 further decreased from 61 ± 10 to 59 ± 10%, ($p< 0.001$). Increase in flow was associated with an increase in ScO_2 from 63 ± 8 to 64 ± 9%, ($p=0.03$), while decreases in pressure with the use of SNP did not affect ScO_2. SvO_2 was significantly lower ($p< 0.001$) and oxygen extraction ratio was significantly higher ($p< 0.001$) in the low flow arms.
Conclusions: In the present study, ScO_2 and SvO_2 were significantly lower with lower flow, regardless of systemic blood pressure. Moreover, phenylephrine administration seemed to be associated with a reduced cerebral and systemic oxygen saturation.

4AP5-2

Evaluation of the venoarterial PCO2 difference in cardiac surgery. Retrospective study on 230 patients

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Background and Goal of Study: Microcirculation is a major determinant of tissue perfusion and organ failure. Several studies offered to measure arteriovenous carbon dioxide difference (GapCO2) as a simple way to assess it[1]. GapCO2 depends on cardiac output and on local perfusion conditions[2]. Their alteration goes with an increase of GapCO2.The main goal of this study was to assess GapCO2 prediction ability on patient outcome (length of stay in the ICU, total length of stay, SOFA scores in the first 48 hours). Secondary goals were to improve our understanding of the link between cardiac output and local perfusion conditions (hemoglobin, pH, lactate, SvO2, PaCO2, body temperature) on GapCO2.
Materials and Methods: The study dealt with a 230 cardiac surgery patients cohort, using retrospective analysis, over 6 months. GaCO2 and the other parameters were monitored at H0, H6, day 1 and 2 from ICU admission. Cardiac output was measured using a Swan-Ganz catheter for patients undergoing a risky procedure. A GapCO2 value lower or equal to 6 was considered normal. Simple logistic regression was used for correlation evaluation, Wilcoxon test was used for central tendency comparison.
Results and Discussion: We did not show any correlation between GapCO2 and patient outcome (total length of stay, SOFA score). Nevertheless, an increasing value of GapCO2 was associated with increasing cardiac output ($r^2=0.266$ $p=0.004$) and decreasing SvO2 ($r^2=0.204$ $p< 0.001$). No correlation was found between GapCO2 and the other parameters. In our sample, contrary to other previous studies in surgery patients, no clinically relevant link was found between GapCO2 and patients outcome. GapCO2 mainly seems to reflect cardiac output.
Conclusion: A microcirculation perfusion measure would provide a better insight on the effect of cardiac output on GapCO2.
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4AP5-3

Dynamic evaluation of near-infrared cerebral and peripheral oxymetry in healthy volunteers: a comparison between INVOS and EQUANOX

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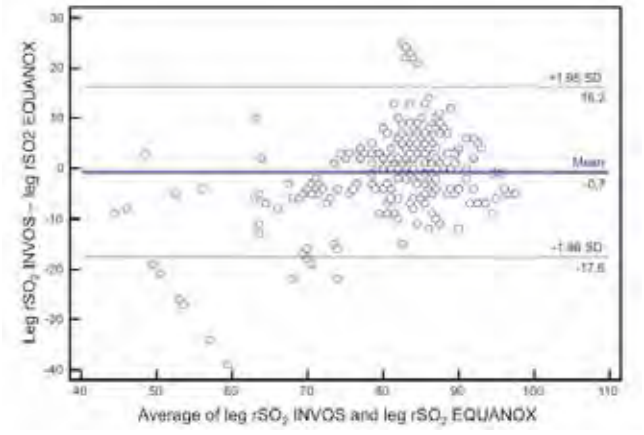
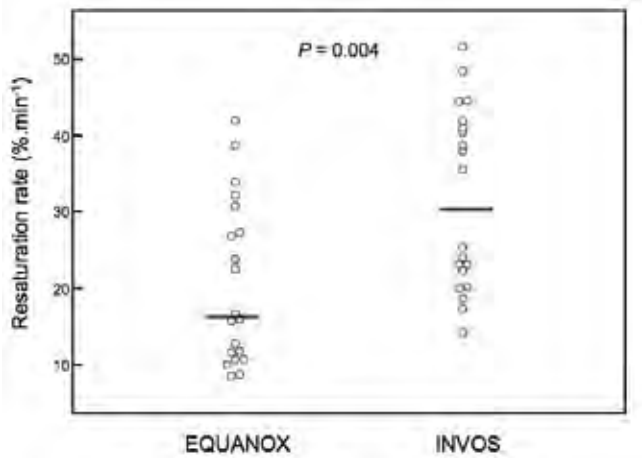
Background and Goal of Study: There is no well-established reference values for rSO_2. The objectives of the present study were to compare rSO_2 values given by INVOS at different levels, and rSO_2 and desaturation/resaturation rates given by INVOS and EQUANOX at the same level.

Materials and Methods: After written informed consent, twenty healthy volunteers (28 ±4 years) were investigated during 6 experimental steps: baseline, hyperoxia, baseline, ischemia, reperfusion, baseline. For each volunteer, 6 sensors were placed on the forehead (INVOS), both calves (INVOS and EQUANOX) and the arch of the foot (INVOS). Blood pressure, heart rate and peripheral pulse oxymetry were monitored.
Results and Discussion: Significant differences were observed at baseline among INVOS values: cerebral rSO_2 70±10% vs. leg rSO_2 81±9% vs. foot rSO_2 60±5% ($p < 0.001$). Hyperoxia induced a variable increase in rSO_2 with both technologies. INVOS leg rSO_2 ranged from 40 to 95% and EQUANOX leg rSO_2 from 47 to 100% (81±12 vs. 82±9, $p=0.469$). A significant positive relationship was found between INVOS and EQUANOX leg rSO_2 ($r=0.695$; $p < 0.001$). Percentage error between both devices was 21%. Rates of desaturation/resaturation during occlusive vascular tests were significantly different: INVOS desaturation rate 3.65 %.min^{-1} vs. EQUANOX desaturation rate 2.36 %.min^{-1} ($p=0.027$); and INVOS resaturation rate 30.42 %.min^{-1} vs. EQUANOX resaturation rate 16.28 %.min^{-1} ($p=0.004$).
Conclusions: rSO_2 depends on systemic oxygenation and perfusion conditions and differ according to the regional level. INVOS and EQUANOX devices could be comparable in measuring absolute values of rSO_2 but neither to evaluate dynamic changes in rSO_2 nor NIRS-derived parameters during vascular occlusion tests.



[Bland-Altman diagram for comparison of leg rSO2]



[Resaturation during occlusive vascular tests]

4AP5-4

Effect of propofol anesthesia induction on cardiac function in low-risk patients: tissue Doppler imaging of mitral valve annular velocity

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Background: Propofol produces dose-dependent myocardial depression, but there is little clinical data available regarding the direct impact of propofol induction on left ventricular (LV) function. The purpose of this study was to examine the impact of propofol-for anesthesia induction on LV function.
Methods: In 19 low-risk patients with normal LV systolic and diastolic function undergoing non-cardiac surgery, propofol(2.0 mg/kg) was administered intravenously for anesthesia induction. LV ejection fraction(EF), longitudinal strain, and tissue Doppler-derived indices of mitral annular velocity during systole(S'), early diastole(e'), and atrial contraction(a') were determined by intraoperative transthoracic echocardiography before and 1, 3, and 5 minutes after bolus propofol (T0, T1, T2, and T3, respectively).
Results: The following at T1, T2, and T3 were significantly less in magnitude than at T0: septal S'(5.61, 5.61 and 5.51 vs. 7.60 cm/s, $p < 0.001$); lateral S'(5.75, 5.89, and 5.94 vs. 8.12 cm/s, $p < 0.001$); septal e'(10.10, 10.26, and 10.07 vs. 11.4 cm/s, $p < 0.01$); septal a'(6.70, 6.21 and 6.13 vs. 8.58 cm/s, $p < 0.01$), lateral a'(7.29, 6.81 and 6.85 vs. 9.01 cm/s, $p < 0.01$); and longitudinal strain(-19.36%, -19.71% and -19.61% vs. -22.28%, $p < 0.001$). LV EF was not significantly changed($p=0.361$).
Conclusion: Propofol 2m g/kg for anesthesia induction seems to compromise LV and atrial contraction in low-risk patients and reduction of its dosage may be required to attenuate the dose-dependent myocardial depressive effect.

4AP5-5

Cardiac performance during neuroaxial blockade in patients with diastolic dysfunction

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Background and Goal of Study: Cardiovascular responses as a result of subarachnoid block (SAB) are due to a loss of sympathetically mediated peripheral vascular resistance and a reduction in venous return. To evaluate the effects of neuroaxial blockade on cardiac function in patients with impaired ventricular relaxation, transthoracic 2D-echocardiography and Doppler tissue imaging (DTI) were performed.
Materials and Methods: The study was approved by the Ethics Committee of the State Medical Chamber of Baden-Wuerttemberg (No. F-2012-040). Written informed consent was obtained. Echocardiographic images were recorded in 51 patients (age 70.3 ± 8.0) scheduled for orthopedic surgery either in single shot spinal or combined spinal-epidural technique. Among other, left ventricular systolic and diastolic function were assessed by means of Doppler transmitral and tissue inflow velocities (*E* = early mitral inflow; *e'* = early diastolic mitral annulus motion; *A* = late mitral inflow; *a'* = late diastolic mitral annulus motion; *LVOT-VTI* = time velocity integral of the left ventricular outflow tract). Right ventricular performance was estimated by the tricuspid annular plane systolic excursion (*TAPSE*). Repetitive measurements were performed before and 5, 10, 15 and 20 minutes after the inition of SAB, respectively. A two-sample unpaired t-test; MANOVA and regression analysis were performed.
Results: All patients had sinus rhythm and normal left ventricular function. In 15 an impaired relaxation was observed (E/A≤0.8). Neither severe valve diseases nor wall motion abnormalities could be identified. During onset of SAB, a significant decrease in mean arterial blood pressure was observed in all patients and a coinciding drop in cardiac output (CO), mainly as a consequence of a reduced heart rate. In patients with impaired relaxation we recognized a marked increase of LVOT-VTI (23.4 ± 4.5 cm *vs* 20.9 ± 5.1, $p < 0.01$), E/A ratio (0.91 ± 0.15 *vs* 0.74 ± 0.06, $p < 0.05$) and a reduction in e' (8.6 ± 2.0 *vs* 8.9 ± 2.1cm*sec^{-1}, $p < 0.01$) compared with controls. TAPSE did not change over time.
Conclusions: 1. A reduced cardiac afterload due to SAB leads to an improvement of diastolic filling patterns in DTI and global systolic function, especially in patients with abnormal relaxation. 2. The reduction of the CO was mainly caused by a decrease in heart rate, and not a result of stroke volume changes. 3. Preload changes had no effect on right ventricular function.

4AP5-6

The accuracy of transesophageal echocardiography for detecting the coronary cusp herniation and aortic valve regurgitation in children with ventricular septal defect

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Background and Goal of Study: Coronary cusp herniation (CCH) and aortic valve regurgitation (AR) are often associated with the ventricular outflow tract deficient form of ventricular septal defect (VSD). Preoperative assessment of CCH and AR is considered important for the surgical planning. To date, transesophageal echocardiography (TEE), transthoracic echocardiography, and cardioangiography are used for the purpose. In this study, we compared the accuracy in detecting CCH and AR among these three procedures in children with outflow tract deficient types of VSD.
Materials and Methods: Under IRB approval and with informed consent of patients and parents, consecutive twelve children with outflow tract deficient form VSD which complicated CCH were recruited in this study.
The location of VSD was based on the Soto's classification, and final evaluation was based on the intraoperative surgical findings. we compared the accuracy in detecting CCH and AR among these three procedures in children with outflow tract deficient types of VSD.
Results and Discussion: During surgery, 5 cases were classified into doublycommitted subarterial type (41.6%), 5 cases into perimembranous outlet type (41.6%) and 2 cases into muscular outlet type (12.6%). Regarding the location of VSD, surgical findings and preoperative TEE were all matched. The detection rate of CCH was equivalent with TEE (100%) and cardioangiography (100%) while the rate was less with transthoracic echocardiography (66.7%). The detection rate of AR of TEE (41.7%) was superior to both of cardioangiography (25%) and transthoracic echocardiography(25%).
Conclusion(s): TEE provides accurate preopetrative information in children with outflow tract deficient types of VSD in detecting CCH and AR.
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4AP5-7

Noninvasive assessment of peripheral microcirculation by near-infrared spectroscopy (NIRS): a comparative study in healthy smoking and nonsmoking volunteers

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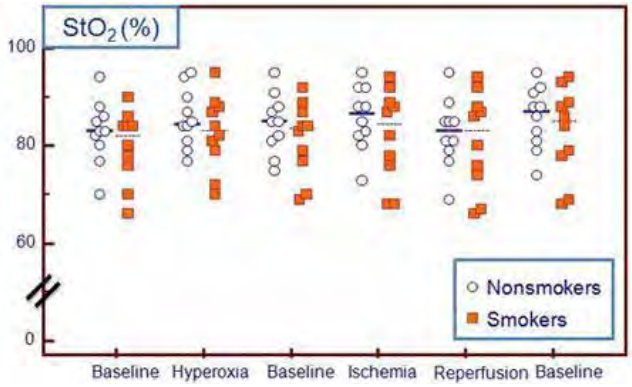
Background: The aim of this study was to compare microvascular reactivity by near-infrared spectroscopy (NIRS) during a dynamic vascular occlusion test in healthy smoker and nonsmoker volunteers.
Materials and Methods: Twenty healthy volunteers (10 men, 10 women), aged from 22 to 38 years old, were included after approval of the local Ethics Committee and divided into two groups: smokers (n=10) and nonsmokers (n=10). Tissue oxygen saturation (StO_2) was measured at the level of each individual's calves thanks to INVOS, at six experimental stages: 1) baseline, 2) hyperoxia, 3) baseline, 4) acute ischemia of the lower left limb, 5) reperfusion of the lower left limb, and 6) baseline. In addition, during the ischemia phase, the slope of decline in StO_2 was known.
Therefore, for each group, we were able to deduce the speed of desaturation (ΔStO_2/ischemia time). The same was applied for resaturation rates during the reperfusion phase (ΔStO_2/reperfusion time)
Results: At baseline, all clinical and hemodynamic characteristics measured in both groups were comparable. StO_2 values were comparable at all experimental steps between smokers and nonsmokers. During the acute ischemia-reperfusion test, rates of desaturation were the same between smokers and nonsmokers (respectively 3,65% / min $[2,50\text{-}12,6]_{0,95}$ and 3,65% / min $[1,80\text{-}15,14]_{0,95}$; p = 0,50). It was the same for the rate of resaturation (respectively : 30,43% / min $[14,15\text{-}51,63]_{0,95}$ and 30,52% / min $[18,64\text{-}44,54]_{0,95}$; p = 0,82). There was however a significant difference between men and women, regardless of their smoking status, for both the desaturation (respectively 5.66% / min $[4.10\text{-}11.24]_{0,95}$ against 2.50% / min $[2.20\text{-}3.16]_{0,95}$; p=0.001) and the resaturation rates (respectively 40.67% / min $[36.68\text{-}46,56]_{0,95}$ against 21.66% / min $[17.95\text{-}24.70]_{0,95}$, p=0.003).



[StO2 (%) at the six experimental stages]

Conclusions: NIRS study of microvascular reactivity during a dynamic vascular occlusion test did not reveal any difference between smokers and nonsmokers. However, according to sex, there were significant differences in the rates of desaturation and resaturation. This could result in a lower tolerance to ischemia in the male population.

4AP5-9

Does transesophageal echocardiography justifies the use of general anesthesia during transfemoral transcatheter aortic valve replacement (TAVR) in high risk patients?

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Background and Goal of Study: TAVR is an established procedure for inoperable and high risk aortic stenosis patients. There are several reported benefits of the use of transesophageal echocardiography (TEE) specific for this procedure: proper positioning of guidewires and catheters, mitral valve function changes, sizing of the prosthesis and evaluation of aortic regurgitation (AR) after implantation. The evaluation of AR is particularly important because it is a marker of poor prognosis at one year. General anesthesia is required for fine imaging.
Material and methods: We compared two series of consecutive patients each undergoing TAVR with CoreValve (Medtronic) via transfemoral retrograde technique divided into two groups: I - Conscious sedation and local anesthetic and II - General anesthesia with TEE monitoring. The primary outcome was AR greater than mild at Hospital discharge and the secondary was AR requiring additional procedures after initial implantation. In group I, the assessment of the need for additional procedures was performed by angiography and hemodynamic data and in group II, TEE provided additional information. In both groups the assessment of residual AR at discharge was made by transthoracic echocardiography (TTE). Chi-square test was applied for significant differences at 95% CI.
Results and Discussion: Sixty cases of IVAP between July 2009 and July 2012 were studied, Group I had 29 patients with a mean age of 83.27 years (69-103) with EuroSCORE average 20.57%; STS average 20.41%; P4 ASA. Group II had 31 patients with a mean age of 82.32 years (67-96) with EuroSCORE average 28.37%, 21.98% average STS; ASA P4. In group I there were 10 cases AR greater than mild after implantation requiring some additional procedure; before discharge we found two cases of moderate AR and one case of severe AR. In group II there were 13 cases of AR greater than mild after implantation requiring some additional procedure; before discharge we found 2 cases of moderate AR. For both outcomes, there was no statistically significant difference between the two groups.
Conclusion(s): The additional information offered by the TEE in these patients had no significant impact on the procedures after implantation or in reducing the frequency and severity of AR at discharge. The benefits of TEE and the complexity of the associated general anesthesia are not evident on this study and are not justifiable.

4AP5-10

Non-invasive cerebral oxygenation monitoring reveals cerebral hypoperfusion during transcutaneous aortic valve implantation (TAVI)

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Background and Goal of Study: Recent data (1) reported that 26% of all post-TAVI strokes revealed lacunar infarcts on brain CT-scan caused by cerebral hypoperfusion. During valve implantation, especially with the Edwards Sapien valve, a transient partial cardiac standstill is induced by rapid ventricular pacing (RVP) (180-220/min). These periods of RVP could induce dangerous reductions of cerebral perfusion with possible ensuing cerebral ischemia. In the past years, Near InfraRed Spectroscopy (NIRS) has been introduced as a usefull non-invasive cerebral monitoring technique assessing cerebral oxygenation. As far as today, no data have been published on the use of NIRS monitoring during TAVI procedures.
Materials and Methods: We report on 14 consecutive pts suffering from severe aortic stenosis and scheduled for TAVI procedure. Fore-Sight technology (Casmed, Branford US) was used to monitor non-invasive absolute cerebral oxygen saturation (SctO2) in the frontal lobe. During procedure, SctO2 monitoring was blinded for interpretation. Normally distributed continuous data were analyzed using the one-sample t test. The results are represented as mean (+/- SD) or percent (%) as indicated. A p-value below 0.05 was statistically significant.
Results and Discussion: Mean starting $SctO_2$ value (after induction of anesthesia) was 69% (63-77%; SD 3.6). During the first RVP periods (for valve dilatation), mean $SctO_2$ was significantly lower: 58% (43-68% ; SD 6.6)(p=0.002). Evenso, during final RVP periods for valve implantation, mean SctO2 was significantly lower: 52% (38-61%; SD 7.9)(p=0.000). Only 5 patients (35.7%) did not experience any decrease in $SctO_2$ below 55% (lower threshold for cerebral ischemia). Mean SctO2 value at the end of procedure was 69% (range 58-78%). In all pts, TAVI procedure was technically succesfully performed. In one pt, RVP caused persistent left ventricular failure with need for ECMO. Despite hemodynamic stabilization, pt was declared brain dead 24h later. Outcome in all 13 other pts was uneventfull, with no neurologic (stroke/TIA) complications.
Conclusion: During TAVI, especially RVP periods caused significant cerebral desaturations. Use of SctO2 monitoring might lead to therapeutic interventions aimed at maitaining or restoring adequacy of cerebral perfusion.
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4AP5-11

Clinical application of supra-annular measurement of aortic root for selecting the correct prosthetic valve size at aortic valve replacement: a novel approach using real-time three-dimensional transesophageal echocardiography

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Background and Goal of Study: Patient-prosthesis mismatch (PPM) is a frequent problem during aortic valve replacement (AVR), especially found in cases of aortic stenosis (AS). There are many reports that PPM is associated with an all-cause and cardiac-related mortality. The aim of achieving an optimal flow orifice, complete supra-annular concept of aortic prosthetic valve was designed. Although it has been widely used at AVR, there have been few reports on predictive value of echocardiographic supra-annular measurement of aortic root for selecting the prosthetic valve size. The usefulness of real-time three-dimensional transesophageal echocardiography (RT-3D TEE) in guidance of cardiac surgery was shown in many studies. In this study, we evaluated the applicability of supra-annular measurement of aortic root using RT-3D TEE for the determination of correctly sized prosthesis.
Materials and Methods: 23 patients (6 male, 14 female, mean age 70.6 (range: 38−85) years) diagnosed with AS whom undergoing AVR and performing preoperative RT-3D TEE were examined retrospectively in this study. RT-3D TEE was performed using the ultrasound system (iE33, Phillips Medical Systems, Andover, Massachusetts, USA), and 3D data set was analyzed offline using the dedicated quantification software (Q-Lab, Phillips Medical Systems, Bothell, Washington, USA). We defined the supra-annular level of aortic root as 2mm above aortic annulus because the superior border of sewing ring was almost placed there. The cross sectional image of aortic root at the supra-annular level was constructed from 3D image by multiplanar reconstruction method, then major and minor axis of it were measured from the image. We compared between the average of each axes and outer sewing ring diameter of actually implanted prosthesis by Bland-Altman analysis. Inter- and intraobserver correlation coefficient were also calculated.
Results and Discussion: There was a good correlation between the average of axes of supra-annular aortic root and the size of prosthesis (R=0.74, p=0.0006). Systematic bias and limit of agreement were -1.7mm (-0.86 to -2.66). Statistical analysis showed no significant differences between the inter- and intraobserver variability (intraclass correlation coefficient was 0.83 and 0.90 respectively).
Conclusion: Supra-annular measurement of aortic root using RT-3D TEE was accurate and reproducible for determining the size of aortic prosthetic valve.

4AP6-1

Implication of Myeloperoxidase in the onset of atrial fibrillation after cardiac surgery under cardiopulmonary bypass

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Background and Goal of Study: Myeloperoxidase (MPO) is an oxidative stress biomarker secreted by leukocytes and macrophages in response to ischemia-reperfusion injuries (I/R). High MPO serum levels predict risk for early cardiac events in patients with acute coronary syndrome(1).
Aortic cross clamping during cardiopulmonary bypass (CPB) induces myocardial I/R and oxidative stress. Atrial fibrillation (AF) is the most common complication following cardiac surgery and is linked to systemic inflammation (2). The aim of this prospective observational study was to investigate whether MPO expression during CPB is correlated to post operative AF.
Materials and Methods: After informed consent we determined MPO kinetics in 43 patients scheduled for elective on pump cardiac surgery. Arterial samples were taken before induction of anesthesia (T0), 5 min after systemic heparinization (T1), 15 min after aortic declamping (T2), and 15 min (T3), 1 h (T4), 5 h (T5), and 19 h (T6) after the end of CPB. Further on we compared the patients presenting post operative AF (Gr 1 n=14) and those without AF (Gr2 n=29) for differences in MPO expression. We then entered all MPO rates, age, gender and pre-existing presence of diabetes and HTA into a logistic regression model for their relationship with AF. Results were analyzed using: Bartlett's test, T-test, Wilcoxon's rank and Chi square test ($p < 0.05$ significant). MPO levels are expressed as mean ± standard deviation.
Results and Discussion: MPO levels increase significantly from 15.16 ± 8.31 (T0) to 208.9 ± 67.15 ng/ml (T1) ($p < 0.001$) and, from T1 to T2 (270.5 ± 103.68 ng/ml)($p < 0.001$). MPO levels decrease starting from T3 (104.00 ± 63.82 ng/ml), until T6 (25.25 ± 8.67 ng/ml) ($p < 0.001$). Fourteen (32.6%) patients presented post operative AF. MPO expression at all test points were not statistically different between groups. AF patients were significantly older (74.8 years) compared to non AF patients(62.5 years; p=0.0048).
Conclusion(s): MPO is secreted during on-pump cardiac surgery and values peak just after aortic declamping. MPO levels do not seem to be linked to post operative onset of AF.
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4AP6-2

Questionnaire about hemodynamic management for high risk surgery patients during surgery in China

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Background and Goal of Study: Post-surgical patient outcome is an essential factor to optimize for physicians and hospitals. Hemodynamic management is a key parameter for this optimization and has been shown to directly correlate with outcome for high risk surgery patients. However, the frequency and details of hemodynamic monitoring among Chinese anesthesiologists are largely unknown. The goal of this study was to evaluate the current intraoperative hemodynamic management practices for high risk surgery patients in China.
Materials and Methods: From September 2010 to Nov 2011, we surveyed anesthesiologists working in the operating rooms of 265 hospitals representing 28 Chinese provinces. All questionnaires were distributed to department

chairs of anesthesiology or practicing anesthesiologists who visited West China Hospital of Sichuan University during this time. Once completed, the 29-item questionnaires were collected and analyzed.
Results and Discussion: 210 questionnaires from 265 hospitals in China were collected. The details on hemodynamic monitoring routinely used for the management of high risk surgical patients were as follows: 91.4% monitored invasive arterial pressure, 82.9% monitored central venous pressure (CVP), 13.3% monitored cardiac output (CO), 10.5% monitored mixed venous saturation and less than 2% monitored pulse pressure variation (PPV) or systolic pressure variation (SPV). The majority (88%) of anesthesiologists relied on clinical experience as an indicator for volume expansion and more than 80% depended on blood pressure, CVP and urine output. Only 8.6% regarded cardiac output as a commonly used indicator and 34% used CVP as a substitute for CO.
Conclusion(s): The anesthesiologists in China who responded to this survey do not appear to place great emphasis on hemodynamic parameters such as PPV, SPV and CO during fluid management in high risk surgical patients. The lack of CO monitoring may be attributed largely to the limited access to technologies with the ability to measure these parameters without an invasive pulmonary artery catheter. In order to improve the use of CO monitoring, there needs to be an improvement in availability and access to these technologies.
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4AP6-3

Cutaneous microcirculation as a marker of endothelial dysfunction in patients undergoing on-pump coronary artery bypass graft

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Background: Coronary artery bypass graft (CABG) surgery with cardiopulmonary bypass (CPB) is associated with systemic inflammatory response and endothelial dysfunction. In the present study we used Laser Doppler perfusion monitoring associated with pharmacological and physiological stimulation to evaluate the subacute effects of the CPB in the skin microcirculation in patients undergoing CABG surgery.
Materials and Methods: Twenty-three patients were evaluated on the day of surgery and 7 days after the CABG surgery with CPB. Plasma nitrite/nitrate (NOx) concentrations, cytokine detection by multiplex microbead Immunoassay and high-sensitivity C-reactive Protein (hs-CRP) were determined. The skin microcirculation was evaluated by microiontophoresis of acetykcoline (Ach) and sodium nitroprusside (SNP), post occlusive reactive hyperemia (POHR), and thermal hyperemia. Cytokines and inflammatory markers such as C-reactive protein (CPR), nitrite/nitrate and IL-6 were also analyzed.
Results and Discussion: Seven days after the surgery patients presented high levels of IL-6 and CPR e low bioavailability of nitric oxide. CABG surgery with CPB induced a significant reduction in the skin microvascular flux after cumulative doses of Ach (endothelium-dependent) and after thermal hyperemia. There was a significant delay in time to maximum flux after POHR. CABG surgery with CPB did not induce any significant change in the microvascular flux after cumulative doses ot SNP (endothelium-independent). We observed a significant impairment of endothelial function and a well-preserved endothelium-independent vasodilatation in the skin microcirculation in patients 7 days after the CABG surgery with CPB.
Conclusion: Our results suggest that Laser Doppler perfusion monitoring in the skin microcirculation may be a useful tool for the assessment of the subacute CPB-induced endothelial dysfunction in patients.

4AP6-4

Predictors of atrial fibrillation after esophagectomy

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Background and Goal of Study: Postoperative atrial fibrillation (pAf) is common after esophagectomy and associated with worsen outcomes[1]. Risk prediction for pAf is important to define its individual risk, and to identify and assess potential targets of therapy. Accordingly, we conducted retrospective observational study to determine risk factors for pAf after esophagectomy.
Materials and Methods: We reviewed the medical records of patients who underwent esophagectomy in the National Cancer Center Hospital, Tokyo, Japan, between April 2009 and October 2012. Patients with a history of chronic AF were excluded. We observed 27 potential predictors, including known risk factors for AF in the general population and intraoperative factors. We compared the occurrence of pAF between patients with and without these factors. To identify independent predictors of pAf, we further performed multivariate logistic regression analysis including relevant predictors as independent factors.
Results and Discussion: Among 303 patients after esophagectomy, pAF developed in 71 patients (23.4%). In these patients, pAf was developed within postoperative 3 days in 52 patients (73.2%). According to univariate analysis, the occurrence of AF was associated with being more than 65 years old, previous treatment by calcium-channel blockers, hypertension, preexisting arrhythmia, and diabetes mellitus. There was no statistically significant difference in intraoperative factors such as infusion volume, operation time, reconstruction route and thoracoscopic surgery. In our multivariate logistic analysis, incidence of pAf was significantly independently associated with history of hypertension (odds ratio, 2.20; 95% confidence interval, 1.25 to 3.86; $p = 0.006$).
Conclusion(s): In patients after esophagectomy, history of hypertension, but not intraoperative factors, was independently associated with pAf.
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4AP6-5

Major cardiac and cerebrovascular events in patients with coronary stents undergoing noncardiac surgery. RegistreStents Study

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Background and Goal of Study: The aim of this study is to describe the incidence of major cardiac and cerebrovascular events (MACCE) in patients with coronary stents undergoing noncardiac surgery and to assess the relationship between these events, as well as bleeding complications with the perioperative management of antiplatelet therapy (APT).
Materials and Methods: Observational, multicenter and prospective study, approved by the Ethics Comittee. All patients with coronary stents undergoing noncardiac surgery with admission from February 2010 to April 2012 were the basis of the study. Demographic data, preoperative active cardiac conditions, clinical risk factors and APT perioperative management were registered and analyzed in relationship to the outcome (in-hospital and up to 3 months after surgery). MACCE: Main cardiac events (Myocardial Infarction, unstable angina and cardiac death) and cerebrovascular events (arrythmia, heart failure, stroke, transient ischaemic attack) and APT management were registered, bleeding complications and overall mortality were collected as well. χ^2 test was used to compare qualitative variables and Mann-Whithney to compare quantitative variables.
Results and Discussion: We included 432 surgical procedures, 83.3 % were male, median age was 70.1 years, 300 (69.4%) underwent high-intermediate risk surgery. Preoperative active cardiac conditions were present in 33 (7.6%). Perioperative MACCE were present in 63 (14.6%), cardiac mortality 1 (0.2%) and overall mortality 12 (2.8 %). Transfusion (red blood cells) and Major bleeding events (MBE: $\geq$ 2 Units and/or Hb (Haemoglobin) level descent > 20g/L, postoperative intracerebral bleeding) were present in 20.1% and 37.3% respectively. Presurgical APT prescription was present in 95.4% of them (27.5% dual APT). Perioperative APT was interrupted ($\geq$ 5 days) in 27.3% of procedures. MACCE were related to recent MI, renal failure (GFR < 60 mL/min), Diabetis Mellitus Insulin dependent and with MBE. Statin therapy and obesity (Body Mass Index >30) was associated to a lower incidence of these events. Patients without previous APT had higher risk of MACCE.
Conclusion(s): This population has high perioperative morbidity and mortality. No correlation was found with perioperative APT management and MACCE. MBE causes a delay in reintroducing APT. Chronic antiplatelet and statin therapy are strongly recommended in patients with coronary stents.

4AP6-6

Evaluation of inflammatory response as predictor of mortality in cardiac surgery

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Background: The European System for Cardiac Operative Risk Evaluation (EuroSCORE) uses good discrimination and calibration to predict early and later mortality for patients undergoing open-heart surgery. Outcome of patients undergoing surgery is unfavorably influenced by systemic inflammation. NTproBNP has demonstrated to be a good predictor of mortality. However, inflammatory response in pre-operative has never been correlated with EuroSCORE and mortality in those patients.
Aim: To assess the clinical utility of NTproBNP, interleukin-6 (IL-6), interleukin-8 (IL-8), interleukin-10 (IL-10), fibrinogen and PCR pre-operative levels as predictors of mortality in subjects undergoing coronary artery bypass grafting (CABG) and the correlation of these parameters with EuroSCORE system.
Method: This is an unicentric and prospective study. We calculated EuroSCORE value and mortality at 28 days. Serum NTproBNP, IL-6, IL-8, IL-10, fibrinogen and PCR levels were measured on the day of the surgery before anesthesia induction. The data are presented as median +/- interquartile range. The area under the receiver operating characteristic (ROC) curve was used to evaluate the elevated inflammatory markers, EuroSCORE and NTproBNP in predicting mortality. The correlation of biomarkers with EuroSCORE was made using Spearman's coefficient.
Results: This study included 68 patients scheduled for elective CABG, including 10 females and 58 males. The median predicted mortality by the logistic EuroSCORE was 4.17% +/-6.22%.
The actual mortality was 5.8%. The median (interquartile range, IQR) serum biomarkers were: NTproBNP 319 +/- 558 ng/mL, PCR 2.1 +/-5.4 mg/dL, fibrinogen 400 +/-127 mg/dL, IL6 7.91+/-13.15 pg/mL, IL8 15.72+/-14.64 pg/mL and IL10 6.26+/-8.6 pg/dL. The AUC values were 0.789, 0.791 and 0.830 for EuroSCORE, serum NTproBNP levels and fibrinogen levels respectively in predicting mortality. NTproBNP levels preoperative had a good correlation with outcome mortality rate R:0.548 p< 0.001.
Conclusions: Pre-operative assessment of NTproBNP level in CABG patients is a good predictor of mortality and has a good correlation with EuroSCORE value. Contrary, pre-operative inflammatory markers don't have a good correlation with EuroSCORE and mortality rate.
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4AP6-7

Increase of proangiogenic hematopoietic cells in response to preoperative cardiopulmonary exercise testing - a risk predictor of postoperative complications

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Background and Goal of Study: Controversy exists about the utility of cardiopulmonary exercise testing (CPET) in perioperative risk prediction.[1-3] Yet, the dynamic response of bone-marrow derived proangiogenic hematopoietic cells (PHCs) to CPET may be able to identify patients at high risk due to poor endothelial vascular function. Poor cellular mobilization of PHCs associates with impaired end-organ recovery and reduced survival[4] after critical illness. This prospective observational study aims to assess the utility of a cellular response (PHCs) to CPET in relation to postoperative complications.
Materials and Methods: Following IRB approval, 60 patients (aged 60.7±10.0 years) scheduled for major thoracic surgery performed exhaustive exercise testing (above anaerobic threshold to peak VO_2) within a week prior to surgery. Fifty three patients had peripheral blood collected both before and 10 minutes after peak exercise for quantification of circulating PHCs (defined as CD45-133+34+ by fluorescence-activated cell sorter analysis). The PHC response to exercise was quantified and then correlated to postoperative complications. The Wilcoxon signed-rank test, Pearson Chi-Square test and ROC-curve analysis analyzed the increase of PHCs in relation to the incidence of postoperative complications. Statistical significance was set as $p < 0.05$.
Results: A limited period (~10 minutes) of exhaustive exercise to peak VO2 significantly increased peripheral circulating levels of PHCs. ROC curve analysis identified an increase in peripheral circulating PHCs ≥60 cells/μL as a cut-point (AUC = 0.71; sensitivity = 86%; specificity = 48%) for postoperative complications.
Conclusion(s): Preoperative exhaustive exercise induces a' physiologic stress response' with mobilization of bone marrow-derived PHCs. A poor preoperative PHC response associated with increased postoperative complications. This association may be causative or a surrogate biomarker.
Irrespectively, the relevance of bone marrow-derived PHCs in the perioperative period as well as the potential for preoperative strategies (e.g. exercise) to impact cellular repair mechanisms affecting postoperative complications, warrants further study.
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4AP6-8

Myocardial infarction after noncardiac surgery, a 10 years experience

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Background and Goal of Study: Acute myocardial infarction (MI) after non cardiac surgery is a major complication, with atypical presentation and poor prognosis[1].The incidence in patients with no history of coronary disease lies below 1%, while in patients with known coronary disease it is 5.6%. Coronary heart disease, age> 75 years, physical status and intraoperative hypotension are risk factors for perioperative MI.This study aims to determine and characterize the incidence of post-operative MI in our hospital, during a ten year period.
Materials and Methods: Our study population included all patients submitted to surgery at our hospital between January 2000 and December 2009, who presented with MI within 30 days of surgery. We established several variables to analyze according to the literature.In 2012 we obtained the survival of these patients in our database.
Results and Discussion: We found 29 patients, out of a total of 70383, with perioperative MI within 30 days of surgery, representing a lower incidence (4.1/10000 surgeries) than that reported in medical literature.[1] 55.2% of patients were older than 75 years, 62.1% male, 78.6% ASA III, 34.5% had known coronary disease and all had risk factors. 51.7% had been submitted to urgent surgery and the incidence of MI was 4 times greater than after elective surgery.Most MIs (69%) occurred within the first week after surgery (31% in the first 48 hours); 62% were asymptomatic and 55.2% had no ST elevation. These results are similar to those found in others studies[1].Our 30-day mortality (58.6%) was higher than expected (33.3% in the first 2 days)[1]. The survival rate after 3 years was 20.7%.
Conclusion(s): The incidence of 30 days perioperative in our hospital, in 10 years, was 4.1 per 10000 surgeries, with a high mortality rate (58.6%).The high number of asymptomatic patients, with no ST elevation, the high incidence after urgent surgery and the high mortality rate, reflect the need for us not only to characterize a risk population, but also to identify these patients earlier, improving our intervention.
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4AP6-9

Indocyanine green clearance and INR: strong predictors of 1-month mortality in patients undergoing orthotopic liver transplantation

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Background and Goal of Study: There have been multiple studies searching for a variable or combination of variables that can predict mortality after a liver transplantation (LT). In a previous study we demonstrated that the indocyanine green (ICG) plasma disappearance rate (PDR) showed a closed relationship with early graft function after LT (1). However it is more important to study mortality predictors in order to identify patients at high risk early on and take action to improve their prognosis.

The aim of the study was to identify the most accurate predictors of 1-month mortality after LT.
Materials and Methods: The study was approved by The Ethical Review Board. From February 2002 to February 2012, clinical data on 330 adult patients undergoing LT were prospectively collected. The following data were analyzed as independent variables: donor (age, AST, days in ICU, BMI), receptor (age, BMI, CHILD-Pugh, MELD and MELD-Na scores), ischemia time and receptor data on the first post-LT day (AST, INR, bilirubin level and PDR ((LiMON with 0.5 mg/Kg ICG)). Univariate and multivariate binary regression and receiver operating characteristic (ROC) analyses were performed to determine clinical predictors and optimal cut-off values for 1-month post-LT mortality (RIP1).
Results and Discussion: The 1-month mortality rate was 4.2% (14 patients). Univariate analysis led to the identification of four significant mortality predictors: PDR, INR, AST and warm ischemia time. In the final multivariate analysis the only independent RIP1 predictors were PDR (OR 0.831, 95%CI: 0.727-0.95; p=0.007) and INR (OR 1.578, 95%CI: 0.737-0.950; p< 0.001). A model combining both data showed a high predictive value for RIP1 (AUROC 0.867, 95%CI: 0.737-0.997; p< 0.001). The best cut-off value for INR was 2.2 and for PDR 10%/min. The RIP1 rate for the best data combination (low INR and high PDR) was 0.6% and the worst data combination (high INR and low PDR) increased the RIP1 rate to 28.1% (χ^2 p< 0.001).
Conclusion(s): PDR and INR, assessed on the first post-LT day, are independent and powerful predictors of 1-month mortality after LT. In the group of patients identified as high risk (INR>2.2 and PDR< 10%/min) urgent diagnosis and effective treatment of the possible complications is needed. Future studies should evaluate other therapies, especially in this high-risk group.
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4AP6-10

Is Myeloperoxidase release during cardiac surgery under cardiopulmonary bypass related to short term outcomes?

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Background and Goal of Study: Myeloperoxidase (MPO) is an oxidative stress biomarker secreted by leukocytes and macrophages in response to ischemia-reperfusion injuries (I/R). High MPO serum levels predict risk for early cardiac events in patients with acute coronary syndrome (1) as well as occurrence within a 3 years period of major adverse cardiovascular events (death, nonfatal myocardial infarction, and stroke). (2)
The aim of this prospective study was to investigate if MPO levels can predict short term outcomes after cardiac surgery.
Materials and Methods: After informed consent we determined MPO kinetics in 43 patients scheduled for elective on pump cardiac surgery. Arterial samples were taken before induction of anesthesia (T0), 5 min after systemic heparinization (T1), 15 min after aortic declamping (T2), and 15 min (T3), 1 h (T4), 5 h (T5), and 19 h (T6) after the end of CPB.
Studied end points included in-hospital death and length of hospital and ICU stay. We further investigated the correlation between MPO levels and CPB duration, dobutamine use, noradrenaline use and glomerular filtration rate (GFR) values at 24 and 48 hours. Tests used for statistical analysis were: Pearsons correlation, Barlett's K-squared, and T-test,
MPO values are expressed as mean $\pm$ standard deviation.
Results and Discussion: MPO levels increase significantly from 15.16 ± 8.31 (T0) to 208.9 ± 67.15 ng/ml (T1) (p< 0.001) and, from T1 to
T2 (270.5 ± 103.68 ng/ml)(p< 0.001). MPO levels decrease, starting from T3 (104.00 ± 63.82 ng/ml), until T6 (25.25 ± 8.67 ng/ml) (p< 0.001). The MPO value at T5 is strongly correlated to CPB duration (p< 0.001) This correlation is not found at T6, possibly due to the rapid clearance of MPO from plasma. We could not find any correlation between MPO levels and ICU/hospital length of stay and GFR values. 23 Patients (53%) needed noradrenaline and 16 (37.2%) dobutamine post CPB but MPO values were not associated to their use. Only one patient died in the postoperative period.
Conclusion(s): MPO is secreted during on-pump cardiac surgery and values peak just after aortic declamping.
MPO levels are associated with CPB duration 5 hours after aortic declamping. In this study MPO levels were not linked to the measured outcome issues.
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4AP7-1

New method of volume effect calculation in clinical practice

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Background and Goal of Study: The knowledge about volume effect of different IV solutions is very important during infusion therapy. We couldn't find any simple formulas to volume effect calculation. The aim of our study was the development of a new formula for volume effect calculation during infusion therapy for clinical and scientific purposes.
Materials and Methods: 20 patients (26 -74 age (50.1±13.7)) undergoing elective major abdominal surgery were included in a prospective randomised controlled blinded study. All patients had a normal value of Hb and Htc. They were divided in to two groups according to the type of fluid administration. 1 group - 6% HES 130/0.4 n=9 (HES). 2 group - Ringer lactate n=9 (RL). The fluids infusion rate was 10 ml/kg/h in both groups. There was no any other fluid administration on the day before the start of the study. We assessed urine output and haemoglobin level before (Hb(b)) and after (Hb(a)) solutions administration. All data present as median [25; 75 percentile]. We used Sign test (St) for intergroup changers and Mann-Whitney U (M-W) test for groups comparison.
Results and Discussion: There was no difference in: Hb(b) HES 132 [111-149], RL 137 [127-144] (p=0.59); blood volume HES 4.27 [3.5-4.8], RL 4.55 [4.55-5.11] (p=0.07); infusion volume HES 0.61 [0.5-0.68], RL 0.65 [0.65-0.73] (p=0.07); urine output HES 130 [120 - 160], RL 130 [115-170] (p=0.09). In HES group Hb decrease up to 102 g/L (p=0,007) and in RS group - up to 121 g/L (p=0,007) after solution administration. There was a significant difference between groups in Hb(a) (p=0.03). We assumed that Hb reduction was in inverse proportion to blood volume augmentation. We developed a new formula for volume expanded effect: VEE=0,07m*(Hb(b)/Hb(a)-1)/VI where VEE - volume expanded effect, 0,07m - initial blood volume according to the patient's weight (m), Hb(b) - Hb concentration before solution administration, Hb(a) - Hb concentration after solution administration, VI - infusion volume. According to our formula VEE for 6% HES 130/0.4 is 1.84 [1.27-2.06] and for Ringer lactate - 0.87 [0.56-0.96] (p=0.0009).
Conclusion(s): 6% HES 130/0.4 with infusion rate 10 ml/kg/h have a significant volume expanded effect in comparison to Ringer lactate. Our new method of volume effect calculation can be used in clinical and scientific practice to assess the volume expanded effect of different intravenous solutions.

4AP7-2

Effect of adrenaline or noradrenaline with/without lidocaine on the contraction response in LPS-treated rat thoracic aorta

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Background: It is well known that analgesic effect is often insufficient when a local anesthetic is administered in acute inflammatory tissues. This phenomenon has been explained by reduction in the pH of inflammatory tissues and/or vasodilation of the inflammatory area. Vasoconstrictor, therefore, is usually contained local anesthetics to prolong the duration of analgesia. Effects of vasoconstrictors (adrenaline: AD, noradrenaline: NA), however, has not been investigated sufficiently with local anesthetics on dilated vessels in inflammatory tissues. There are few reports that investigated the effect of AD and NA to a lipopolysaccharide (LPS) treated vessels in the presence of a lidocaine. In this study, we prepared the blood-vessel inflammation model using LPS, and investigated the contractile effects of AD and NA on LPS-treated vessels in combined with lidocaine.
Methods: Sixteen male Wister rats aged 6 ~ 8 weeks were used in this study. Thoracic aortas were dissected from rats and cut into about 3-4-mm-long rings. Each ring was stretched by a pair of hooks in an organ bath (5 ml) filled with Krebs-Henseleit solution (37°C, pH=7.4). After exposure of LPS (1 microg/ml), AD or NA were applied as a vasoconstrictors in a cumulative manner from 10^{-9} to 10^{-5} M with or without lidocaine (10^{-4} M). Changes in isometric vasocontractions were recorded continuously with an amplifier system using the PCD-30A computer system. Statistical significance is shown as P< 0.05 using the Steel-Dwass test.
Results and Discussion: LPS treatment attenuated the concentration-dependent contraction by AD and NA in the presence of lidocaine in a time-dependent manner (Fig.A,B). In the aorta with LPS treatment, on the other hand, lidocaine enhansed the contractile responses produced by low concentrations by 10^{-8}-10^{-7} M AD, while lidocaine has vasodilation effect. Analgesic effect, needless to say, depends on the concentration of lidocaine. These results

suggested that concentration of AD is important for sufficient analgesia.
Conclusion: In our results, LPS treatment attenuated contraction response by either AD or NA. Lidocaine was not effective on it in spite of its vasodilation potential.

4AP7-3

Prophylactic administration of atropine attenuates the negative haemodynamic effects of propofol/remifentanil induction of anaesthesia

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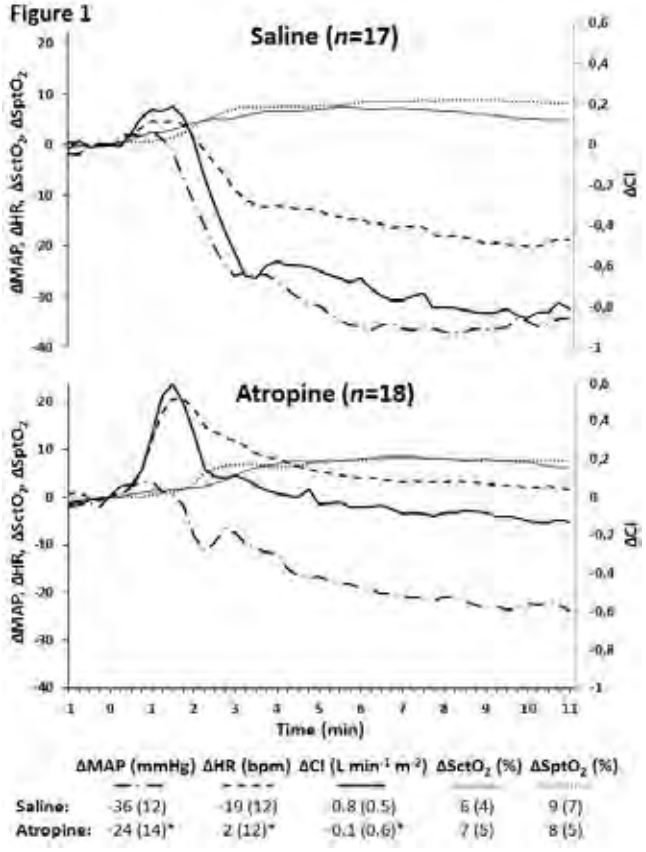
Background and Goal of Study: Induction of anaesthesia with propofol and remifentanil often induces unwanted bradycardia and hypotension. This raises the concern for preserving haemodynamic stability and adequate tissue oxygenation. We previously demonstrated that atropine significantly improves haemodynamics and tissue oxygenation during propofol/remifentanil anaesthesia.[1] The aim of this study is to investigate if prophylactic administration of atropine at induction of anaesthesia can attenuate these negative haemodynamic effects and thus maintain tissue oxygenation.
Materials and Methods: After local IRB approval and written IC, 35 patients were included in a preliminary analysis of this double blind, randomised controlled trial. MAP, HR and CI were continuously recorded with the Nexfin device (Edwards Lifesciences BMEYE). The FORE-SIGHT® (CASMED) and InSpectra™ (Hutchinson Technology) oximeters monitored cerebral ($SctO_2$, forehead) and peripheral ($SptO_2$, thenar) tissue oxygenation, respectively. Euvolemia was pursued by infusion of 500ml colloid solution prior to anaesthesia, which was induced with remifentanil TCI, propofol TCI, and cis-atracurium. According to randomisation methylatropine (500μg, 1ml) or saline (1ml) was administered at start of induction of anaesthesia.
Results and Discussion: Figure 1 shows the evolution of the studied variables 1 minute before the induction of anaesthesia until 11 minutes thereafter of 17 saline and 18 atropine patients respectively, as well as values of relative changes at 10 minutes. Atropine prophylaxis resulted in better haemodynamics with a significantly higher MAP, HR and CI compared to the saline group. There was no intergroup difference in tissue oxygenation.

Figure 1



	ΔMAP (mmHg)	ΔHR (bpm)	ΔCI (L min^{-1} m^{-2})	$\Delta SctO_2$ (%)	$\Delta SptO_2$ (%)
Saline:	-36 (12)	-19 (12)	0.8 (0.5)	6 (4)	9 (7)
Atropine:	-24 (14)*	2 (12)*	-0.1 (0.6)*	7 (5)	8 (5)

*[Relative changes of variables. Mean (SD), *p<0.05.]*

Conclusions: Prophylactic administration of atropine at induction of remifentanil/propofol anaesthesia is an effective approach to anticipate its negative haemodynamic effects. This approach maintains tissue oxygenation and may prevent the requirement of additional perioperative vasoactive medication.
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4AP7-4

Effects of non-selective opioid receptor antagonists on splanchnic perfusion during cardiopulmonary bypass in pigs

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Background and Goal of Study: The use of cardiopulmonary bypass (CPB) is increasing in cardiothoracic surgery. One of the major complications of CPB causing high mortality is splanchnic hypoperfusion [1]. Studies performed in dogs showed amelioration of splanchnic perfusion (SP) by application of opioid receptor antagonists (ORA) [2]. The authors postulated that increased SP is modulated by non-selective ORA effects on the central nervous system [2]. Aim of this study was to investigate if the centrally and peripherally unselective acting ORA Naltrexone (NTX) and the solely peripherally non-selective acting ORA Naltrexone-Methiodide (NTX-M) are able to improve SP in pigs undergoing CPB.
Materials and Methods: Ethics approval was obtained from the Bezirksregierung Muenster. 31 pigs (mean 35 kg) were anaesthetized and intubated and received invasive hemodynamic monitoring. A fluid filled catheter in the left atrium was used to infuse fluorescent microspheres (FMS). After baseline measurements either placebo, 2 mg/kg NTX or 2,56 mg/kg NTX-M was infused and measurements were repeated (compound). CPB was commenced and pigs were then exposed to VF and cardioplegia as well as hypothermia (28°C for 90 min, ischemia).
Following re-establishment of normal body temperature, the animals were reperfused for 30 minutes. Then animals were weaned off the CPB according to a standardised algorithm. Final measurements were taken 30 minutes after successful weaning from CPB (end). Hemodynamic variables were kept constant within predefined ranges following a standardized protocol using fluid resuscitation and catecholamines. After euthanasia tissue specimens were taken for analysis of FMS.
Results and Discussion: Hemodynamic parameters were comparable. SP is considerably reduced by instrumentation as well as CPB.

	Baseline			Compound			Ischemia			End		
	Placebo	NTX	NTX-M	Placebo	NTX	NTX-M	Placebo	NTX	NTX-M	Placebo	NTX	NTX-M
	0,10	0,10	0,12	0,04	0,02	0,04	0,09	0,08	0,08	0,06	0,05	0,08
	0,06	0,09	0,10	0,02	0,03	0,03	0,08	0,06	0,08	0,03	0,04	0,05
	0,20	0,18	0,32	0,11	0,06	0,07	0,29	0,29	0,24	0,12	0,08	0,16
	0,31	0,27	0,47	0,14	0,11	0,07	0,33	0,28	0,30	0,16	0,12	0,20
	0,26	0,32	0,37	0,12	0,11	0,12	0,20	0,24	0,22	0,18	0,14	0,21
	0,14	0,21*	0,24	0,06	0,09	0,08	0,11	0,07	0,08	0,10	0,13	0,13
	0,21	0,24	0,28	0,07	0,10	0,09	0,09	0,12	0,09	0,10	0,12	0,18*
	0,20	0,18	0,22	0,05	0,07	0,07	0,09	0,07	0,08	0,11	0,11	0,13
	0,22	0,26	0,27	0,10	0,10	0,09	0,07	0,08	0,08	0,12	0,12	0,17
	0,16	0,13	0,14	0,08	0,08	0,04	0,07	0,06	0,07	0,11	0,10	0,13
	0,35	0,36	0,36	0,11	0,13	0,11	0,17	0,30	0,15	0,10	0,10	0,09
	0,28	0,36	0,33	0,13	0,16	0,14	0,14	0,29	0,17	0,16	0,18	0,19
	0,33	0,39	0,38	0,10	0,19	0,10	0,18	0,26	0,18	0,21	0,18	0,23
	0,11	0,14	0,21	0,06	0,08	0,06	0,09	0,06	0,08	0,13	0,11	0,16
	0,16	0,14	0,23	0,07	0,06	0,06	0,13	0,06	0,09	0,14	0,12	0,13
	90	82	79	73	70	64	70	63	71	78	73	77
	11	11	11	10	11	10	11	11	11	10	11	11
	2338	2011	2233	2150	1929	1818	—	—	—	2244	1974	2341

* = p<0.05 NTX resp. NTX-M versus Placebo

[Table]

Conclusion(s): The results show that neither NTX nor NTX-M influence SP during and early post CPB. Also, we can not confirm the hypothesis of centrally mediated effects of ORA on SP. Thus, reduced morbidity mediated by unselective ORA seems to be unlikely.
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4AP7-5

Esmolol treatment reduces plasmatic oxidative stress and vascular hypertrophy in spontaneously hypertensive rats

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Background and Goal Study: Chronic treatment with antihypertensive drugs may interfere with vascular remodeling. We hypothesized that even a short period (48 hours) of administration of esmolol could reduce plasmatic oxidative stress and induce vascular remodeling in a model of stable compensated left ventricular hypertrophy.
Materials and Methods: Fourteen-month-old male spontaneously hypertensive rats (SHRs) were randomly divided into two groups according to whether they received esmolol (SHR-E, n=6) or not (SHR, n=5). After 48 hours of intervention, we performed a histological study analyzing left ventricle intramyocardial arteries parameters: wall thickness (WW), wall to lumen ratio (W/L) and media cross-sectional area (MCSA).
Furthermore, we assessed several plasmatic oxidative stress biomarkers (superoxide dismutase and nitrates). All the data were expressed as mean ± SD. *One way* ANOVA followed by the Bonferroni test was used. $P < 0.05$ was considered significant.
Results and Discussion: Esmolol treatment reduced systolic blood pressure in SHR-E compared to SHR ($P < 0.001$). Esmolol-treated rats showed a significant reduction of WW ($P < 0.001$), W/L ($P < 0.05$) and MCSA ($P < 0.05$) compared to untreated SHR. Plasmatic superoxide dismutase and nitrates values were significantly higher in SHR-E compared to untreated SHR ($P < 0.001$ and $P < 0.05$, respectively).
Conclusion: Our study show that esmolol is capable to produce, after a short treatment period, an antioxidant effect and a short term regression of intramyocardial arteries hypertrophy in an animal model of arterial hypertension and left ventricular hypertrophy. However, these effects need to be proven in future human clinical prospective studies.
Acknowledgements: This work was supported by a grant from FIS 10/02831, Spain.

4AP7-6

The effects of sugammadex and neostigmine-atropine administration on hemodynamic parameters in cardiac patients undergoing non-cardiac surgery

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Background and Goal of Study: In this study, we aimed to observe the effects of sugammadex and neostigmine-atropine administration on hemodynamic parameters in cardiac patients undergoing non-cardiac surgery.
Materials and Methods: The study group included, 90 patients, 18-75 years old, NYHA II-III, undergoing non-cardiac surgery who were randomly divided into two groups as group N (neostigimine, n= 45) and group S (sugammadex, n=45). In group N, after the termination of surgery, patients were reversed with 0,03 mg/kg neostigmine i.v., at the reappearance of T2. After the administration of neostigmine, atropine sulfate 0,5 mg was administered when a decrement of 5 (± 10) beats/min in heart rate occured. In group S, sugammadex 3mg/kg i.v. was administered at the reappearance of T2. Systolic, diastolic, mean arterial pressure and heart rate were recorded at pre-administration, at 1st, 3rd, 5th min of administration and at 1st, 10th min of postoperative periods. Electrocardiogram characteristics including rate-corrected Qt (Fridericia and Bazett) interval were recorded at pre-administration, at post-administration and at 10th min of postoperative periods. Statistical significance was determined by unpaired t-test, Pearson's correlation test and ANOVA. A value of $p < 0,05$ was considered significant.
Results and Discussion: There were no statistically significant difference observed for QtF and QtB values among and within groups. Blood pressure and heart rate decreased after induction of anesthesia in two groups. In group S, blood pressure and heart rate values were significantly higher ($p < 0,05$) at 5 min after administration of sugammadex and at postoperatively. Heart rate was significantly lower at 1st min after sugammadex administration compared to pre-administration. In group N, systolic blood pressure and heart rate was significantly higher at 3rd min after drug administration and at postoperatively determined times ($p < 0,05$), diastolic blood pressure was significantly higher at 5th min administration and at postoperative periods ($p < 0,05$). Systolic, diastolic, mean arterial pressure and heart rate was significantly lower ($p < 0,05$) in group S compared to group N.
Conclusion(s): We assume that, sugammadex may be preffered to neostigmine-atropine administration on the reversal of rocuronium induced blockage for, its stabilizing effects on hemodynamic parameters of patients with cardiac disease undergoing non-cardiac surgery.

4AP7-7

Systemic lidocaine during experimental lung autotransplant model in pigs

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Background and goals: Ischemia-reperfusion lung injury (IRLI) is characterized by non- specific alveolar damage, lung edema, and hypoxemia after lung transplantation. Despite refinements in lung preservation and improvements in surgical techniques, IRLI remains a significant cause of early morbidity and mortality after lung transplantation**.** Lidocaine is a sodium and calcium blocker, a scavenger of oxygen free radicals and anti-inflammatory agent.The purpose of this study was to clarify the effect of Lidocaine in the IRLI.
Material and methods: Two groups of Large-white pigs were subjected to an orthotopic left lung autotransplantation (left pneumonectomy and left caudal lobe reimplantation). Lidocaine group (LG n=5) received intravenous lidocaine during surgery (1,5 mg/kg/h). Control group (CG n=6) received physiological serum. The process was a single-blind. Haemodynamic, arterial blood gas measurements and lung biopsies were taken. Interleuquine -1 (IL-1), Tumor necrosis factor (TNF-), nitrous oxide (NO) were analyzed .The Mann-Whitney U-test was applied to establish differences between the analyzed groups. $P < 0.05$ was considered significative. Results are expressed as mean (typical error)
Results: There were no differences between LG and CG in terms of haemodynamic parameters, airways pressures during mechanical ventilation and arterial blood gas measurements. However, PO2 measured in pulmonary vein was significantly higher in LG ($p < 0.05$). IL-1 was significantly lower after 30 minutes of reperfusion (post 30) in GL. Animals of LG showed TNF- lower than CG in pre-reperfusion (Prereperf), post 30 and 60 minutes after reperfusion (post 60). NO was lower in CG in prereperf, post 30, and post 60 comparing with LG.

	GC	GL	p	Typical error
Prereperf	5,09	2,21	0,082	0,61
Post 30	4,93	1,37	0,03	0,54
Post 60	4,74	3,15	0,24	0,49

[IL-1(µ g/mL)]

	GC	GL	p	Typical error
Prereperf	11,58	1,05	0,004	0,11
Post 30	11,56	1,75	0,004	0,28
Post 60	30,02	2,24	0,004	0,37

[TNF alpha (µ g/mL)]

	GC	GL	p	Typical error
Prereperf	22,60	37,75	0,002	1,41
Post 30	26,11	41,18	0,002	0,83
Post 60	27,78	41,88	0,002	0,33

[NO (µ g/mL)]

Conclusions: According to the data obtained, lidocaine could have an important modulating effect (role) in IR lung injury.

4AP7-8

Comparison of the effect of propofol versus sevoflurane on hepatic hemodynamics in a porcine model of extensive (85%) liver resection

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Background and Goal of Study: Extensive liver resections can cause an excess of portal flow, an increase in portal pressure, a reduction of arterial flow and an inflammatory reaction, that leads to hepatic failure in the first postoperative days (i.e. small-for-size syndrome, SFSS). Anesthetic drugs alter the hepatic circulation and can modulate the inflammatory response to injury, which could modify the response after liver surgery. The study aimed to compare the effect of two anesthetic drugs (sevoflurane and propofol) on portal pressure and hepatic blood flow one day after hepatectomy. Secondary outcomes included changes in liver function.
Materials and Methods: The study was approved by the Ethics Committee. Ten Mini-pigs were randomized into two groups: anesthetized with propofol (P) vs sevoflurane (S). All animals were subjected to a hepatectomy (85% of the liver), reoperation and sacrifice after 24 hours. Monitoring: PiCCO catheter; femoral-artery, porta- and suprahepatic-vein, and central-venous pressures; hepatic-artery and portal-vein flows. Liver function data: chemical pathology, clotting and indocyanine green clearance. Data were collected: at baseline (B) half an hour after resection (R); and after 24 hours (24h). Data were expressed as mean ± DS. Statistical analysis: Kolmogorov-Smirnov, and student's T tests.
Results and Discussion: At B, group P showed lower portal pressure (S 15±3, P 11±3 mm Hg, p=0.053) and increased arterial blood flow (p=0,2). At R, data showed no significant differences. At 24h, there was an overall increase in portal pressure, but it remained lower for P (S 22±1, P 17±2, p=0.005) and the B-24h portal flow increased significantly for S (average increase 238 ml/min, p=0.002) but not for P (64 ml/min p=0.7). At 24h, all 5 cases in group P showed a portal pressure ≤ 20 (considered the limit to develop SFSS (1)), while all 5 cases in group S exceeded that limit. There was no difference in liver function data, but with lactate level trending upward in S group.
Conclusion(s): Propofol reduces the increase of portal pressure and flow after a great liver resection compared with sevoflurane, suggesting a protective effect that may reduce the incidence of SFSS. If this effect is confirmed in humans, the use of propofol could reduce postoperative risk after liver resection.
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4AP7-9

Esmolol and labetalol for attenuation of sympathetic response to laryngoscopy and endotracheal intubation. A randomized double-blind study

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Background and Goal of Study: Esmolol is an ultrashort acting beta1- selective adrenergic agent while labetalol is an adrenergic receptor blocking agent with mild alpha1- and predominant beta -adrenergic receptor blocking action. Both these drugs have been used to attenuate the stress response to laryngoscopy and endotracheal intubation. The scientific objective of this study was to compare the efficacy of esmolol and labetalol for attenuation of sympathetic response to laryngoscopy and endotracheal intubation.
Materials and Methods: The present study included sixty (60) patients, aged 20-40 years, with ASA physical status 1 and 2, who underwent elective surgical operations requiring general anaesthesia and endotracheal intubation. Patients were randomly divided into three groups. Each group included twenty patients. (n=20) Patients in group A received normal saline 2 and 5 minutes prior to endotracheal intubation, in group B 0.5 mg/kg esmolol 2 minutes prior to endotracheal intubation and additionally normal saline 5 minutes prior to endotracheal intubation and in group C 0.25 mg/kg labetalol 5 minutes prior to endotracheal intubation and additionally normal saline 2 minutes before endotracheal intubation. The anaesthetic technique was the same in all groups. Systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR) and mean arterial pressure (MAP) were recorded prior to induction of anaesthesia, at the time of endotracheal intubation and 1, 2, 4 and 10 minutes after endotracheal intubation.
Results and Discussion: Labetalol significantly attenuated the rise of SBP and HR during laryngoscopy and endotracheal intubation in comparison to esmolol. (P< 0,05) There was no statistically significant difference between DBP and MAP values.
Conclusion(s): Labetalol seems to have an advantage in attenuating sympathetic response to laryngoscopy and endotracheal intubation in comparison to esmolol.

4AP7-10

Pharmacologic autonomic block with atropine and propranolol: evaluation of the extent and duration of blockade in a close-chest porcine model

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Background and goal of study: The status of the autonomic nervous system (ANS) is a major determinant of cardiovascular health and prognosis. Several clinical and experimental investigations need to be performed in conditions of autonomic block. We have previously assessed the intrinsic heart rate in a close porcine model. (1) In this model 0.25 $mg.kg^{-1}$ of propranolol and 0.04 $mg.kg^{-1}$ of atropine produced an effective temporary blockade of the autonomic activity. However we unknown the extent and duration of autonomic blockade with the reported doses of atropine and propranolol.
Materials y Methods: 22 mini-pigs were premedicated with ketamine and anesthetized with propofol 4 $mg.kg^{-1}$ followed by an infusion of 13 $mg.kg^{-1}.h^{-1}$. After instrumentation and a stabilization period we determined the extent and duration of sympathetic and parasympathetic block. The efficiency of sympathetic block was determined assessing heart rate (HR) response after 0.4 $mg.kg^{-1}$ of isoproterenol administered before (control) and every 20 min after autonomic block. The parasympathetic block was evaluated assessing the appearance of a sinusal pause of 2-3 seconds with acetylcholine administered before (control) and every 20 min after autonomic block.
Results: At the end of the injection, HR response to isoproterenol was reduced to an average of 15% of their control values. Some recovery was evident after 20 min (29%) and administering half the dose of propranolol regained an effective sympathetic blockade (7% of their control values). An effective duration of parasympathetic blockade was maintained during 129 ± 62 min. Two animals developed ventricular fibrillation with the administration of acetylcholine at 50 and 80 min respectively, excluding these specimens the mean parasympathetic blockade lasted 144± 59 minutes.
Conclusions: In this closed-chest porcine model, the administration of 0.25 $mg.kg^{-1}$ of propranolol and 0.04 $mg.kg^{-1}$ of atropine induce an intense autonomic blockade. However some recovery of sympathetic system was evident after 20 minutes, this response was abolished repeating half the dose of propranolol. Concerning parasympathetic blockade our results suggesting an effective blockade for practical purpose for at least 2h after an injection of 0.04 $mg.kg^{-1}$ of atropine.
References:
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4AP8-1

Noninvasively derived stroke volume variation by finger volume clamping can reliably predict fluid responsiveness

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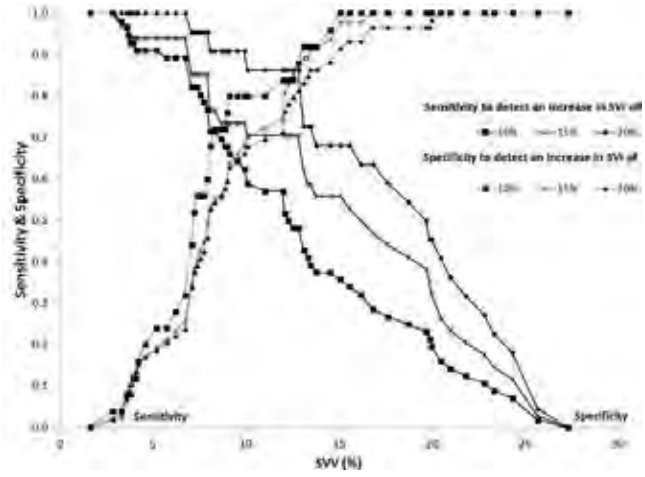
Background and Goal of Study: Dynamic preload variables derived from the arterial pressure waveform have been shown to accurately predict fluid responsiveness in mechanically ventilated patients. One of these variables, stroke volume variation (SVV), can also be obtained noninvasively by the finger volume clamp method using the Nexfin® device (Edwards Lifesciences BMYE, Amsterdam, Netherlands).
In patients undergoing general surgery, we explored the ability of noninvasive SVV to predict fluid responsiveness defined at multiple thresholds. We also studied the limits of the so-called grey zone, indicating the area of doubt.[1]
Materials and Methods: After local IRB approval, 81 patients undergoing general surgery were included. SVV and stroke volume index (SVI) were measured using the noninvasive volume clamp method (Nexfin®). All patients received a 500 ml colloid bolus for routine clinical care and the attending

anaesthetist was blinded for Nexfin®- derived variables.
A minimal increase in Stroke Volume Index (↑SVI) was used to define fluid responsiveness with thresholds of 10, 15, and 20%. Areas under the ROC curve (AUROC) were calculated to assess the ability of SVV to predict fluid responsiveness and to calculate the grey zone limits (i.e. values for which sensitivity and specificity are < 90%).
Results and Discussion: Mean (SD) SVI increased from 40 (11) to 45 (10) ml/m². For all thresholds, the number of fluid responders / non-responders, AUROC's and the associated limits of the grey zone are shown in table 1. Sensitivities and specificities are shown in figure 1.

↑SVI (%) threshold	No. of responders and non-responders	AUROC	Limits of the grey zone (%)	No. of patients below/within/above grey zone
10	56/25	0.76	6-13	12/44/25
15	34/47	0.80	7-13	15/41/25
20	22/59	0.89	10-15	40/21/20

[Table 1]



[Figure]

Conclusion: Advanced noninvasive haemodynamic monitoring using the volume clamp method to measure SVV can adequately predict fluid responsiveness in patients undergoing general surgery. Its ability to assess fluid responsiveness is dependent on the intended increase in SVI and improves for higher ↑SVI thresholds.
Reference: [1] Cannesson M, et al. Anesthesiology 2011; 115: 231-41

4AP8-2

Prediction of fluid responsiveness by non-invasive cardiac output monitoring and transthoracic echo in children after repair of ventricular septal defect

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Background and Goal of Study: Non-invasive cardiac output monitoring is a potentially useful clinical tool in the pediatric setting. This study aimed to compare stroke volume variation (SVV) in non-invasive cardiac output monitoring (NICOM) with respiratory variation in transthoracic echo-derived aortic blood flow velocity (ΔVpeak) as predictors of fluid responsiveness in children after repair of ventricular septal defect (VSD).
Materials and Methods: A prospective study conducted in pediatric intensive care unit investigated 26 mechanically ventilated chidlren who had undergone repair of VSD. Standardized volume replacement (VR) was the intervention used. Hemodynamic measurements including central venous pressure, heart rate, mean arterial pressure, transthoracic echo derived stroke volume (SV), cardiac output, ΔVpeak, and SVV in NICOM were performed 30 min after patient arrival in the intensive care unit. Hemodynamic measurements were repeated 10 min after VR by an influsion of 6% hydroxyethyl starch 130/0.4 (10 ml/kg) over 20 min.
Results and Discussion: The volume induced increase in the SV was 15% or more in 13 patients (responders) and less than 15% in 13 patients (non-responders). Before volume replacement, the ΔVpeak (19 ± 6% vs. 9 ± 4%; p < 0.001) and SVV (13 ± 3% vs. 8 ± 2%; p < 0.001) was higher in the responders than in the non-responders.
The prediction of fluid responsiveness was higher with the ΔVpeak, as shown by a receive operating characteristic curve area of 0.956 (95% confience interval [CI], 0.885 - 1.00; p = 0.001), a SVV of 0.888 (95% CI, 0.764 - 1.00; p = 0.001).
Conclusion(s): The ΔVpeak and SVV can predict the response of SV after volume expansion in mechanically ventilated children at completion of VSD repair.
References:
1. Pereira de Souza Neto E, Grousson S, Duflo F, et al. Predicting fluid responsiveness in mechanically ventilated children under general anaesthesia using dynamic parameters and transthoracic echocardiography. Br J Anaesth 2011;106:856-64.
2. Weisz DE, Jain A, McNamara PJ, et al. Non-invasive cardiac output monitoring in neonates using bioreactance: a comparison with echocardiography. Neonatology 2012;102:61-7.

4AP8-3

Intravasal volume load & organ specific anemia tolerance

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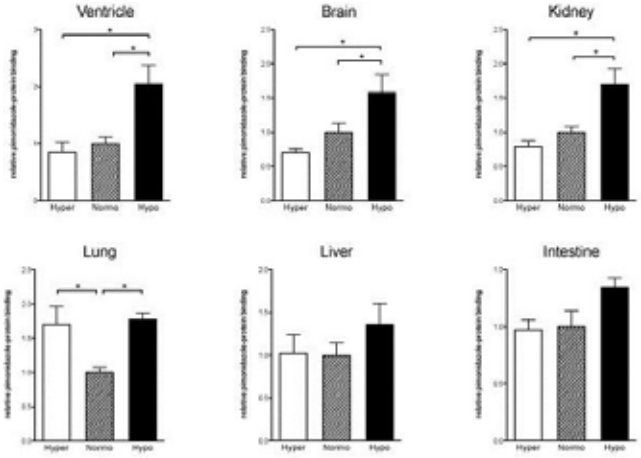
Background and Goal of Study: Restrictive intraoperative fluid management has been demonstrated to improve outcome of visceral surgery. However, subsequent hypovolemia might be accompanied by a decrease of organ specific tolerance to acute anemia, and by that an increase of transfusion needs. The aim of the study presented is to specify the influence of restrictive and permissive fluid management on organ specific anemia tolerance.
Materials and Methods: After governmental approval experiments were performed in 18 anesthetized, ventilated pigs. Animals were randomized into 3 experimental groups (n=6): normovolemia (no intervention), hypovolemia (haemorrhage of 40% of blood volume), and hypervolemia (hydroxyethyl starch bolus of 40% of blood volume).
Thereafter animals were hemodiluted by exchange of whole blood for 6% hydroxyethyl starch (130.000:0.4) until the individual critical hemoglobin concentration (Hb_{crit}) was reached. Hb_{crit} was defined as the onset of oxygen supply dependency of oxygen consumption and was identified with indirect calorimetry. At Hb_{crit}, 10 mg/kg pimonidazole (a marker for hypoxia) were injected. One hour after injection, tissue samples were collected and analyzed for pimonidazole binding indicating organ specific tissue hypoxia.
Results and Discussion: Neither hemodynamics, metabolic parameters, nor oxygen consumption indicated that tissue oxygenation was restricted before Hb_{crit} had been reached. Hb_{crit} was detected at the same hemoglobin concentration in all groups (2.3g/dL, n.s.), but exchangeable blood volume differed significantly between the three groups (normovolemia: 83 ml/kg, hypovolemia: 61 ml/kg, hypervolemia: 89 ml/kg; p>0.05). During hypovolemia tissue hypoxia was aggravated in the myocardium, the brain, and the kidneys, whereas tissue oxygenation of liver and intestine were not influenced by the volume status.
Conclusion: Since neither hypo- nor hypervolemia influence Hb_{crit}, the effect of the volume status on global anemia tolerance seems negligible. However, focusing on individual organ systems essential differences in anemia tolerance can be detected.



*[Figure 1. Pimonidazole-protein binding in ventricle, brain, kidney, lung, liver & small intestine in normovolemic, hypovolemic and hypervolemic animals at Hb_{CRIT} (Hb 2.3 g/dL). Data are mean±SEM, n=6 per group. *p<0.05]*

4AP8-4

Perioperative goal-directed hemodynamic therapy based on radial arterial pulse pressure variation and continuous cardiac index trending reduces postoperative complications after major abdominal surgery. A multi-center, prospective, randomized study [NCT014001283]

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Background and Goal of Study: Single-center studies and meta-analyses have shown that intraoperative goal-directed therapy may improve outcome in surgical patients. We hypothesized that using a treatment algorithm based on pulse pressure variation, cardiac index trending by radial artery pulse contour analysis, and mean arterial pressure would result in reduced complications and reduced length of hospital stay in abdominal surgical patients.
Material and methods: This study was conducted as a multicenter study in five centers. All patients undergoing major abdominal surgery were checked for the in- and exclusion criteria (see table 1). After informed consent all eligible patients were randomized. In the study group (SG) hemodynamic therapy was guided by pulse pressure variation, cardiac index trending and mean arterial pressure. In the control group (CG) hemodynamic therapy was performed at the discretion of the treating anesthesiologist. Complications and Outcome data were recorded up to 28 days postoperatively for each patient. Non-parametric data were analysed with the Mann-Whitney U-test, categorical data were compared using χ^2 and Fisher's exact tests. A level of $p < 0.05$ was defined as statistically significant.
Results and Discussion: 160 patients were randomized to the SG (n=79 patients) or to the CG (n=81 patients). Patient characteristics are given in Table 2. The number of complications was significantly lower in the SG (72 complications vs. 52 complications, p=0.038). In particular, infection complications were significantly reduced (SG: 13 complications vs. CG: 26 complications, p=0.023). These data match well with previously reported findings [1-3]. There were no significant differences between the two groups for length of hospital stay (SG: 11 days vs. CG: 10 days, p=0.929).
Conclusions: This multi-center study confirms that hemodynamic goal-directed therapy using pulse pressure variation, cardiac index trending and mean arterial pressure as the key parameters leads to a decrease in postoperative complications in patients undergoing major abdominal surgery.
Literature:
1. Corcoran T, Rhodes JE, Clarke SS et al. Anesth Analg 2012;114:640-651; 2. Dalfino L, Giglio MT, Puntillo F et al. Crit Care 2011;15:R154; 3. Hamilton MA, Cecconi M, Rhodes A. Anesth Analg 2011;112:1392-1402

4AP8-5

Gap or Trap? Intestinal arterial pCO_2-Gap as a splanchnic perfusion marker in pigs undergoing cardiopulmonary bypass

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Background and Goal of Study: Procedures including cardiopulmonary bypass (CPB) are increasingly common in modern cardiovascular surgery [1]. Reduced splanchnic perfusion (SP) is a cause of severe complications and a major risk factor for postoperative mortality [2]. The aim of our study was to evaluate intestinal arterial pCO_2-gap (ΔpCO_2), often used to detect splanchnic hypoperfusion, in the setting of CPB [3].
Materials and Methods: Ethics approval for this study was granted by the Bezirksregierung Muenster. 8 pigs (mean 35kg) were anesthetized and intubated. A central venous catheter and an arterial catheter were inserted. A fluid filled catheter was placed in the left atrium to inject fluorescent microspheres (FMS) to assess SP. ΔpCO_2 was monitored, both using tonometric (Tonocap®, slow onset) and fiberoptic (Paratrend®, fast onset) devices. CPB circuit was established and baseline data were recorded. Then ventricular fibrillation was electrically induced and cardioplegic solution was infused, followed by a hypothermic period (28°C, 90min, ischemia). After re-warming for 30min, pigs were re-perfused. Final measurements were performed after successful weaning from CPB (end). Pigs were euthanized and tissue specimens were taken for analysis of FMS.

Results and Discussion: Detailled data are shown in the table.

	ΔpCO_2 Paratrend mmHg	ΔpCO_2 Tonocap mmHg	Ileum perfusion [ml/g/min]	Bowel perfusion [ml/g/min]	Splanchnic perfusion [ml/g/min]
Baseline	86,5 [38,1;110,5]	8,3 [5,6;12,4]	0,20 [0,16;0,28]	0,19 [0,13;0,27]	0,18 [0,11;0,30]
Ischemia	163,6 # [60,7;168,4]	20,3 [12,9;26,7]	0,08 # [0,06;0,13]	0,10 #§ [0,06;0,20]	0,10 #§ [0,05;0,19]
End	149,3 # 81,0;163,2]	38,9 # [25,1;49,2]	0,10 # [0,09;0,12]	0,11 #§ [0,08;0,15]	0,11 #§ [0,06;0,17]

[Table]
= p<0,05 compared to baseline § = p<0,05 compared to prior measurement

ΔpCO_2 was only significant compared to baseline values. The slow onset tonometric device (Tonocap®) failed to show even long term reductions of splanchnic perfusion during ischemia.
Conclusion(s): This study demonstrates that ΔpCO_2 is not suitable to evaluate dynamic changes in intestinal perfusion.
Accordingly, we propose that ΔpCO_2 cannot be used as a valid and fast marker of splanchnic malperfusion and thus is not suitable for the development of therapeutic strategies to prevent ischemic states in the splanchnic bed.
References:
1. Gummert, Thorac Cardiovasc Surg. 2011; 59:259-67. [2] Hessel, Semin Cardiothorac Vasc Anesth. 2004; 8:243-63. [3] Levy, Crit Care Med. 2011; 39:450-5.

4AP8-6

Prediction fluid responsiveness in laparoscopic major abdominal surgery

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Background and Goal of Study: Monitoring cardiac output and/or preload parameters predicting fluid responsiveness are the basis of the concept of «Goal Directed Therapy». Although these tools are useful for guiding fluid challenge, and also improving outcomes, there are only few data on preload parameters during ongoing laparoscopic surgery (1). The aim of our observational study was to compare predictive value of static and dynamic parameters for guiding fluid loading while pneumoperitoneum was established.
Materials and Methods: After approval by our local ethic committee, 28 patients were prospectively included. In these patients, six preload parameters were simultaneously recorded during major laparoscopic surgery while a fluid challenge was guided by patient's clinical status : PVI®(Masimo Radical 7®); Stroke Volume Variation (SVV) (Vigileo-Flotrac®; Edwards Lifesciences™); Flow Time corrected (FTc), ΔSV® and ΔPV® (CardioQ®- Deltex™ Oesophageal Doppler Monitor [ODM]) and Pulse Pressure Variation (PPV). The cardiac output monitoring by ODM allowed us to define two groups given to cardiac output variation (cut off value: 15%) induced by 500 ml of Voluven® infusion: Fluid response group (FR) and No fluid response group (NR). The predictive value of each parameter was assessed by building Receiver Operating Characteristic (ROC) curves and by determining the area under ROC curves (AUC_{ROC} [CI 95%]).
Results and Discussion: Fourty-three fluid challenges were performed into 28 included patients Twenty-two challenges were characterized by could be defined as responders (FR) and twenty-one as no responders (NR). The AUC_{ROC} were respectively 0,73 [0,57-0,85] for FTc; 0,66 [0,50-0,80] for SVV; 0,64 [0,48-0,78] for PPV; 0,53 [0,37-0,68] for PVI®; 0,48 [0,30-0,66] for ΔPV® and 0,43 [0,25-0,62] for ΔSV®.
Conclusion(s): FTc as well as SVV seems to be better to discriminate patients responding to fluid challenge during laparoscopic major abdominal surgery. However, the predictive value of all parameters appear to be seriously altered by pneumoperitoneum in comparison with standard conditions.
References:
1. Hoiseth L, Hoff IE, Myre K, Landsverk SA, Kirkeboen KA. Dynamic variables of fluid responsiveness during pneumoperitoneum and laparoscopic surgery. *Acta Anaesthesiologica Scandinavica*. 2012.

4AP8-7

Accuracy of volumetric and dynamic variables of fluid responsiveness in presence of left ventricular hypertrophy and diastolic dysfunction

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Objective: Recent studies could demonstrate that goal directed therapy based on dynamic and volumetric variables of fluid responsiveness could reduce morbidity after major surgery [1]. The limitations and the reliability of variables of fluid responsiveness like stroke volume variation (SVV), pulse pressure variation (PPV) and global end-diastolic volume index (GEDVI) have been investigated repeatedly [2]. However, the ability of SVV, PPV and GEDVI to predict percentage changes in stroke volume index (SVI) in presence of left ventricular hypertrophy and diastolic dysfunction is unknown. The aim of the present study was to challenge the predictive power of SVV, PPV and GEDVI in this group of patients.
Methods: After institutional ethics committee approval and informed consent 25 patients scheduled for elective aortic valve replacement were studied after induction of anaesthesia and both during and after passive leg raising (PLR). Each patient was monitored with central venous pressure (CVP), the PiCCO2 monitoring system and transoesophageal echocardiography. Responders were defined to increase their SVITPTD >15% during passive leg raising (PLR). Diastolic dysfunction was evaluated by echocardiography using e:a ratio and mitral flow propagation. To assess the ability of a variable to identify responders and non-responders receiver operator characteristic (ROC) curves were generated.
Results: We observed 13 responders (increase in SVITPTD >15%) after PLR and 12 non-responders (increase in SVITPTD < 15%). ROC-analysis yielded an AUC (95% confidence interval; p-value) of 0.65 (0.39-0.97, p=0.19) for SVV, 0.68 (0.41-0.96, p=0.18) for PPV, 0.62 (0.32-0.87, p=0.47) for GEDVI and 0.55 (0.32-0.87, p=0.51) for CVP.
Conclusion: Dynamic and volumetric variables of fluid responsiveness were not able to predict a percentage increase in stroke volume in patients with diastolic dysfunction.

4AP8-8

A restrictive deferred fluid regimen combined with an adjuvant norepinephrine administration during open radical cystectomy decreases postoperative complication rate and accelerates recovery: results of randomised clinical trial

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Background and Goal of Study: Radical cystectomy is a challenging major urologic procedure including mainly old patients at high risk for early postoperative complications. The impact of intraoperative fluid management on postoperative outcome in patients undergoing open radical cystectomy is poorly assessed. The objective of this study was to determine the influence of a restrictive and deferred intraoperative crystalloid hydration combined with a norepinephrine administration on postoperative complications compared to a more standard crystalloid hydration.
Materials and Methods: *Design, setting and patients:* Double-blind, randomized, clinical trial including 166 patients undergoing pelvic lymph node dissection, open radical cystectomy and urinary diversion at a single major urological centre between November 2009 and September 2012. Exclusion criteria were severe hepatic and renal dysfunction, congestive heart failure and contraindication to epidural analgesia. *Interventions*: Patients were randomly assigned to 1ml/kg/h crystalloid administration until the cystectomy was finished and then 3ml/kg/h until the end of surgery combined with an adjuvant norepinephrine administration (intervention group) or 6ml/kg/h of crystalloid infusion (control group).
Main Outcome Measures: Primary outcome: in-hospital complication rate according to the postoperative morbidity survey. Secondary outcomes: hospitalisation time and 90d mortality rate.
Results and Discussion: Overall in-hospital complications occurred in 43/83 patients (52%) in the intervention group and in 61/83 (73%) in the control group (P=0.006). The rates of gastrointestinal and cardiac complications were significantly lower in the intervention group (5 (6%) vs 31 (37%); P< 0.001 and 17 (20%) vs 39 (48%); P< 0.001), respectively. The number of renal, infectious, pulmonary and thromboembolic complications did not differ between the two groups. The median hospitalisation time was 15d [range: 11-27] for the intervention group and 17d [11-95] in the control group (P=0.02). The overall 90d mortality was 2.4% (0/83 patients (0%) in the intervention group and 4/83 patients (4.8%) in the control group; P=0.12).
Conclusion: In patients undergoing open radical cystectomy, an intraoperative restrictive deferred crystalloid administration combined with an adjuvant administration of norepinephrine reduces the postoperative complication rate, accelerates recovery and shortens the hospitalisation time.

4AP8-9

Comparison of peripheral to central venous pressure in postoperative cardiac surgery patients

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Background and Goal of Study: Central venous catheters are associated with potential complications including arterial puncture, pneumothorax and development of infection. Peripheral venous pressure (PVP) through a peripheral venous cathether is technically easier and safer and has been suggested as an alternative to central venous pressure (CVP).[1,2] We prospectively compared CVP and PVP in postoperative cardiac surgery patients at the intensive care unit.
Materials and Methods: Thirty-seven postoperative cardiac surgery patients were enrolled in the study. CVP and PVP were recorded simultaneously at random points in time. The data pairs were analyzed for correlation (Spearman's rank correlation), linear regression and agreement (Bland and Altman analysis corrected for repeated measurements). Values of P < 0.05 were considered statistically significant.
Results and Discussion: Ninety-one paired recordings of CVP and PVP were collected. The mean CVP (SD; range) was 9.1 mmHg (4.1; 4.0 to 21.0) and the mean PVP was 11.5 mmHg (4.9; 4.0 to 26.0) (P < 0.0005). Overall there was a strong positive correlation between PVP and CVP (r = 0.879; P < 0.0001). The linear regression equation showed that CVP = 0.71PVP + 0.88 (r^2 = 0.736; P < 0.0001). The mean (SD) bias (PVP-CVP) was 2.4 (2.5) mmHg (P < 0.0001). Lower and upper limits of agreement (LOA) were -2.5 and 7.3 mmHg, respectively. Four of 91 points were outside the LOA. PVP showed a strong correlation with CVP although there was a statistically significant bias and relatively large LOA.
Conclusion(s): We conclude that although the two methods cannot be used interchangeably, PVP may be considered as a noninvasive alternative to CVP in postoperative cardiac surgery patients.
References:
1. Intensive Care Med. 2004 Apr; 30(4): 627-32.
2. Anaesth Intensive Care. 2003 Feb; 31(1): 34-9.

4AP8-10

Haemodynamic changes in morbidly obese patients undergoing laparoscopic bariatric surgery

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Background: The prevalence of morbid obesity has reached 1% in the UK and laproscopic bariatric surgery has become increasingly common. Although the adverse haemodynamic effects of a pneumoperitoneum are well characterised, there is currently conflicting evidence as to its impact on bariatric patients[1,2].
We sought to determine the effects of pneumoperitoneum (PP) and reverse trendelenburg positioning (RT) on the haemodynamic parameters (HDP) of morbidly obese patients undergoing laproscopic bariatric surgery.
Methods: The demographics of 7 morbidly obese patients undergoing laproscopic bariatric surgery were recorded and intraoperative HDPs measured using LiDCORapid. Heart rate (HR), stroke volume index (SVI), systemic vascular resistance index (SVRI), stroke volume variability (SVV) and cardiac index (CI) were measured post-induction (t1), after abdominal insufflation (t2) and after reverse trendelenburg positioning (t3). Changes in HDPs were compared to baseline (t1) using the paired t-test.
Results: Unless otherwise stated, values are mean (SD).

Age	41.7 (9.8)
Gender (%[n])	85 (6) Female
ASA Grade (Mode [Range])	2 (2)
BMI	49.6 (9.1)

[Table 1: Patient Demographics]

	t1	t2	t2 vs t1 (P Value)	t3	t3 vs t1 (P Value)
HR	81 (16)	71 (10)	0.06	69 (11)	0.035*
MAP	92 (13)	90 (20)	0.08	80 (10)	0.12
SVRI	1830 (513)	2419 (878)	0.02*	2414 (968)	0.04*
SVI	46 (15)	37 (7)	0.04*	35 (7)	0.036*
SVV	18 (4)	18 (8)	0.93	16 (8)	0.69
CI	3.79 (1.82)	2.64 (0.71)	0.05*	2.46 (0.74)	0.049*

[Table 2: Haemodynamic Responses to PP and RT]
*Significant at the 0.05 level

Discussion: Despite significant decreases in SVI and CI, MAP remained unchanged suggesting that BP monitoring alone in bariatric patients undergoing laparoscopic surgery is insufficient for rational intraoperative cardiovascular management. The dramatic inter-individual variation in haemodynamic response to PP and RT further illustrates the need for CO monitoring in this patient population.
The SVV was initially high and did not change significantly during the monitoring period indicating that better pre-optimisation and intra-operative fluid replacement is required. Moreover, the rise in SVRI suggests that vasopressors may not be the optimum management of hypotension in these patients.
References:
1. Nguyen NT, Wolfe BM. Ann. Surg. 2005;241:219-26.
2. El-Dawlatly AA, Al-Dohayan A, Favretti F, et al. Middle East J Anesthesiol. 2002;16:411-7.

4AP8-11

The sympathetic nervous system mediates protective effects of hypothermia on gastric mucosal oxygenation during haemorrhagic shock

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Background and Goal of Study: Hypothermia attenuates gastric mucosal oxygenation (μHbO_2) during haemorrhagic shock [1]. At the same time hypothermia activates the sympathetic nervous system. The aim of this study was to analyze whether the effect of hypothermia on μHbO_2 is mediated by the sympathetic nervous system.
Material and Methods: The effects of haemorrhagic shock (loss of 20% of the estimated blood volume) on μHbO_2 were studied during hypothermia (34°C, blood temperature) and normothermia (37.5°C) in repetitive experiments on five dogs anaesthetized with sevoflurane (approval of the local animal care and use committee). In additional experiments both groups were repeated with blockade of the sympathetic nervous system via thoracic epidural anaesthesia (TEA). Systemic haemodynamics, gastric mucosal microvascular oxygenation (reflectance spectrophotometry) and blood temperature were recorded continuously. Arterial blood was sampled intermittently for blood gas analysis and calculation of systemic oxygen delivery (DO_2). Data are presented as means±SEM. Wilcoxon signed-rank test, $p < 0.05$
Results and Discussion: During haemorrhagic shock μHbO_2 was reduced from 81 ± 3 to 56 ± 6% and TEA had no additional effect (77 ± 2 to 50 ± 5%). In the presence of hypothermia, however, haemorrhagic shock did no longer reduce μHbO_2 (79 ± 3 vs. 66 ± 8%). This effect of hypothermia was abolished during TEA (μHbO_2 decreased from 74 ± 2 to 47 ± 2%). Effects are independent of DO_2, which was equally reduced in all groups.
Conclusion: Improvement of μHbO_2 during haemorrhage via hypothermia is abolished by TEA. Thus, effects of hypothermia are mediated by the sympathetic nervous system.
References:
1. Vollmer et al. Eur J Anaes 2012; 29:63
2. Steven et al. Clin Sci 2003; 104:503-508

Respiration

5AP1-1

The effect of nasal high flow for acute hypoxemia: systematic review

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Background and Goal of Study: Nasal High Flow (NHF) delivers high flow rate oxygen-gas mixture by nasal cannula. As NHF has little discomfort compared with Noninvasive Positive Pressure Ventilation, the use of NHF as a respiratory support is recently increasing at ICU. NHF in neonates has already been reported by many publications, but the efficacy of NHF in children and adult has not been sufficiently established yet. We assess the effectiveness of NHF in patients with acute hypoxemia.
Materials and Methods: We conducted meta-analysis about the effectiveness of NHF. We searched for publications and abstracts in PubMed about NHF We detected 763 papers about NHF, and selected 66 papers based on their titles and abstracts. We then selected only prospective studies which compared the group treated by NHF with the group treated by other oxygen therapy, and extracted data from 16 papers. Among them, we identified 9 studies as appropriate for inclusion in our review.
Results and Discussion: About PaO2, we analyzed data of 387 patients in six studies. All patients were adult. The PaO2 of NHF group was significantly higher than control group ($p < 0.00001$). The mean difference of two groups was 28.03mmHg (95% CI 17.07, 38.99mmHg). Similarly, we analyzed data of 366 patients in seven studies about SpO2 including four adult and three pediatric studies. Overall, the SpO2 of NHF group tended to be higher than control group ($p=0.07$). The mean difference of two groups was 3.51% (95% CI -0.23, 7.26%). In subgroup analysis, the mean difference of adult patients was 4.87% (95% CI -0.74, 10.47%) and that of pediatric patients was 1.18% (95% CI-1.18, 3.54%). We also analyzed data of 477 patients in eight studies (five adult and three pediatrics) about respiratory rate. The respiratory rate of NHF group was significantly lower than control group ($p < 0.00001$) and the mean difference of two groups was -5.73/min (95% CI -8.36, -3.10/min). In subgroup analysis, the mean difference of adult patients was -6.10/min (95% CI -8.98, -3.21/min) and that of pediatric patients was -5.25/min (95% CI-13.16, 2.66/min).
Conclusion(s): Our systematic review showed that NHF promoted improvement of oxygenation and reduction of respiratory rate in patients with acute hypoxemia. Both oxygenation and respiratory rate has been improved in adult patients, but this improvement was not clear in pediatrics, because of their limited sample size. Further large scale randomized trial is needed.

5AP1-2

Non-lung oxygenation: revising the old idea

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Background and Goal of Study: Severe hypoxemia due to acute pulmonary gas exchange derangement remains the common reason for patients' mortality. One of the alternative ways to alleviate hypoxemia is non-lung oxygenation. The goal of this study was to reexamine the old idea concerning O_2 administration to the gastro-intestinal tract, aiming systemic oxygenation instead of the local one [A.Charniy, 1961, N.Sirotinin, 1968, S.Gelman, 1975].
Materials and Methods: 23 ICU (medical and surgical) ventilated patients with undamaged gastro-intestinal tract were investigated. 100% of oxygen was introduced to the patients' intestine by the nasointestinal tube, connected to an extra respirator. Special parameters creating low gas flow were used: breath rate 5-8 min, tidal volume 30-80 ml, inversed I:E ratio (3:1, 4:1). The average volume of the introduced oxygen was 150-400 ml/min, or 3-7 l/hr. The time of the procedures was 40-90 min. Intra-abdominal and intra-intestinal

pressures were monitored while insufflating. The arterial blood gases were tested: before, 1, 3, 6, 9, 19, 32, 42, 51 hrs after the procedure. None of the lung ventilation parameters (FiO_2, PEEP, I:E, Vt, MV) were changed during the procedure and the evaluation time. Received PaO_2 figures were standardized as percent of total increment relating to their initial values. The data presented as M±SD.

Results and Discussion: The received results allow us to state that oxygen administered to the gastro-intestinal tract is absorbed there producing delayed but long lasting blood oxygenation growth. As soon as the quantity of the absorbed oxygen is affected by several factors, this method seems to be effective in cases of pulmonary hypoxemia, whereas its use for hypoxemia due to other reasons (cardial, hematic, tissue) will probably not be reasonable.

However, proper indications for practical usage of this method need further reseach. Moreover, some questions should be cleared: 1) optimal technique for prolonged O_2 administration (low flow insufflator), 2) O_2 absorption improvement (medicines to increase the gut wall circulation, foam breakers), 3) application of high frequency or oscillatory flow aiming for oxygen-intestinal mucosa contact area enlargement.

Conclusion(s): Further research is needed to prove clinical benefits of the intestinal oxygenation.

5AP1-4

Assessment of regional ventilation distribution: comparison of vibration response imaging (VRI) with electrical impedance tomography (EIT)

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Background and Goal of Study: Vibration response imaging (VRI) is a new bedside technology to monitor lung volume distribution based on lung sound vibrations. However, it is unknown whether VRI is capable to differentiate regional ventilation distribution. Therefore we compared VRI to electrical impedance tomography (EIT), a well established technique for assessment of regional ventilation.

Materials and Methods: With IRB approval, in 9 piglets, simultaneous EIT and VRI measurements were performed in healthy and impaired lungs (ALI) at different PEEP levels (0, 5, 10, 15 mbar). Vibration energy amplitude (VEA) by VRI and amplitudes of relative impedance changes (rel.ΔZ) by EIT were evaluated for 7 regions of interest (ROIs). To assess the tidal volume (V_T) by VRI and EIT, absolute values were normalized to V_T obtained from simultaneous spirometry. The following statistics were performed: Student's T-test, linear regression, Bland-Altman method.

Results and Discussion: Overall, regional V_T by EIT ranged from 57 to 681 ml while VRI depicted regional V_T from 42 to 688 ml. Redistribution of ventilation by ALI and PEEP was equally detected by VRI and EIT (all $P>0.05$). Linear correlation between V_T by VEA and rel.ΔZ was R^2 0.96. Bland Altman analysis calculated: $diff_{mean}$ -1.07±24.71 ml; 1.96 SD-limits -49.05/47.36 ml. Comparing measures of regional ventilation distribution by EIT and VRI for the seven predefined ROIs, results showed high agreement for ventral, dorsal, right, left, level 2 (middle) and level 3 (lower dorsal) lung V_T-measurements (R^2 0.8-0.96). However, agreement in level 1 (upper ventral) ROI was weak (R^2 0.29), most likely due to interference of heart sounds. To our knowledge this is the first study that compared VRI to EIT. We need to emphasize that regional ventilation within the different ROIs were assessed by amplitudes of rel.ΔZ (EIT) and by VEA (VRI) and therefore need to be considered as indirect relative quantities. Also, a precise synchronization of the respective ROIs examined by VRI and EIT is challenging, because tomograms derived by EIT show no anatomical landmarks, neither do sounds, recorded by VRI.

Conclusion(s): These results suggest high agreement between measurements of regional ventilation distribution obtained by VRI and EIT.

Acknowledgements: Experiments were performed at the University Medical Centre, Johannes-Gutenberg University Mainz, Germany and supported by DFG PAK-415.

5AP1-5

Electrical impedance tomographic evaluation of the possibility of reversal of Trendelenburg position induced atelectasis

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Background and Goal of Study: Atelectasis developed during general anesthesia (GA) is increased by Trendelenburg position (head-down). The electrical impedance tomography (EIT) is a recent imaging technique without radiation, measuring pulmonary impedance, allowing visualisation of the ventilation. With the Pulmo Vista 500 EIT monitor we evaluated the Trendelenburg induced atelectasis and the possibility of its reversal with head-up tilt.

Materials and Methods: After IRB approval, informed, written consent was obtained from 15 adult ASA class 1-2 patients scheduled for general surgery. This study was a randomised observational clinical trial. All the study was done before the start of surgery, with all patients in supine position. Monitoring consisted of five lead ECG, pulse-oxymeter, non-invasive blood pressure, capnography and the belt of the EIT monitor around the patient's thorax . Baseline data were recorded with the patient breathing spontaneously room air. GA with muscle relaxation was standardised with an FiO2 0.5 in air. Ventilatory settings were kept constant. After intubation and ventilation (10 minutes) in horizontal position, the patients were tilted in Trendelenburg position (approximatively 30°) for 10 minutes, and thereafter into a reverse Trendelenburg (30°) for another 10 minutes. After completion of the study, the lungs were recruited. The date recorded with EIT, were converted into a readable form. Primary outcome was an increase in atelectasis under GA and the secondary was a variation of 5% in ventilation between positions. ANOVA was used to compare differences. Data are expressed as percentage of ventilation variations (Mean± SD).

Results and Discussion: After induction of GA, all the patients developed atelectasis (-9.7 % ± 1.9, as compared to baseline ventilation, $p< 0.01$). During Trendelenburg, the atelectasis accentuated (-16.7 % ± 3.2 vs baseline, $p< 0.01$). However, in reverse Trendelenburg, the ventilation was not ameliorated. Alveolar recruitment under EIT visualisation resulted in comparable ventilation to the baseline values.

Conclusion(s): Atelectasis occurs after induction of GA and head-down tilt accentuates it. Head-up tilt is not enough for reversa of head-down induced atelectasis during GA, a recruitment under EIT visualization is optimal. The use of EIT during GA in operating rooms, reveals the possibilities of visualised ventilation.

5AP1-6

An emergency medical oxygen generator for difficult environments

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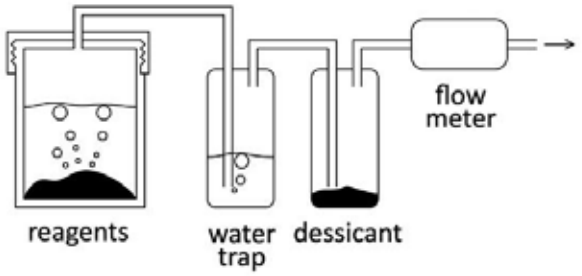
Background and Goal of Study: A lightweight emergency means of providing oxygen (O_2) without use of compressed gas cylinders is required in certain situations: most notably sustenance of battlefield casualties until they can be evacuated[1], but also mining/submarine escape, and altitude medicine. O_2 can be generated *in situ* electrically or chemically[2]. However, electrolysis systems and O_2 concentrators are bulky and inefficient, and to date the output of chemical systems has been uncontrolled, irregular, and inefficient in use of reagents.

We describe a well controlled chemical O_2 evolution system designed for use in combination with a rebreather circuit to allow highly efficient use of low O_2 flow rates, with sufficient O_2 for metabolic demand for 1 hr with minimum weight of reagents[3].

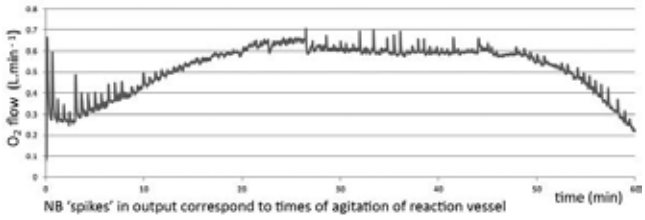
Materials and Methods: The apparatus and reaction are shown in Fig 1. O_2 was measured using a mass flowmeter (4140, TSI, UK) & gas analyser (GKM-03, INSOVT, RU) and captured at 1Hz using bespoke data logger software (Python).

Results and Discussion: O_2 evolution was controlled by catalyst and reagent dissolution rate, which was varied by use of different reagent pellet sizes. The best combination (~2mm Ø granules + ~10mm Ø pellets) allowed generation of an initial 'rebreather purge pulse' of 650 $mL.min^{-1}$ 100% O_2 for 5 min, followed by sustained ~300-600 $mL.min^{-1}$ 100% O_2 - enough to meet metabolic demands for 1 hr - using 1 L water and 550 g reagents (Fig 2).

Conclusion(s): By choice of reagent particle size it has been possible to design a lightweight emergency chemical oxygen generator with O_2 output flow profile optimised to meet metabolic demand for 1 hr. We are currently developing the rebreather circuit for *in vivo* tests.



[Fig 1. Apparatus and reaction]



[Fig 2. Oxygen output]

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5AP1-7

ELWI as a predictor of prolonged mechanical ventilation in the postoperatory of liver transplantation

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Background and Goal of Study: Monitoring of extravascular lung water index (ELWI) has been used in critically ill patients as a marker of lung damage with prognostic value(1). Orthotopic liver transplantation (OLT) is a surgical procedure that requires infusion of large amounts of fluid and blood products that can cause postoperative respiratory compromise(2).
The aim of this study is to assess the usefulness of the last measurement of ELWI values in the intraoperative period of liver transplantation to predict the need for prolonged postoperative mechanical ventilation (PPVM) (beyond the first 48 hours).
Materials and Methods: We studied 63 consecutive liver transplants monitored intraoperatively with Swan Ganz catheter and Picco and analyze variables (age, sex, MELD, intraoperative fluids, need of transfusions, and hemodynamic parameters) which could prolong postoperative intubation and stay in critical care units. Statistical analysis was performed with the software IBM SPPS Statistics 17, and a logistic regression analysis was conducted including all the variables which had yielded $p < 0.1$ in the univariate analysis when comparing patients with VMPP.
Results and Discussion: 63 patients undergoing OLT were analyzed consecutively. Seven of them required mechanical ventilation for more than 48 hours. Baseline characteristics of patients (age, sex, Child, MELD, and hepatic pressure gradient) were similar between the two groups. Intraoperatively, the duration of the intervention, fluid and blood products transfusion requirements were also similar. The only statistically significant difference between both groups was found in ELWI. Patients requiring mechanical ventilation had an ELWI of 12.1 ± 2.6 versus 9.7 ± 2.1 in patients who did not require it ($p = 0.009$).
Conclusion(s): The ELWI value measured immediately before admission to the recovery unit is a predictor for prolonged mechanical ventilation in patients undergoing liver transplantation.
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5AP1-8

Opto-electronic plethysmography accurately measures lung volume variations in ventilated pigs

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Background and Goal of Study: Opto-electronic plethysmography (OEP) has been widely used during a variety of clinical situations and it accurately and noninvasively assesses lung volume variations in humans. The method has however not been validated in pigs, a species commonly used for studies of lung physiology. The aim of this study is to verify the accuracy and feasibility of OEP in a porcine model.
Materials and Methods: We developed a geometrical model of the chest wall of the pig in supine position to obtain consistent and reliable estimations of total and compartmental chest wall volume variations. The model was applied to seven anesthetized and paralyzed piglets (weight 26±2.3 kg) receiving pressure-controlled ventilation. Tidal volume changes were measured using OEP and, additionally, derived from pneumotachography (PNT) at three different PEEP levels: 0, 10 and 20 cmH_2O. The OEP volume changes (ΔV_{OEP}) were compared to those by PNT (ΔV_{PNT}). Additional gas measurements by expiratory computer tomography of the lungs and the abdomen were performed in five piglets for all PEEP levels.
Results and Discussion: For all PEEP levels, volume changes obtained by OEP and PNT were highly correlated (global $r^2=0.988$). Moderate differences between ΔV_{OEP} and ΔV_{PNT} with ΔV_{PNT} being consistently higher were found (at least 14.5±5.9 %) and related to gas compression phenomena by means of CT analysis.
Conclusion(s): OEP is suitable for use in the porcine model; therefore it is possible to study global lung volume changes noninvasively in pigs. For regional aeration distribution, other methods than OEP should be considered.

5AP1-9

Near-real time pulmonary shunt and deadspace measurement with multiple inert gas elimination technique (MIGET) by micropore membrane inlet mass spectrometry (MMIMS) in porcine lung injury models

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Background and Goal of Study: Currently, pulmonary gas exchange analysis by MIGET based on MMIMS is under evaluation by several groups.[1,2] MMIMS reduces analytical complexity compared to gas chromatography used in conventional MIGET.[1,2] MMIMS-MIGET shunt (MMS) has been shown to correlate well with Riley shunt (RS) in a porcine lavage lung injury model.[1,3] This study evaluated MIGET by multi-pore MMIMS and aimed to compare fractional (I) MMS with RS and (II) MMIMS-MIGET deadspace (MMV_D) with deadspace based on volumetric capnography (VCV_D).
Materials and Methods: With animal care committee approval, anaesthetized pigs (24±1 kg; lavage injury, n=15; autologous clot pulmonary embolism; n=10) were studied. A dissolved inert gas (IG) mixture [2] was infused at a rate of 8 $mlkg^{-1}h^{-1}$. Arterial, mixed venous and mixed expired samples were collected at baseline and after lung injury induction in 15 minutes intervals. Samples were analyzed for IG partial pressures using a multipore MMIMS system (Oscillogy LLC, Folsom PA). Resultant retention and excretion data were transformed to V_A/Q distributions.[5] As compartments of interest, fractional MMS and MMV_D were determined as shunt ≡ $V_A/Q < 0.005$, deadspace ≡ $V_A/Q > 100$. RS and VCV_D fractions were calculated as previously reported.[2,3]
Results and Discussion: Analysis was based on n=334 data pairs, comparing MMS to RS and MMV_D to VCV_D.

	Range (%)	Linear regression	r2	*P*	bias (%)	2 SD (%)
MMS	0 - 41	MMS = 0.82*RS - 0.04	0.60	<0.0001	-6.5	± 9.8
RS	4 - 72					
MMVD	22 - 79	MMVD = 0.92* VCVD - 0.03	0.48	<0.0001	-8.7	± 14
VCVD	47 - 89					

[Table 1]

As indicator of experimental error, the MMIMS dataset had a residual sum of squares (RSS) < 5.3 in 31%, RSS < 10.6 in 61% and RSS < 16.8 in 80%.

Conclusion: MMS and MMV_D correlate well with conventionally determined RS and VCV_D. Whether systematic negative offsets reflect superior resolution by MIGET at the extremes of V_A/Q distribution, requires further study. MMIMS-MIGET emerges as a near real-time technique for true V_A/Q distributional analysis.

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5AP1-10

Validation of MMIMS-MIGET (multiple inert gas elimination technique by micropore membrane inlet mass spectrometry) in an in vitro lung model of lung compartments with low-to-normal ventilation-perfusion ratios (V_A/Q)

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Background and Goal of Study: MMIMS-MIGET has been designed as rapid and direct method to assess the full range of V_A/Q distributions.[1,2] In an in-vitro lung model (IVLM), MMIMS-MIGET shunt has been shown to correlate well with preset model shunt.[3] In this study we aimed to compare low ($0.005 < V_A/Q < 0.1$) to normal ($0.1 < V_A/Q < 10$)[4] V_A/Q compartments determined by MMIMS-MIGET (MM-VQ) with reference low-to-normal V_A/Q compartments as preset in the IVLM (IVLM-VQ).

Materials and Methods: One oxygenator (QUADROX-iD Pediatric; MAQUET) was perfused with 2.5 L min^{-1} saline using a micro-diagonal pump (DeltaStream DP-II; Medos) and ventilated (sweep gas = air). Inert gas solution [1] (6 solubilities) was infused at a rate of 1.5 ml min^{-1}. Seven model IVLM-VQ were generated by setting sweep gas flow randomly to 0.05, 0.1, 0.2, 0.4, 0.6, 0.8 and 1 L min^{-1} measured by thermal mass flowmeter (TSI series 4000/41, MN, USA). Perfusate samples (duplicates, 3 ml) were taken at each preset IVLM-VQ (0.02, 0.04, 0.08, 0.16, 0.24, 0.32, 0.4) simultaneously from up- and downstream mixing chambers of the gas exchange assembly (representing arterial and venous vascular beds), and were analyzed by MMIMS-MIGET to determine MM-VQ from retention data.[5] V_A/Q ratios (mean representing MM-VQ) corresponding to the V and Q peaks were taken from MMIMS-MIGET V_A/Q distributions for comparison with preset IVLM-VQ.

Results and Discussion: The IVLM performed well, allowing stable control of compartmental saline and gas flows, as well as reproducible inert gas transfer. All pairs (n=14) of preset IVLM-VQ (range 0.02 to 0.4) and MM-VQ (range 0.034 to 0.346) were feasible for analysis.
Linear regression: MM-VQ = 0.69*IVLM-VQ + 0.04 ($P < 0.0001$, $r^2=0.89$).
Bland-Altman analysis: Mean bias (± 2 SD) = - 0.02 (± 0.11).
Overall Coefficient of Variation for MM-VQ was 12%.

Conclusion: Low-to normal V_A/Q compartments generated in an IVLM are detected by MMIMS-MIGET with good accuracy and precision. This in-vitro lung model appears as convenient system to validate and test MIGET systems and underlying assumptions by generating known V_A/Q relationships.

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5AP2-1

Smokers in the operating room. Characteristics of patients, age and number. Observational study involving 41,240 patients

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Background and Goal of Study: The relation between tobacco use and postoperative complications is well documented in many interventions. The preoperative period is an ideal time for smokers to quit. Therefore, desintoxication programs were developed to help them before being admitted to hospital. The Royal College of Anaesthetists recommends smokers programmed for surgery to quit as far in advance of their surgery as possible, preferably a minimum of six weeks. If this is not possible, patients are asked to not smoke in the day of the operation. The goal of this study was to determine the prevalence of smokers in the population of a teaching hospital and to evaluate in which age range could be more efficient a desintoxication plan.

Materials and Methods: We designed an observational non interventional study to evaluate the prevalence of smoking patients in our population. After local ethic committee approval, the preoperative anaesthetic evaluation data base of our hospital was analized to determine the prevalence of smokers in our population. Patients were classified by surgical specialty and age to identify risk populations.

Results and Discussion: 41420 patients were included,8283 (14%) were smokers and 8251(14%) ex-smokers. Only 189 (2,3%) patients with age under 20 years were smokers.
They were mainly scheduled for urological and trauma surgeries. 945(11,4%) patients aged 20-30 years, 1371(16,5%) aged 31-40 years, 1885 (22,7%) aged 41-50 years, 1752(21,7%) aged 51-60 years, 1236(14,9%) aged 61-70 years, 724(8,8%) aged 71-80 years, 115 (1,4%) aged 81- 90 years and 4(0,05%) aged over 90 years were smokers respectively. The last 2 groups of patients were mainly programmed for eye surgery.
A linear relationship exists between the presence of tobacco consumption and alcoholism (r2= 0,28; p=0,002), with a peak of prevalence of co-intoxication in the 51-60 years group (22%). In the group with major prevalence (41-50yrs), patients were programmed for general surgery (12,4%), ENT procedures (12,4%), neurosurgery (9,7%) and vascular surgery (7,9%).

Conclusions: We find a peak of smokers in patients with age between 41 to 50 years with a 22% of prevalence and direct relationship between smokers and alcoholic. 60% of smokers were scheduled for general, trauma, ENT, vascular and neurosurgery. A desintoxication program in this groups would be the more efficient.

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5AP2-2

Intraoperative recruitment does not affect postoperative restrictive pulmonary syndrome and hypoxaemia after laparoscopic gastric by-pass in morbidly obese patients: a randomised controlled study

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Background and Goal of Study: General anaesthesia and upper-abdominal surgery decrease the functional residual capacity (FRC), more particularly in obese patients (1-2). Atelectases and low FRC can lead to postop hypoxaemia and respiratory complications (3). Intraop recruitment manoeuvre (RM) combined with PEEP reverses the decease in FRC (2).
However, whether the benefits of RM persist postoperatively remains unknown. We tested the hypothesis that intraop RM + PEEP improves postop spirometry including FRC and reduces the incidence of postop hypoxaemia in morbidly obese (MO) patients undergoing laparoscopic gastric by-pass.

Materials and Methods: After IRB approval and informed consent, 50 MO patients scheduled for laparoscopic gastric by-pass were randomly ventilated with a 10 cm H_2O PEEP or a 10 cm H_20 PEEP associated with 2 RMs (airway pressure at 40 cm H_2O for 40 sec). Controlled ventilation was standardized: tidal volume = 6 ml/kg IBW, respiratory rate adjusted for a $PetCO_2$ 38-45 mmHg, FiO_2 = 0.8. RMs were performed after induction of pneumoperitoneum (14 mmHg) and after exsufflation.
Anesthaesia (desflurane in O2/air) and analgesia were standardized in both groups. Spirometry was assessed preoperatively and 24 h after surgery. Postop oxygenation and the apnoea hypopneae index (AHI) were recorded during the first night postop using a Somnolter®. Changes in spirometric parameters (mean±SD) were compared using Student *t* test, Somnolter® data (median[IQ 25-75]) were compared using Mann Whitney test. $P < 0.05$ = statistically signiificant.

Results and Discussion: Age, BMI, and STOP BANG score were similar in both groups. RMs did not affect postop changes in spirometry (Table 1). Oxygenation and AHI were similar in both groups (Table 2).

% preop values	PEEP	PEEP + RM
Forced vital capacity	0.76±0.15	0.77±0.13
FEV1	0.72±0.13	0.76±0.14
FRC (helium technique)	0.92±0.33	0.94±0.34

[Table 1]

median [IQ25-75]	PEEP	PEEP + RM
AHI	2.6 [1.5-7.6]	2.1 [0.9-5.1]
mean SpO2 (%)	92.6 [90.4-94.4]	92.1 [91.1-94.1]
% recording time with SpO2 < 90%	0.9 [0.1-28.0]	1.1 [0-23.8]

[Table 2]

Conclusion(s): This study demontrates that combining 2 RMs with PEEP do not affect the postop pulmonary restrictive syndrome, the postop oxygenation and the AHI after laparoscopic upper-abdominal surgery in MO patients.

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5AP2-3

Prediction of postoperative respiratory complications on the basis of expiratory flow limitation and use of intraoperative peep: preliminary study

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Background and Goal of Study: General anaesthesia is associated to a decreased functional residual capacity. This phenomenon, associated with a reduction of maximal expiratory flow, could lead to expiratory flow limitation (EFL) during major abdominal surgery[1] in patients with unpredictable reduction of lung function. We reasoned that the presence of EFL could be used as a predictor of postoperative respiratory complication because its represent an important limitation of lung function. Moreover, the presence of EFL should be avoided because of the inflammatory consequence of low lung volume ventilation. The use of extrinsic positive end expiratory pressure (PEEP) could be able to reverse EFL by increasing the FRC.[2] Hence the use of PEEP might reduce postoperative pulmonary complications (PPCs). Purpose of our study was to evaluate if
1) EFL could predict PPCs; and
2) the application of PEEP can reduce the risk of PPCs.
Material and methods: One hundred and sixteen consecutive patients scheduled for general anaesthesia were randomly allocated to be ventilated either at zero PEEP (group ZEEP; n= 58), or at 5 cmH_20 of PEEP (group PEEP; n=58) for the entire duration of surgery. The presence of EFL was determined by the PEEP test during surgery in supine, Trendelemburg, and anti-Trendelemburg positions.
Results: The two groups were homogeneous in terms of age, ASA physical status, duration of surgery, number of co-morbidities, BMI and the percentage of patients with EFL (43,9% group ZEEP versus 40,7% group PEEP). Respiratory complications were demonstrated mainly in patients with EFL and ventilated at ZEEP (62,5%); the use of PEEP was able to avoid pulmonary complication even in patients with EFL. The risk of having EFL was associated with an age > 62 yr (odds ratio: 3.7) and elevated BMI (odds ratio 1.2). The hospital length of stay was 11.4 day for patients with EFL and 9.1 for those without EFL.
Conclusion: The presence of EFL seems a good predictor of respiratory complications. The use of low level of PEEPe in patients with EFL is able to reduce respiratory complications and to prevent the deterioration of respiratory mechanics that occurs during surgery.

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5AP2-4

Airway management and respiratory complications in acromegalic patients undergoing pituitary surgery

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Background and Goal of Study: Acromegaly is associated with difficult intubation (in 43%) and with obstructive sleep apnoea (OSA). Acromegalics may have an increased incidence airway complications postoperatively; most centres place patients in either Level 1 or Level 2 locations.
We investigated the incidence of difficult intubation and postoperative respiratory complications in acromegalics undergoing transphenoidal hypophysectomy.
Materials and Methods: A retrospective analysis of acromegalic patients (APs) at one neurosurgical centre. We recorded: the diagnosis of OSA, the use of home CPAP, difficult intubation (C&L grade 3 or 4), the use of intubation aids, respiratory complications (episode of SpO_2< 95% or requiring >40% O_2), the need for re-intubation, and location of postoperative care.
Results and Discussion: We collected data for 25 APs between Jan. 2007 - Aug. 2011; 10 female, 15 male. BMI data available for 18 APs, 8 >30 kg m^{-2}. Six APs were diagnosed with OSA, an additional AP had abnormal overnight oximetry but was not diagnosed with OSA. Four used nocturnal CPAP. Of the 6 difficult intubations, 3 were in APs with OSA (P=0.12, Fisher's exact test). The 6 APs were successfully intubated with either a gum-elastic bougie (GEB) and size 3 Mac (3) or a GEB in combination with either a McCoy laryngoscope (2) or size 4 Mac (1). Seven APs desaturated, 4 in recovery and 5 on the ward; and 2 in both locations. One AP with OSA required 60% O_2 in recovery and in HDU. The lowest recorded $Sp0_2$ in recovery was 90% (treated with 40% O_2) and the lowest $Sp0_2$ on a ward (HDU) was 90% (AP re-started on CPAP). No APs required emergency re-intubation. Thirteen APs were discharged from the recovery area to Level 0/1 (ward) care, 12 APs to Level 2/3 (HDU/ICU) care.

Age; yr	46.5 ±12
Height; cm	177 ± 13.7
Weight; kg	97.9 ± 26.0
BMI; kg m-2 (n=18)	32.1 ± 6.4
OSA	6 (24%)
Difficult intubation	6 (24%)
Recovery resp.comps	4(16%)
Ward resp.comps	5 (20%)

[Patient characteristics; mean (± SD) or n (%)]

Conclusions: Acromegaly can be associated with difficult intubation and a tendency to desaturate postoperatively. APs should be monitored, but do not necessarily require emergency airway intervention. Savings may be achieved by managing APs in a Level 1 environment without compromising patient safety.

5AP2-5

STOP BANG but not BMI predicts postoperative obstructive apnoea and hypoxaemia after laparoscopic upper-abdominal surgery

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Background and Goal of Study: Morbid obesity results in respiratory and ventilatory pathophysiological changes and increases the risk of sleep apnoea obstructive syndrome (SAOS). Both theoretically lead to postoperative hypoxaemia (1-2). However whether morbid obesity (MO) *per se* increases the risk of postoperative hypoxaemia remains controversial (3-5). We tested the hypothesis that the STOP BANG risk score for SAOS (6) rather than obesity is associated with postoperative hypoxaemia.
Materials and Methods: After IRB approval and informed consent, 44 MO patients with a BMI ≥ 40 kg/m^2 and 20 patients with a BMI < 25 kg/m^2 scheduled for laparoscopic upper-abdominal surgery under standardized general anaesthesia and intraoperative mechanical ventilation were included in this study. Postoperative oxygen saturation and obstructive apnoea (OA = apnoea hypopnoea index [AHI] ≥20) were recorded the first postoperative night using a Somnolter® (Nomics, Angleur, Belgium). Exact logistic regression was used to evaluate the association between MO, STOP BANG ≥ 4 and OA. Postop oxygenation (median [IQ25-75]) was compared between groups using Kruskal-Wallis. P < 0.05 = statistically significant.
Results and Discussion: Patient data were similar in the 2 MO groups. STOP BANG ≥ 4 (*P=0.001*) but not MO (*P=0.4*) was significantly associated with postop OA. Obese patients with STOP BANG ≥ 4 also have the lowest postop oxygen saturation (Table1).

median[IQ25-75]	Non obese	Obese with STOP BANG < 4	Obese with STOP BANG ≥ 4	P
Mean SpO2	94.8 [91.5-96.1]	93.8 [91.4-94.4]	91.3[90.4-93.6]	0.01
% recording time with SpO2 < 90%	0.05 [0-11.2]	0.04 [0-0.9]	8.0 [0.3-31.7]	0.03

[Table 1]

Conclusion(s): STOP BANG but not BMI is predictive of postoperative hypoxaemia after laparoscopic upper-abdominal surgery.

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5AP2-6

Incidence and risk factors of postoperative respiratory complications in patients undergoing thoracic surgery

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Background and Goal of Study: Respiratory complications account for 15-19% of thoracic patients and these could increase perioperative mortality and morbidity. The purposes of this study are to determine the incidence of postoperative respiratory complications and identify the preoperative and intraoperative predisposing factors thereof in patients undergoing thoracic surgery.
Materials and Methods: A retrospective cohort study of consecutive adult patients undergoing noncardiac thoracic surgery between 2005 and 2010 in a tertiary medical center was performed. Preoperative,perioperative and outcome variables were assessed using standard descriptive statistics.Operative mortality is defined as death from any causes within 30 days after the operation. Univariable and multivariable regression analysis were used to identify the associated risk factors.
Results and Discussion: During the study period, 210 of the 1,237 patients had cardiovascular complications after thoracic surgery, an incidence rate of 170:1,000 (95%CI:149.9-191.7). The operative mortality was 10.1:1,000 (95%CI:6.1-17.9). Among the respiratory complications, acute respiratory failure (4.2%), pneumonia (2.8%) and atelectasis (2.6%) were common,while air leak (2.8%) and empyema thoracis (1.6%) were common in operative-related complications. Patients with age more than 70 years (odds ratio(OR) =1.49;95% CI:1.06-2.11), ASA physical status 2 and 3 (OR =2.21; 95%CI:1.13-4.32,4.28;95%CI:2.11-8.70), chronic obstructive pulmonary disease (COPD) (OR=1.75; 95% CI:1.25-2.47), right-sided operation (OR=1.37;95% CI:1.01-1.85), pneumonectomy (OR = 2.04;95% CI:1.05-3.97), intraoperative desaturation (OR = 1.65; 95%CI:1.05-2.60) and intraoperative bronchospasm (OR =1.60;95% CI:1.10-2.32) were strong risk factors of postoperative respiratory complications.
Conclusion(s): The incidence of respiratory complications in patients undergoing thoracic surgery was 170 per 1,000 anesthetics. Major risk factors were age more than 70 years, ASA physical status 2 and 3, COPD, right-sided operation, pneumonectomy, intraoperative desaturation and bronchospasm. Identifying preoperative and intraoperative risk factors provides an opportunity to conduct further study in predictive and preventive strategies to improve safety and quality of care.
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5AP2-7

Relationship between plasma triglyceride and albumin concentrations and severity of acute lung injury and pulmonary edema

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Background and Goal of Study: Critically ill patients are frequently suffering from metabolic disorders that might affect clinical outcome. However, the influence of abnormalities in lipid and protein metabolism on the development of acute lung injury (ALI) still remains unsettled. Thus, the aim of our study was to evaluate the relationship between plasma triglyceride (TG) and albumin (Alb) concentrations and the severity of ALI.
Materials and Methods: Eighteen adult patients with ALI were enrolled into this prospective study. All patients were canulated with femoral artery catheter, monitored with $PiCCO_2$ (Pulsion Medical Systems, Germany) with assessment of cardiac index (CI) and extravascular lung water index (EVLWI). Patients received protocolized respiratory support and enteral nutrition. Blood gases were taken once a day and plasma TG and Alb concentrations were determined at 1, 4, 7 and 10 days of the study. For assessment of the relationship between lipid metabolism and the severity of ALI depending on TG concentration on Day 1, all the patients were subdivided into a low TG group (< 1.0 mmol/L, TG_{low}, n = 7) and a high TG group (≥ 1 mmol/L, TG_{high}, n = 11). The intergroup and intragroup data analysis was performed using Mann-Whitney U-test and Wilcoxon test, respectively. The data are presented as median (25^{th}-75^{th} percentiles). The relationships between variables were assessed with Spearman's *rho* correlation coefficient.
Results and Discussion: At Day 1, we found a negative correlation between TG concentration and PaO_2/FiO_2 (n = 18, *rho* = -0.48, p = 0.03). A similar relationship was revealed after inclusion of the measurements from all study stages (n = 47, *rho* = -0.35, p = 0.02). On Day 1, TG_{high} group demonstrated increased EVLWI value: 9 (8-14) *vs.* 7 (6-8) mL/kg (p = 0.04 compared with the TG_{low} group). In parallel, TG_{low} group presented higher CI: 4.3 (2.9-5.0) *vs.* 2.8 (2.3-3.4) L/min/m^2 in the TG_{high} group (p< 0.03). Plasma Alb concentration increased to Day 4 by 1.5 [-5.5 - +6.0] g/L in patients with EVLWI < 10 mL/kg (p = 0.03) but did not change significantly in the subgroup with EVLWI > 10 mL/kg.
Conclusion(s): The increased plasma TG concentration ≥ 1 mmol/L correlates significantly with severity of ALI and pulmonary edema. During the course of ALI, the patients with EVLWI > 10 mL/kg demonstrate a lack of improvement in plasma Alb concentration, possibly due to capillary leak syndrome.

5AP2-8

Predictive value of lung inflammatory markers for pulmonary complications after lung resection surgery

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Background and Goal of Study: Some studies have related an exacerbated lung inflammatory response to the development of post-operative pulmonary complications (PPC) in lung resection surgery. The goal of the study was to evaluate the predictive value of certain lung inflammatory markers: cytokines (IL-1, IL-2, IL-6, IL-10, TNF-a), metalloproteinase2 (MMP2), nitric oxide (NO), for PPC in patients undergoing lung resection surgery.
Material and methods: We designed a prospective study, which was approved by the local Ethics Committee. Written informed consent was obtained from all patients scheduled for lung resection. The exclusion criteria applied were as follows: treatment with immunosuppressant drugs within 3 months prior to surgery, blood products administration within 10 days before the surgery, relevant pulmonary disease (FEV1< 50%).
After intubation with a double-lumen tube, they were managed with volume-controlled ventilation (VCV), tidal volume (TV) 8 ml/kg, PEEP 5 cmH2O, FiO2 0.4-0.5 and respiratory rate to maintain ETCO2 30-35 mmHg. In one-lung ventilation (OLV), TV 6 ml/kg, PEEP 5 cmH20, permissive hypercapnia and FiO2 0.6-1 to maintain SatO2>90%. Fiberoptic bronchoalveolar lavage (BAL) was performed in both lungs before and after OLV for analysis of the lung inflammatory markers. BAL samples were centrifuged and the supernatant was stored until analysis. Expressions of cytokines, NO, and MMP2 were measured with Western Blot.
Patients were divided in those with and those without PPC before hospital discharge, defining PPC as the presence of: pneumonia, acute lung injury, atelectasis, respiratory failure, and acute respiratory distress syndrome. For statistical analysis we used Mann Whitney U test and Chi^2 test.
Results: 41 patients were included in the study; 6 developed PPC. All inflammatory markers studied were increased in all patients after the OLV. Significant differences (p< 0.05) were found between patients that did and did not develop PPC in TNF-a (23.56±4 vs 18.37±5 ng/ml respectively) and MMP2 (7.25±1 vs 8.7±1 respectively) values in the BAL from the operated lung post-OLV. No significant differences were found in the values of the other markers in the BAL of either lung.
Conclusions: An increased inflammatory response in BAL samples from the operated lung appears to be a risk factor for the development of PPC in lung resection surgery.

5AP2-9

Patients with STOP-Bang score ≥5 in a surgical population

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Introduction: The STOP-Bang questionnaire is used to screen patients for obstructive sleep apnea (OSA). The aim of the study was to evaluate the characteristics and incidence of patients with STOP-Bang scores ≥5 and to evaluate its association with critical respiratory events in the Post Anaesthesia Care Unit (PACU).
Methods: Observational, prospective study that included all consecutive adult patients admitted in the PACU after elective surgery, during 6 weeks. Patients submitted to cardiac surgery, pulmonary surgery and neurosurgery as well as those incapable to give informed consent were excluded. We studied 221 patients and collected demographic data, perioperative variables including length of recovery room stay. For each patient STOP-Bang questionnaire were included for data analysis. Patients were classified as having high probability of moderate/severe OSA (HP-OSA) if their STOP-BANG score were ≥5. Adverse Respiratory Events (ARE) were defined as upper-airway obstruction, hypoxia (mild/moderate and severe), respiratory failure, inability to breathe deeply, respiratory muscle weakness, reintubation and pulmonary aspiration after tracheal extubation. Descriptive analysis of variables was used to summarize data and the Mann-Whitney U test, Chi-square or Fisher's exact test were used for comparisons.
Results: Thirty-seven (17%) patients had HP-OSA. These patients were older (mean age of 66 vs. 56 years, p< 0.001), more frequently were male (70% vs. 37%, p< 0.001) and had an higher body mass index (30 kg.m2 vs. 26mg.m2, p=0.001). HP-OSA patients had an higher American Society Anaesthesiologists physical status (ASA-PS) (ASA-PS III, IV 41% vs. 21%, p=0.01) and had more frequently ischaemic heart disease (24% vs. 4%, p< 0.001), hypertension (92% vs. 40%, p< 0.001), hyperlipidemia (68% vs 29%, p< 0.001), chronic pulmonary obstructive disease (19% vs. 5%, p=0.003) and diabetes insulin treated (30% vs. 14%, p< 0.02). These patients had more frequently ARE (30% vs. 15%, p=0.02), decreased inspiratory capacity (14% vs. 2%, p=0.008) and respiratory muscular weakness (22% vs. 9%, p=0.03). HP-OSA patients did not stay longer in PACU.
Conclusion: In this cohort of surgical patients the incidence of HP-OSA was important. These patients had more frequently comorbidities and acute respiratory events in the PACU.

5AP2-10

Relation between the immediate postoperative hypoxemia and postoperative complications in major abdominal and thoracic surgery

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Background and Goal of Study: To determine if hypoxemic patients in the immediate postoperative period have more complications during hospitalization, To observe a correlation between postoperative hypoxemia, complications during hospitalization and the type of surgery performed.
Materials and Methods: We collected data on all patients undergoing abdominal surgery and major thoracic surgery in a period of 4 months. During the first hour ABG were obtained from each patient. PaO2/FiO2 ratio was calculated for each patient. We defined hypoxemia as a patient who presented PaO2/FiO2 ratio < 300. We follow the progress of each patient during admission until discharge, and recorded the occurrence of the following complications: need for mechanical ventilation, pneumonia, myocardial infarction, wound infection, sepsis, suture dehiscence, ICU readmission, reoperation, pulmonary embolism, atrial fibrillation and death.
Results and Discussion: Data were collected from a total of 112 patients, of whom 51 underwent lower abdominal surgery, 24 upper abdominal surgery and 37 thoracic surgery. Of total patients (n=112) presented at least one complication 19,77% of the PaO2/FiO2 >300 group, 19,05% of the PaO2/FiO2 between 200 and 300 group, and 60% of the PaO2/FiO2 < 200 group. Patients undergoing major thoracic surgery, those had PaO2/FiO2 >300, 76.92% showed no complications (n=20) and 23.08% (n=6) had complications, those who had PaO2/FiO2 between 200 and 300, 11,11% had complications, and those who had PaO2/FiO2 < 200 didn't present any complications. Patients undergoing upper abdominal surgery those who had PaO2/FiO2 >300, 17.65% had complications, those with PaO2/FiO2 between 200 and 300, 40% (n=2) had complications, and those who had PaO2/FiO2 < 200, all patients presented complications. Patients undergoing lower abdominal surgery, those who had PaO2/FiO2 >300, 18.60% presented at least one complication, those with PaO2/FiO2 < 300, 90% presented no complications.
Conclusion(s): We found a relationship between severe hypoxemia and complications during hospital stay. Patients with PaO2/FiO2 < 200 have more complications. Subdividing the patients according to the type of surgery, patients undergoing thoracic surgery the complications do not seem to relate to the PaO2/FiO2 after surgery. The upper abdominal surgery patients do seem to have more complications when PaO2/FiO2 < 300. The lower abdominal surgery patients appear to behave similarly to thoracic surgery patients.

5AP2-11

Residual neuromuscular block and critical respiratory events in a post-anaesthesia care unit

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Background and Goal of Study: Residual neuromuscular block (RNMB) is an important postoperative complication associated to the use of neuromuscular blocking drugs (NMBDs). The purpose of this study was to access the incidence of RNMB in a post-anaesthesia care unit (PACU) and to evaluate its association with critical respiratory events (CRE).
Materials and Methods: Prospective cohort study conducted in a Post Anaesthetic Care Unit (PACU) during a period of 6 weeks. 134 adult patients submitted to general anesthesia scheduled non-cardiac and non-intracranial surgery were eligible to the study. The primary outcome variable was RNMB after PACU arrival that was defined as train-of-four (TOF) ratio < 0.9 and objectively quantified using acceleromyography after recovery room admission. Demographic data, perioperative variables, lengths of hospital and recovery room stay and CRE were recorded. Inadequate emergence was classified in its different forms according to the Richmond agitation and sedation scale (RASS) 10 minutes after admission to the recovery room. Descriptive analyses of variables were used to summarize data. The Mann-Whiney U test, Chi-square or Fisher's exact test were used for comparisons.
Results and Discussion: RNMB incidence in the PACU was 30% (confidence interval 95%, 22-38). Patients with RNMB were older (median age 58 vs. 52, p= 0.027) had a lower median temperature at PACU admission (35.3 vs. 35.6, p= 0.013), more frequently had post-operative hypoactive emergence as defined by the RASS (40% versus 17%, P=0.004). Patients with RNMB had more frequently CRE (35% versus 7%, P< 0.001) and more frequently each of the following events considered independently: mild-moderate hypoxemia (38% versus 2%, P< 0.001), inability to breathe deeply (10% versus 1%, P=0.013) and muscular weakness (25% versus 4%, P< 0.001).
Conclusion(s): This study suggests that RNMB is common in the PACU and was associated with more frequent CRE.

5AP3-1

Effect of positive end-expiratory pressure during robotic radical prostatectomy

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Background and Goal of Study: Increased intra-abdominal pressure during the laparoscopic surgery causes cephalad displacement of the diaphragm resulting in the formation of atelectasis, which can be overcome by the positive end-expiratory pressure (PEEP). The aim of this prospective study was to investigate the level of the optimal PEEP for the arterial oxygenation and hemodynamics during robot-assisted laparoscopic radical prostatectomy (RLRP).
Materials and Methods: One hundred patients undergoing RLRP were randomly allocated to one of five groups (n = 20) (0, 3, 5, 7 and 10 cmH_2O of PEEP). Hemodynamic variables and respiratory parameters were measured at baseline supine position, at 30 min, 1, 2, 3 and 4 h during CO_2 insufflation in post-Trendelenburg position, and after deflation in the supine position with increasing PEEP.
Results and Discussion: The PaO_2 levels and alveolar-arterial difference in oxygen tension ($AaDO_2$) were improved with a PEEP compared with no PEEP. The application of PEEP (10 cmH_2O) resulted in higher PaO_2 levels compared than other PEEPs, but which occurred the excessive peak airway pressure (PAP). The application of a PEEP (7 cmH_2O) resulted in a similar PaO_2 without excessive PAP. While there were no significant differences in heart rate, mean arterial pressure and minute ventilation except central venous pressure between all groups.
Conclusion(s): A PEEP of 7 cmH_2O was the optimal PEEP than other PEEPs during RLRP.

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5AP3-3

CPAP combined with air reinflation reduces lung injury after esophagectomy

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Background and Goal of Study: One lung ventilation (OLV) is routinely required in esophagectomy. Recent studies show that reinflation of the collapsed lung after OLV leads to oxidative and inflammatory reactions. Continuous positive airway pressure (CPAP) is an efficacious way to improve oxygenation during OLV. Air reinflation is suggested to reduce oxidative reactions.
The aim of this prospective, randomized trial was to determine whether the combined interventions of CPAP and air reinflation would alleviate lung injury resulted from OLV in patients undergoing esophagectomy.
Materials and Methods: Patients scheduled for esophagectomy were assigned randomly to four groups. In control group (CON), the collapsed lung was reinflated with 85% oxygen. In CPAP group, the nondependent lung was given 5 cm H_2O CPAP with 85% oxygen. In air reinflation group (AIR), room air instead of 85% oxygen was used to reinflate the lung.
In the CPAP and AIR group (CPAP+AIR), the nondependent lung received CPAP with 85% oxygen during OLV, and room air was applied to reinflate the lung after OLV. Arterial blood samples were acquired for measureing the levels of interleukin-8 (IL-8), interleukin-6 (IL-6), superoxide dismutase (SOD) and the content of malondialdehyde (MDA) before and 3h after OLV. Computed tomography scans were used for atelectasis measurement 4 days after operation.
Results and Discussion: The lung MDA content, an index of lipid peroxidation, was significantly reduced in the AIR (14.43±4.03 nmol/L) and CPAP+AIR groups(14.38±4.15 nmol/L), compared to CON group(16.72±3.34 nmol/L) ($P < 0.05$). Meanwhile, SOD level, an antioxidant was significantly increased in the CPAP+AIR group, when compared with CON group (214.24±40.28 vs.191.04±30.75 U/ml, $P< 0.05$). The levels of IL-6(84.97±30.69 pg/ml) and IL-8(53.57±19.58 pg/ml) in the CPAP+AIR group were significantly lower than that in CON group.(104.79±31.37, 69.77±22.98 pg/ml) ($P < 0.05$). The atelectatic area, as assessed from CT scan, was smaller in the CPAP (8.2±4.4 cm^2) and CPAP+AIR groups (7.4±4.3 cm^2), when compared with the CON group (10.1±4.5 cm^2) ($p < 0.05$).
Conclusion(s): The combined intervention of CPAP and air reinflation reduced inflammation and oxidative stress, decreased atelectatic area, thus alleviated lung injury in patients undergoing esophagectomy.
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5AP3-4

Alveolar recruitment and optimal level of PEEP improves oxygenation and lung efficiency during one-lung ventilation. A pilot study

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Background and Goal of Study: Atelectasis and pulmonary shunt in the dependent lung during one-lung ventilation (OLV) impairs arterial oxygenation and increases dead space[1]. Many studies have confirmed that applying positive end-expiratory pressure (PEEP) to the dependent lung during OLV improves gas exchange and lung efficiency[2].
This study was conducted to determine if an alveolar recruitment maneuver (ARM) and optimal level of PEEP application during OLV improves oxygenation and ventilatory efficiency.
Materials and Methods: 12 patients with ASA status I-III undergoing elective thoracotomy for lung resection in the lateral position were included.Exclusion criteria were: Patients< 18 years, neumonectomy, ASA IV, preoperative hemoglobine< 10gr/dl, pregnant.
When OLV started a tidal volume(TV)of 5-7 ml/kg was set with a platteau pressure< 30 cmH2O,a respiratory rate (RR)to obtain a CO_2 arterial pressure ($PaCO_2$) between 35-55 mmHg,FiO_2 of 100%. After pleura was opened ARM was applied and individualized optimal PEEP was calculated. ARM consisted in 10 consecutive breaths in each level of PEEP from 5 to 20 cmH2O,5 in 5[1]. Optimal level of PEEP was defined as the level of PEEP for the best compliance. Compliance(Csr), dead space ratio (VD/ VT)(NICO NM3), arterial blood samples and cardiac index (CI)(Vigileo™) were recorded 5 minutes (min) into two-lung ventilation (TLV)(T1),5 min into OLV(T2)and before re-stablishing TLV(T3).
Data was analyzed with T-student test for paired samples.
Results and Discussion: 12 Patients were included.We compared O_2 arterial pressure(PaO_2 mmHg),CI L/min/m^2,Csr and VD/VT between T2 and T3. Differences in Csr were significant ($p< 0.05$), PaO_2 was also significantly better in T3.VD/VT decreased statistically significant in T3. And CI did not suffer significant changes,which means that ARM and optimal level of PEEP calculation does not affect hemodynamics.

	Baseline	T2	T3	P value T2-T3
Csr	49,25±13,86	33,08±9,01	47,91±8,65	0,001
PaO_2	444,91±95,61	241,58±119,78	336,50±108,01	0,001
VD/VT	0,69±0,04	0,70±0,04	0,68±0,05	0,030
CI	2,81±0,79	2,69±0,41	2,71±0,46	0,803

[Measures]

Conclusions: Alveolar recruitment and optimal level of PEEP calculation after instituting OLV improves oxygenation and compliance, decreases dead space ratio and does not affect hemodynamics during OLV.
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5AP3-5

Alveolar recruitment: a comparison between increasing versus decreasing possitive end expiratory pressure in open colonic surgery

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Goal of Study: To compare changes in the hemodynamic parameters and in the arterial oxygen partial pressure (pO_2) caused by the progressive increase of positive end-expiratory pressure (PEEP) to 20 cmH_2O vs. the progressive decrease of PEEP from 20 cmH_2O for the alveolar recruitment in laparotomy.
Methods: Prospective study of patients planned for open abdominal surgery for colonic neoplasia. Patients previously diagnosed of COPD, older than 80 and those classified as NYHA >2 were excluded.
The recruitment maneuver was performed 20 min after the anesthetic induction. In the increasing PEEP group (IPEEP), 5 cmH_2O of PEEP to a maximum of 20 cmH_2O was added every 5 respiratory cycles. In the decreasing PEEP group (DPEEP), 5 cmH_2O from a maximum of 20 cmH_2O were decreased every 5 respiratory cycles. A final PEEP of 5 cmH2O and FiO_2 of 0.4 were maintained during the whole procedure. Mean arterial pressure (MAP), peak airway pressure (Ppk), plateau airway pressure(Ppl) and EtCO2 were measured previously and at min 1, 3 and 5 after the maneuver. An arterial blood gas sample was obtained previously and 15 min after the recruitment.
Results: Data from 72 patients were analyzed (IPEEP, n= 38; DPEEP, n= 34). The two groups were similar on the basis of age in years (68.5 IPEEP vs. 65.1 DPEEP ; p=0.33) and BMI in $kg.m^{2.-1}$ (25.1 IPEEP vs. 25.7 DPEEP ; p=0.25). Results for the effect variables are shown in table 1.

	IPEEP (n=38)		DPEEP (n=34)		
	Mean	SD	Mean	SD	p
Previous MAP (mmHg)	88,11	17,41	81,59	14,14	0,081
Min.1 MAP (mmHg)	83,32	14,98	81,71	11,06	0,609
Min.3 MAP (mmHg)	82,21	15,61	81,12	11,36	0,731
Min.5 MAP (mmHg)	79,58	14,87	80,65	8,97	0,717
Previous pO2 (mmHg)	128,94	39,30	117,32	33,17	0,200
Min.15 pO2 (mmHg)	120,69	33,01	127,81	27,81	0,334

[Table 1.]

We found no differences in Ppk, Ppl and EtCO2 between the 2 maneuvers. A comparison of the previous and 5 min MAP showed a fall in the IPEEP group (8.52 mmHg SD 12.75 vs. 0.94 mmHg SD 10.38; p=0.08). pO2 after the alveolar recruitment showed a decrease in the IPEEP group (8.63 mmHg SD 25.64) and an increase in the DPEEP group (19.13 mmHg SD 18.18).
Conclusion(s): DPEEP maneuver would be elective for alveolar recruitment in the open colonic surgery when compared with the IPEEP maneuver since DPEEP maintains hemodynamic stability and increases pO_2 better than IPEEP. According to our results, IPEEP could be deleterious given that it could cause a decrease in pO_2.

5AP3-6

Effect of xenon anesthesia on oxygenation during surgery in gynecological cancer patients with metabolic syndrome

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Background and Goal of Study: Patients with metabolic syndrome undergoing surgery in Trendelenburg position may have the diaphragm displacement and decreased lung capacity that leads to decreased respiratory volume with pulmonary function impairment. Improvement of the gas blood composition during artificial pulmonary ventilation is a necessary condition for providing safe anesthesia in these patients.
Materials and Methods: The study included 53 endometrial cancer patients with metabolic syndrome. All patients underwent surgery. The study group comprised 26 patients who received xenon anesthesia in combination with epidural analgesia. The control group received anesthesia with sevoflurane and prolonged epidural analgesia. The gas blood composition was regularly monitored in all patients. The oxygen concentration in the exhaled gas mix (FiO2) was determined by the gasoanalyser installed on the channel expiratory. The statistical analysis was carried out using the STATISTIKA 6.0 software. P-values < 0.05 were considered as statistically significant by using Mann-Whitney analysis for the continuous variables and Fisher's exact test for categorical variables.
Results and Discussion:
Changes in oxygen in the intraoperative period depending on anesthetic technique.

Value	Before surgery		60 minutes of surgery		120 minutes of surgery		P
	Xenon	Sevoflurane	Xenon	Sevoflurane	Xenon	Sevoflurane	
pO2 mm Hg	55,4 ±12,3	54,6 ±11,7	99,3 ±1,5[1]	90,3 ±3,5[1]	95,1 ±1,3[1]	90,4 ±2,1	p1<0,05
PaO2/ FiO2 Mm Hg	323 ±38,6	337 ±31,8	338 ±26,3[1]	270 ±27,7	393 ±32,5[1,2,3]	311 ±27,9	p1<0,05 p2<0,05 p3<0,05

[Table 1]

p[1]- difference is statistically significant as compared to the preoperative level (p< 0,05).
p[2]- difference is statistically significant as compared to the previous level (p< 0,05).
p[3] - difference is statistically significant as compared to the control group (p< 0,05).
In endometrial cancer patients with metabolic syndrome, PaO_2 value was increased by 23% compared to preoperative values indicating favorable effect of xenon on the respiratory system. The respiratory quotient during operation was higher by 21% in the study group patients than in the control group (p< 0.05).
Conclusion(s): Favorable effect of xenon on the respiratory system is related to its ability to increase laminar flow and to penetrate in the nonfunctional alveoli, thus resulting in increased oxygen saturation of the blood in patients with metabolic syndrome.

5AP3-7

Intraoperative ventilatory changes in robotic assisted surgery

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Background and Goal of Study: The use of robotic assisted surgery (RAS) has the potential to improve patient outcome and to reduce postoperative complications when compared with traditional laparotomy or laparoscopy. Patient positioning and pneumoperitoneum due to carbon dioxide (CO_2) insufflation has a clear impact on pulmonary ventilation and perfusion.
The aim of this study was to investigate the combined effect of the patient's characteristics (body mass index, BMI), medical history (cardiac pathology, chronic pulmonary disease, smoking, neurological pathology), surgical positioning and CO_2 pneumoperitoneum on ventilatory variables.
Materials and Methods: We prospectively analyzed 52 (ASA II-III) consecutive patients who underwent RAS under general anesthesia. All patients were ventilated in a volume - controled mode. Intraoperative data were recorded: tidal volume, respiratory rate, lung compliance (C), peak inspiratory pressure (IP), end - tidal CO_2 ($etCO_2$) and arterial blood gases ($PaCO_2$, PaO_2) hourly.
Results and Discussion: The mean age in our study group was 59.5 years (range 7-80). Twenty three percent of patients had a BMI higher than 30 kg/m^2. Trendelenburg position was used in 32 cases (61.5%) during surgery. At the end of the surgery 46.2 % of patients had respiratory acidosis and required short ventilatory support in the post anesthesia care unit. We found that increase body mass index (BMI) significantly correlated with high IP (p=0,001) and low C (p< 0.001).
The lung compliance decreased by approximately one third (34%) and was not significant correlated with: previous abdominal surgery (p=0.406), pulmonary disease (p=0.843), history of smoking (p=0.972) and Trendelenburg position (p=0.411). Chronic pulmonary disease therapy correlated with high IP post-induction of general anesthesia (p=0.035) and during pneumoperitoneum (p=0.035). During robotic surgery $etCO_2$ was not correlated with arterial CO_2 pressure (p=0.093).
Conclusion: We found that only BMI was associated with high IP and low C. A larger study is needed to assess the impact of RAS on the respiratory system and to identify patients at risk of hypoxemia and respiratory acidosis.

5AP3-8

Comparison of ventilation/perfusion between square and decelerating flow in an experimental setting with healthy neonatal lungs

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Background and Goal of Study: The most adequate ventilatory mode in pediatric anesthesia has been controversial. Traditionally, pressure controlled ventilation (PCV) has been the most used ventilatory mode. It was thought that ventilation with PCV improved gas distribution producing better oxygenation. The goal of our study was to demonstrate that there are no differences in ventilation/perfusion between square and decelerating flow when a recruitment maneuver is made and a level of positive end-expiratory pressure is set, in an experimental setting with healthy neonatal lungs.
Materials and Methods: An experimental, prospective, randomised, controlled study was conducted. 8 pigs weighing 3±0.1 kg were employed. Anaesthesia management and monitoring were identical in all animals. A PiCCO monitor was employed for haemodynamic monitoring. Volumetric capnography was recorded continuously using the NICO capnograph. In all animals both ventilatory modes (decelerating, PCV and square, VCV) were applied during 30 min in different order.
Animals were ventilated with a tidal volume of 10 mL/kg, inspiratory/expiratory ratio (I/E) of 1/2, inspiratory time 0,5 seg, respiratory rate of 30 breaths/min, FiO2 of 50% and PEEP of 8 cmH2O after a RM of 40 cmH2O during 40 seconds. Data was collected at the beginning and at the end of each ventilatory mode.
Statistical analysis: Wilcoxon and Friedman tests.
Results and Discussion: Oxygenation was similar in both ventilatory modes (VCV:pO2 274.6±22.7 /PCV:pO2 275±18) but the difference between final and basal pO2 was higher in VCV statistically significant(p< 0.05). There were no differences in the dead space ratio (VD/VT)(VCV:0.74±0.10/PCV:0.71±0.11). Mean airway pressure (MAP) was slightly higher after PCV period (MAP 14.0 ± 1.2) than after VCV period (MAP 13.0±0.6) without statistically significant difference. All animals were hemodynamically stable with

similar cardiac index (CI) after both ventilation modes (VCV 5,44±1,04/PCV 5,27 ± 1,24).

	Flow type	BASAL Mean ± ED	FINAL Mean ± ED	Difference FINAL - BASAL Mean ± ED // p-valor1		Difference between FLOWS p-valor1
pO2	**VCV**	268,5 ± 22,7	274,6 ± 22,7	6,1 ± 12,0	0,208	
	VCP	282,9 ± 22,2	275,0 ± 18,0	-7,9 ± 12,6	0,182	0,017*
VD/Vt	**VCV**	0,71 ± 1,12	0,74 ± 0,10	0,04 ± 0,05	0,088	
	VCP	0,76 ± 0,09	0,71 ± 0,11	-0,05 ± 0,14	0,726	0,079

[Results oxigenation and dead space]

Conclusion(s): The present study showed that when a RM and a level of PEEP is set there are no differences between square and decelerating flow in oxygenation, ventilation, lung mechanics and haemodynamics in healthy neonatal lungs.

5AP3-9

Similar ventilation/perfusion between square and decelerating flow with end-inspiratory pause in an experimental setting with healthy neonatal lungs

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Background and Goal of Study: The most adequate ventilatory mode in pediatric anesthesia has been controversial. Traditionally, pressure controlled ventilation (PCV) has been the most used ventilatory mode. It was thought that ventilation with PCV improved gas distribution producing better oxygenation. The goal of our study was to demonstrate that there are no differences in ventilation/perfusion between square and decelerating flow with end-inspiratory pause when a recruitment maneuver is made and a level of positive end-expiratory pressure is set, in an experimental setting with healthy neonatal lungs.
Materials and Methods: An experimental, prospective, randomised, controlled study was conducted. 8 pigs weighing 3±0.1 kg were employed. Anaesthesia management and monitoring were identical in all animals. A PiCCO monitor was employed for haemodynamic monitoring. Volumetric capnography was recorded continuously using the NICO capnograph. In all animals both ventilatory modes (decelerating, PCV and square, VCV) were applied during 30 min in different order.
Animals were ventilated with a tidal volume of 10 mL/kg, inspiratory/expiratory ratio (I/E) of 1/2, inspiratory time 0,5 seg, end-inspiratory pause 10 %, respiratory rate of 30 breaths/min, FiO2 of 50% and PEEP of 8 cmH2O after a RM of 40 cmH2O during 40 seconds. Data was collected at the beginning and at the end of each ventilatory mode.
Statistical analysis: Wilcoxon and Friedman tests.
Results and Discussion: Oxygenation was similar after both ventilatory modes (VCV: pO2 281,9 ± 19,9/ PCV: pO2 277,8 ± 23,1) and there were no differences in the dead space ratio (VD/VT)(VCV: 0,72 ± 0,09/ PCV 0,71 ± 0,10). Mean airway pressure was analogous after PCV period (MAP 13,3 ± 0,5) and after VCV period (MAP 13,8 ± 1,0). All animals were hemodynamically stable with similar cardiac index after both ventilation modes (VCV 5,03 ± 1,08/ PCV 5,51 ± 1,01).

	Flow type	BASAL Mean ± ED	FINAL Mean ± ED	Difference FINAL - BASAL Mean ± ED // p-valor1		Difference between FLOWS p-valor1
pO2	VCV	278,6 ± 20,2	281,9 ± 19,9	3,3 ± 20,8	0,889	
	VCP	273,1 ± 25,0	277,8 ± 23,1	4,6 ± 21,3	0,753	0,779
VD/Vt	VCV	0,71 ± 0,10	0,72 ± 0,09	0,02 ± 0,04	0,351	
	VCP	0,72 ± 0,08	0,71 ± 0,10	0,00 ± 0,13	0,233	0,160

[Results oxigenation and dead space]

Conclusion(s): The present study showed that when a RM and a level of PEEP is set there are no differences between square and decelerating flow with end-inspiratory pause in oxygenation, ventilation, lung mechanics and haemodynamics in this experimental setting with healthy neonatal lungs.

5AP4-1

Spontaneous breathing during pressure support ventilation improves oxygenation and lung aeration in patients with acute respiratory distress syndrome

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Background and Goal of Study: Experimental and clinical data suggest that spontaneous breathing (SB) during pressure-controlled ventilation (PCV) in acute respiratory distress syndrome (ARDS) improves lung aeration and oxygenation. The aim of our study was to evaluate the efficacy of pressure support ventilation (PSV) in patients with ARDS.
Materials and Methods: Eight adult patients with direct and indirect ARDS were enrolled in a prospective pilot study. All the patients were mechanically ventilated and sedated with continuous infusion of fentanyl (1 mcg/kg/hr) and diazepam (2-8 mg/hr) and received volume control ventilation (VCV). Tidal volume (V_T) was set at the level of 6-8 ml/kg of predicted body weight (PBW). PEEP was set from 6 to 12 cm H_2O according to severity of ARDS. Respiratory rate was adjusted to provide $EtCO_2$ values of 30-35 mm Hg. After 12 hrs of VCV, all patients were transferred to PSV with inspiratory pressure aiming to achieve V_T 6 ml/kg of PBW. PEEP level remained unchanged. The measurements included ventilation parameters and arterial blood gases (Radiometer ABL 800 Flex, Denmark). Hemodynamic parameters, including cardiac index, were registered by a ProAQT monitor (Pulsioflex, Pulsion Medical Systems, Germany). Changes in lung aeration were assessed using electrical impedance tomography (PulmoVista 500, Dräger, Germany). For data analysis, we used Wilcoxon test. Data are presented as median (25^{th} - 75^{th} percentiles).
Results and Discussion: The median of age was 58 (45-72) years. After restoration of spontaneous breathing during PSV, we observed the improvement of PaO_2/FiO_2 ratio from 188 (153-220) to 205(184-252) mm Hg (p=0.09). These changes were accompanied by the simultaneous decrease of peak airway pressure from 25 (21-29) to 23 (19-26) cm H_2O (p=0.12). We also observed the improvement of lung aeration in the most consolidated areas from 1.5 (-2-+10) % to 12 (3-16) % (p=0.03). There were no significant hemodynamic changes after transfer to PSV.
Conclusion(s): In patients with ARDS, pressure support ventilation increases oxygenation due to improvement of aeration in the most consolidated lung areas.

5AP4-2

Cyclic stretch on human isolated bronchi significantly increases basal tone and responsiveness to acetylcholine

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Background and Goal of Study: Bronchial responsiveness may be induced by various environmental stimuli but also may be directly provoked by medical intervention (either by drugs or by mechanical ventilation). Therefore the cyclic stretch induced local and systemic inflammation on the alveolar component, and a single and maintained strain significantly modified bronchi functional response.
The aim of this study was to determine impact of a continuous cyclic stimulus on bronchi.
Materials and Methods: Functional study of human bronchi retrieved from surgical pieces was performed on isolated organ submitted to a physiological and continuous one-hour stretch through an automated device. Response to this stretch was measured through developed basal tone and maximal response to acetylcholine. Different pretreatments in the bath involving membranous or intracytosolic receptors about contraction pathway were tested. Pro-inflammatory factors were detected with ELISA techniques and eventual genomic activation through RT-PCR on ARN from bronchial segment.
Results and Discussion: 132 human bronchi were examined after atypical resection or lobectomy for cancer. A cyclic stretch markedly increased basal tone of bronchial rings whatever the experimental conditions (0.01±0.1 vs 1.02±0.2, p< 0.001) without changing sensitivity to acetylcholine (EC50 4.99±0.2 vs 5.27±0.1g, p=0.26). Responsiveness to acetylcholine after stretch was also increased (5.03±0.5 vs 2.40±0.2g, p< 0.01). No pro-inflammatory cytokines were detected by ELISA whereas only IL8 gene was significantly increased after stretch (OR=2.91, p=0.04). Basal tone increase involved mainly cytoskeleton reorganization of the contractile unit in case of physiological stretch. Another major component was bronchial epithelium with a highly participation of Calcium L-channel. At last, the genomic activation was probably blunted related to the timing of ARN storage.

Conclusion(s): This study demonstrates potential activation of bronchial cells in case of repetitive or cyclic stretch and may suggest clinical implications in case of prolonged mechanical ventilation.

5AP4-4

Low tidal volume ventilation adherence in postoperative acute respiratory failure, a multicenter study

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Background and Goal of Study: Low tidal volumes ventilation (LTV) is the only strategy proved to reduce mortality in ARDS. Our aim was to describe the adherence to LTV recommendations and its association with the ventilation mode.
Materials and Methods: In a retrospective descriptive study, we reviewed records of patients admitted to the postoperative intensive care units of 3 teaching hospitals during 6 months. The study was considered a clinical audit. We included all patients who required 24 hours or more of mechanical ventilation and had a PaO2/FiO2< 300. Exclusion criteria were unilateral pulmonary injury, cardiogenic respiratory failure and cardiac, thoracic or neurosurgery. We obtained 2 daily ventilation and arterial gasometry records.
We classified the records into 3 categories:
1) Optimal ventilation: tidal volume 4-6ml/kg ideal body weight (IBW) + plateau pressure ≤ 30cmH_2O + pH > 7.30.
2) Acceptable ventilation: pH< 7,15 with any ventilation or; tidal volume 4-6ml/kg IBW with any pH or; plateau pressure 30-35cmH_2O with any pH or; tidal volume > 11ml/kg IBW + pH <7.35 or; plateau pressure > 35cmH_2O + pH < 7.35.
3) Hyperventilation: tidal volume > 11ml/kg IBW + pH > 7.35 or; plateau pressure > 35cmH_2O + pH > 7.35.
Results and Discussion: We included 49 patients (26 in Center 1, 7 in Center 2, and 16 in Center 3) and 699 records (369, 90 and 240 respectively). Only 4.3% (3.0-6.1 CI 95%) records meet criteria for Optimal ventilation (2.2%, 6.6% and 0% for centers 1 to 3 respectively). The rate for Acceptable ventilation was 70.6% (64.5-77.1 CI 95%) (83.2%, 72.8%, and 62% respectively). Hyperventilation rate was 25.1% (22.3-27.9 CI 95%) (14.6%, 20.6% and 38% respectively). Pressure controlled ventilation (PCV) was used in 71% (67-75 CI 95%) records, either Biphasic Positive Airway Pressure (47%) or Pressure Support (24%). Volume controlled ventilation was used in the remaining 29% (26-32 CI 95%). Hyperventilation was more frequent with PCV, 29.3% (25.5-33.4 CI 95%); compared with the volume controlled ventilation records, 12.9% (9.2-17.7 CI 95%), with an OR of 2.2 (1.6-3.2 CI 95%) against PCV.
Conclusion: Although most records are within acceptable ventilation, strict adherence to LTV recommendations is homogeniously low among the 3 centers. Furthermore we found a high rate of unnecesary hyperventilation, associated to PCV. Protocol implementation can be recommended together with

5AP4-5

Hepatic inflammatory response modulation by lidocaine in a one-lung ventilation experimental model

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Background and Goal of Study: One-lung ventilation (OLV) is usually needed in lung resection surgery (LRS) and is associated with local and systemic inflammatory response. Anti-inflammatory effect of intravenous lidocaine (IV-LID) in major surgery has been reported in several studies. The aim of this study was to determine the role of IV-LID on the liver inflammatory response induced by LRS with OLV.
Materials and Methods: 15 mini-pigs were submitted, under general anesthesia maintained with propofol (8-10mg/kg/h), to a left caudal lobectomy under OLV for 120 minutes. Animals were randomly assigned to 3 different groups: Control (C), Lidocaine group (L) or Sham (S). An IV-LID bolus (1,5mg/kg) was administered to L experimental group, plus a continuous perfusion of 1,5mg/kg/h during the whole procedure. Sham group underwent a left thoracotomy, without being exposed to LRS or OLV. At the end of LRS the animals awoke and after 24 hours they received another general anesthesia to obtain liver biopsies (LB). Hemodynamic measures and arterial blood samples (ABS) were registered in 5 moments during the procedure: Baseline, 30 and 120 minutes of OLV, 60 minutes after the end of OLV, and 24 hours after the procedure. LB were taken 24hours after the procedure, to measure: tumor necrosis factor (TNF), monocyte chemotactic protein-1 (MCP-1), inducible nitric oxide synthase (iNOS), interleukin 1 and 10 (IL-1, IL-10), and nuclear factor- kB (NF-kB). Data are expressed as mean ± standard error and were measured in arbitrary units. ANOVA test was used to determine differences between groups, corrected with Bonferroni (Bonf) post-hoc analysis. Values of $p < 0,05$ were considered significant.
Results: Neither the ABS nor the hemodynamic data were affected by the IV-LID. However, IV-LID attenuated the expression in LB of TNF, MCP-1 and iNOS, compared to C group.

	TNF			MCP-1			iNOS		
GROUP	S	C	L	S	C	L	S	C	L
MEAN ± SE	0.9 ±0.3	3.0 ±1.2	1.1 ±0.4	1.2 ±0.6	2.2 ±1.6	0.4 ±0.1	1.2 ±0.7	2.7 ±1.5	0.8 ±0.3
P (Bonf)	.031 (C vs L or S)			.011 (C vs L or S)			.039 (C vs L or S)		

[Tab. 1]

	IL1			IL10			NFKB		
GROUP	S	C	L	S	C	L	S	C	L
MEAN ± SD	0.4 ±0.1	0.6 ±0.3	0.6 ±0.3	1.1 ±0.5	1.2 ±0.6	1.0 ±0.3	2.0 ±1.5	1.9 ±0.6	1.8 ±0.6
P		Ns			Ns			Ns	

[Tab. 2]

Conclusion: In our LRS experimental model, the inflammatory response to OLV, measured in liver tissue, was attenuated by the administration of IV-LID.

5AP4-6

Nonintubated thoracoscopic anatomical segmentectomy for management of lung tumors

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Background and Goal of Study: Intubated general anesthesia with one-lung ventilation is considered mandatory and the only preferred anesthetic technique, especially in major pulmonary resections. Our previous study showed that thoracoscopic lobectomy without endotracheal intubation can be a valid alternative of intubated and single-lung-ventilated thoracoscopic surgery in managing early-stage lung cancer.[1] However, nonintubated thoracoscopic anatomical segmentectomy for management of lung tumors, which is more technically challenging, has not been reported previously. The goal of this study is to evaluate the feasibility and safety of thoracoscopic anatomical segmentectomy without endotracheal intubation.
Materials and Methods: From August 2009 to Nov 2012, 21 patients with lung tumors were treated using thoracoscopic anatomical segmentectomy under combination of thoracic epidural anesthesia, intrathoracic vagal blockade[1] and propofol sedation, without endotracheal intubation.
Results and Discussion: Collapse of the operative lung and inhibition of the coughing were satisfactory and a definite diagnosis was obtained in all 21 patients. One patient required conversion to intubated-single lung ventilation because of vigorous diaphragmatic breathing. There were 14 patients with primary lung cancers with lymph nodes sampling (median: 4.5, range: 0-18), 2 patients with metastatic cancers and 5 patients with non-malignant tumors. Left upper lobe lingual-sparing trisegmentectomy was the most commonly performed (n = 6), following by superior segmentectomy of the right lower lobe (n=4) and the left lower lobe (n=4). Operative complications developed in 1 patient who had air leak for more than 3 days postoperatively. The mean postoperative chest tube drainage and hospital stay were 2.5 days and 6.0 days, respectively. Anesthetic induction and operation had a mean of 26.5 minutes and 148.0 minutes, respectively. The lowest oxygen saturation by pulse oximetry was a median of 97% (range: 88%-100%) while end-tidal carbon dioxide in peak was a median of 42 mmHg (range: 35-53 mmHg) during operation. Postoperative pain management was satisfactory in all patients without complications related to epidural catheterization.
Conclusion(s): Nonintubated thoracoscopic segmentectomy is technically feasible and safe. It can be an alternative of intubated-single lung ventilation in selected patients for management of lung tumors.
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5AP4-7

Higher levels of unsupported spontaneous breathing improve lung aeration and redistribute perfusion in experimental acute lung injury

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Spontaneous breathing (SB) during mechanical ventilation may influence lung function during ARDS. However, the impact of different levels of SB on lung function are not well defined.
We investigated the effects of different degrees of SB activity during BIPAP/APRV on lung function in model of ARDS in pigs.
Experimental ARDS was induced in 12 juvenile pigs by saline lung lavage. After injury, mechanical ventilation using BIPAP/APRV combined with four different levels of SB, able to generate 0% ($BIPAP_0$), >0-30% ($BIPAP_{>0-30}$), 30-60% ($BIPAP_{30-60}$) or > 60% ($BIPAP_{>60}$) of total minute ventilation was applied for 1h in every animal (cross over design).
The sequence of the four ventilatory tasks was varied according to a Latin square. In $BIPAP_0$, the mandatory respiratory rate (RR) was adjusted to maintain pH > 7.30, while in other groups mandatory RR was adjusted to maintain the target spontaneous-to-mandatory ventilation ratio. Additional ventilator settings: FIO2 = 0.5, PEEP = 10 cmH2O and I:E = 1:1; driving pressure (Phigh-Plow) was titrated to V_T » 6 mL/kg.
At the end of each ventilation mode, lung function and hemodynamic variables were determined. In addition, lung aeration was quantified by computed tomography, while pulmonary perfusion was marked with intravenous administered 68Ga-labelled microspheres and assessed by positron emission tomography.
$BIPAP_{>60}$ improved oxygenation compared to $BIPAP_0$. All levels of SB reduced peak airway (Ppeak) and transpulmonary pressures (Ppeak trans) as well as mean airway pressures (Pmean) compared to $BIPAP_0$, while $BIPAP_{30-60}$ and $BIPAP_{>60}$ reduced Ppeak and Pmean compared to $BIPAP_{>0-30}$ as well as mean transpulmonary pressures compared to $BIPAP_0$. CO2 Elimination, RR, V_T, minute ventilation as well as all major hemodynamic parameters did not differ among groups. $BIPAP_{>60}$ reduced the amount of non-aerated lung tissue, whereby the amount of normally aerated lung tissue was increased compared to $BIPAP_0$. All levels of SB redistributed blood flow from ventral to dorsal lung regions compared to post injury conditions, while $BIPAP_0$ did not.
In this model of acute lung injury, only higher levels of spontaneous breathing activity during BIPAP/APRV improved gas exchange and lung mechanics compared to controlled mechanical ventilation. Such effects were explained by a reduction of non-aerated and an increase of normally aerated lung tissue, as well as redistribution of lung perfusion to dependent lung zones.

5AP4-8

Non-invasive ventilation after neuromuscular block antagonism with sugamadex in an asthmatic patient

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Background: Bronchospasm in asthmatic patients undergoing anaesthesia may be due to several causes. Sugamadex is the best choice for neuromuscular block antagonism (NMBA) of patients with pulmonary disease. Recent studies of non-invasive ventilation (NIV) in asthmatic patients showed good results with bilevel positive airway pressure (BiPAP). We describe a case of severe bronchospasm in an asthmatic patient, managed with pharmacological therapy that was extubated after NMBA with sugamadex and was set for NIV (BiPAP).
Case report: 41 years old female admitted for urgent corneoscleral repair. Classified as ASA III (asthma, obesity, smoking, HIV positive, drug addict) with mallampati class II medicated with salbutamol during the last 24h. A general anaesthesia with rapid sequence induction was performed with rocuronium and oro-tracheal intubation was achieved at the third attempt. During intubation, severe bronchospasm developed and was managed with pharmacological therapy. Based on serial evaluations of blood gases the patient was extubated after NMBA with sugamadex and was set to BiPAP. She was disconnected 2h latter with significant clinical and laboratorial improvement.
Discussion: The incidence of severe perioperative bronchospasm in asthmatics undergoing anaesthesia is low but life-threatening. Bronchospasm may occur at induction and emergence and may be due to perioperative medications(1). Increased airway resistance with bronchoconstriction is associated with anticholinesterases but the absence of cholinergic activity with sugamadex makes it an appropriate agent for NMBA in asthma(2). Although not well established in asthma, the use of NIV simultaneously with pharmacological treatment may be a good choice(3).
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Learning points: Advantages of sugamadex and NIV in patients with asthma are well described in recent studies and must be considered a tool for the treatment of asthmatic patients. The combination of a rapid approach to severe bronchospasm, use of sugamadex and set to NIV was essential for the clinical outcome of this patient.

5AP4-9

Our first experience in thoracoscopic esophagectomy in prone position

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Background: Convantional esophagectomy have high morbidity and mortality rates.[1] In recent years minimal invasive techniques like thoracoscopic esophagectomy which cause less trauma became more popular. The aim of this case report is to present our first experience of thoracoscopic esophagectomy using prone position.
Case report: 68 years old man with carcinoma at his lower 1/3 esophagus undergoing thoracoscopic esophagectomy was entubated with left double lumen tube and the position of the tube was controlled by fiberoptic bronchoscope. After he was turned prone it become impossible to deflate the right lung. The most likely possibility was the disposition of the tube but before we decided to check the other posibilities. The endotrachel tube cuff control balloons were stucked under the patients head and were deflated. The problem was solved when the cuffs were inflated again. During thoracoscopic esophagus liberalization 3 thoracars were inserted to the right thorax and pneumothorax with 6 mmHg of CO2 was acheived. Tidal volume was kept at 5-6 ml/kg, peak airway pressures at 25-38 mmHg and SpO2 was 93-95% with 100% oxygen during one-lung ventilation. Patient was taken to Level 1 PACU after the operation with a single lumen tube. Operation time and anesthesia times were 410 and 430 minutes respectively. Prone position time was 3,5 hours and one-lung ventilation time was 80 minutes. He was extubated at 19th hour, mobilized at postoperative first day. Thorax tubes were out at second day and discharged home at day 7.
Discussion: Lateral decubitis position is preferred for thoracoscopic esophagectomy as surgeons are more used to it and it is more easy to revert to open procedure if needed. The advantage of the prone position a wider surgical field with the downwards relocation of the lungs. PaO_2/FiO_2 during one lung ventilation is better in prone position.[2] Nevertheless, the stabilization of the double lumen tube is more difficult. The proper fixation of both the head and body is very important. There may be difficulties with the vulnerability of the arterial and venous lines and continuous monitoring.
References:
1. N Engl J Med 1997; 337:161
2. J Clinical anesthesia 2010,24:803
Learning points: Thoracoscopic esophagectomy with double lumen tube in prone position is a safe alternative to lateral position. The one lung ventilation period is one of the most important factors that affect the surgical success.

Transfusion and Haemostasis

6AP1-1

Rotational thromboelastometry to predict postoperative bleeding in pediatric cardiac surgery

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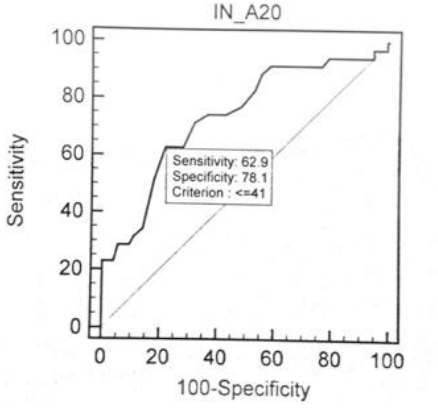
Background and Goal of Study: Excessive bleeding and blood products transfusion increase morbidity, mortality, and cost during cardiac surgery. Rotational thromboelastometry (ROTEM) represents a rapid viscoelastic analysis of clot firmness in whole blood. This test might be used to predict bleeding and guide subsequent therapies. However, the predictive value of ROTEM in the perioperative period of pediatric cardiac surgery remains unclear. This study aims to evaluate if the ROTEM parameters could predict postoperative bleeding in this pediatric population.
Materials and Methods: In this retrospective analysis of prospectively collected data, we included 163 patients weighting less than 20 kg and scheduled for congenital heart surgery with cardiopulmonary bypass. Exclusion criteria were: acquired or congenital coagulopathy, liver disease, and kidney failure. Blood sample were drawn from the arterial line 10 minutes after weaning of bypass, and after heparin antagonisation with protamine. Based on previous reports, significant bleeding was defined as a blood loss that exceeds 10% of total blood volume within the first 6 postoperative hours. (1) Logistic regression analysis was performed to evaluate ROTEM variables independently associated with bleeding.



[ROC curve]
Results and Discussion: According to bleeding definition, 35 patients were included into the “bleeding” group and 128 into the “non-bleeding” group. No patient required surgical re-exploration for bleeding. ROTEM data were altered in both groups. Clot firmness at 20 min with the INTEM test (INTEM A20) was the only independent predictor of postoperative bleeding.
Conclusion(s): This retrospective analysis of prospectively collected data shows that INTEM A20 is the only predictor of bleeding with a good specificity, but a poor sensitivity in the pediatric population after cardiac surgery. In the context of our study, most ROTEM parameters did not seems to predict bleeding. As a consequence, ROTEM might be only used in case of abnormal bleeding to guide hemostatic therapy.
References:
Williams GD, et al. Anesth Analg 1999 Jul;89(1):57-64.

6AP1-2

Influence of hemodilution to coagulation state detected by TEG in patients after on-pump cardiac surgery

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Background and Goal of Study: The levels of antithrombin III, fibrinogen and coagulation factors decrease approximately by 30% to 50% or more, due initially to hemodilution therefore contributing to hypocoagulation and to bleeding complications after on-pump cardiac surgery. The goal: to investigate does kaolin activated thromboelastography (kTEG) and heparinase modified kTEG (hep-kTEG) parameters (R, K, A, MA) reflect hypocoagulation state due to hemodilution comparing with standard coagulation tests (SCT) in patients undergoing on-pump cardiac surgery.
Materials and Methods: 83 adult first time on-pump cardiac surgery patients were enrolled into a prospective study at Pauls Stradins Clinical University hospital, Riga Latvia. Blood samples for SCT (activated partial thromboplastin time, prothrombin time, platelet count, fibrinogen) were collected preoperatively and on admission to the recovery. kTEG and hep-kTEG were performed on admission to the recovery. The patients were allocated to two groups depending on the volume of Deltajonin priming in extracorporeal circuit calculated on one patient body surface area (BSA) m^2: I group (n=40), priming volume 1015 ± 200 ml/m^2, II group (n=43), priming volume 620 ± 116 ml/m^2. Postoperative blood volume was registered as milliliters 1 h, 4 h and 24 h after the surgery. Associations of hemodilution with kTEG, hep-kTEG parameters, SCT, postoperative blood loss were analyzed with SPSS® 17.0.
Results: Values of kTEG performed on admission to the recovery differed significantly between group I and II: R (12.6 ± 6 vs 9.7 ± 5, p=0.04), K (5 ± 3 vs 3.8 ± 2.5, p=0.02), A (40 ± 12 vs 50 ± 13, p=0.001), MA (56 ± 9.7 vs 60 ± 10, p=0.04). Values of hep-kTEG differed significantly within groups excepting R parameter: K (3.5 ± 1.5 vs 2.9 ± 1, p=0.02), A (47 ± 11 vs 53 ± 11, p=0.03), MA (59 ± 8 vs 62 ± 6, p=0.04). Variables of SCT did not differ between groups, except for fibrinogen (2.9 ± 0.8 vs 3.5 ± 1.2, p=0.01). I group when compare with II group showed significantly greater blood loss at 4 h (237 ± 119 ml vs. 182 ± 116 ml) and at 24 h (647 ± 254 ml vs. 496 ± 267 ml) after surgery, respectively, (p = 0.04; p = 0.01).
Conclusion: The kTEG and hep-kTEG parameters reflected hypocoagulation state and may have higher diagnostic value for detection of hypocoagulation due to hemodilution after on-pump surgery in comparison with SCT. 24-hour blood loss may be affected by volume of priming solution used in extracorporeal circuit.

6AP1-3

How to control the coagulation disorders?

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Background and Goal of Study: It’s known that deep vein thrombosis of lower extremities and pulmonary embolism occupies an important place in the structure of postoperative morbidity and mortality.
Materials and Methods: After Ethics approval and informed consent, was studied the functional state of hemostasis in a group of 57 healthy volunteers, who were not receiving drugs affecting coagulation and 43 patients with postphlebothrombotic syndrome (PPTS).
In patients PPTS conducted baseline studies coagulation state and daily monitoring of dynamic changes in the functional state of hemostasis, a comparative evaluation of performance low-frequency piezoelectric vibration hemoviscoelastography (LPVH) and platelet aggregation test (PAT), standard coagulation tests (SCT), thromboelastogram (TEG).
Results and Discussion: It was found that the LPVH correlated with SCT, PAT and TEG. However, our proposed method is more voluminous: indexes ICC (the intensity of the contact phase of coagulation), t1 (the time the contact phase of coagulation), and AO (initial rate of aggregation of blood) consistent PAT indexes, indexes ICD (the intensity of coagulation drive), CTA (a constant thrombin activity) and CP (the clot intensity of the polymerization) - SCT and TEG. In addition, the advantage of this method is to determ ne the intensity ot fibrinolysis - with indicator IRIS (the intensity of the retraction and clot lysis).
Conclusion(s): LPVH allows make the total assessment of all parts hemostasis: from initial viscosity and platelet aggregation to coagulation and lysis of clot, as well as their interaction. His figures are objective and informative, as evidenced by close correlation with the performance of traditional coagulation methods.

6AP1-4

Measuring the activity of the oral factor Xa inhibitor rivaroxaban with rotational thrombelastometry (ROTEM®)

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Background and Goal of Study: Rivaroxaban (Xarelto®, Bayer Pharma AG) is a novel direct factor Xa (FXa) inhibitor that can be applied orally. Routine drug monitoring is not recommended, but rapidly available test results might be beneficial in case of bleeding or prior to urgent surgery. Rotational thrombelastometry (ROTEM®) allows rapid detection of coagulation abnormalities. In low tissue factor (LowTF) - ROTEM® minimal amounts of tissue factor are utilized as an activator. Prothrombinase induced clotting time (PiCT®) - ROTEM® is an assay sensitive to FXa - and Factor IIa - inhibitors. The aim of this study was to evaluate the applicability of these ROTEM® test modifications for determination of rivaroxaban in vitro.
Materials and Methods: After ethics committee approval, blood samples from 20 volunteers were included. For each volunteer, 7 citrated whole blood samples were spiked with rivaroxaban (dissolved in 5% albumin and dimethylsulfoxide; 9:1) or the carrier solution alone to yield 5 samples with plasma concentrations from 0.05 - 0.40 µg/ml and 2 control samples. For quantitative rivaroxaban plasma concentration measurement, the chromogenic test BIOPHEN DiXaI (Hyphen-Biomed, France) was used. The main ROTEM® parameters were "clotting time" (CT) and "time to maximum velocity" (t,MaxVel).
Results and Discussion: There was a strong linear correlation between rivaroxaban plasma concentrations and the LowTF - ROTEM® parameters CT and t,MaxVel (Spearman correlation coefficient (SCC): 0,81 and 0,80, respectively). For PiCT®-ROTEM®, there was a moderate correlation between rivaroxaban concentrations and CT and t,MaxVel (SCC: 0,59 and 0,68, respectively). A cut-off-point for a rivaroxaban concentration of 0.20 µg/ml could be determined at 658 s for the LowTF parameter t,MaxVel with a sensitivity of 0.92 and a specificity of 0.72 (Area under the receiver operating characteristic curve: 0.90). For LowTF - ROTEM® the intraclass correlation coefficients (ICC) for CT and t,MaxVel were 0,84 and 0,83 respectively.
Conclusion: LowTF - ROTEM® could be a valuable diagnostic tool for determination of the effect of rivaroxaban at the point of care.

6AP1-5

Platelet function following trauma; a prospective study

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Background and Goal of Study: Platelet function is pivotal for hemostasis yet remains scarcely investigated in trauma patients. We aimed to elucidate platelet aggregation capacity in trauma patients.
Materials and Methods: A prospective observational study of platelet aggregation capacity in 213 adult trauma patients on admission to an emergency department (ED). Inclusion criteria were trauma team activation and arterial cannula insertion. On arrival, blood samples were analyzed by aggregometry initiated by thrombin receptor agonist peptide (TRAP) or collagen using a Multiplate device. Abnormal aggregation was defined as values outside the manufacturer's reference range. The association between aggregation response and injury severity was examined by linear regression. We also examined whether the aggregation response was associated with massive transfusion in the ED, or death due to cerebral injuries within 28-days by logistic regression, both corrected for injury severity score (ISS) and platelet count.
Results and Discussion: Low aggregation was found in 48 (23%) patients for TRAP and in 31 (15%) patients for collagen; high aggregation was found in 48 (23%) patients for TRAP and in 52 (24%) patients for collagen. No significant association was found between injury severity and aggregation response. A high aggregation response to TRAP was significantly associated with death due to cerebral injuries ($p < 0.01$), whereas low platelet count was associated with massive transfusion in the TC irrespectively of aggregation ($p < 0.01$). A relevant cutoff value of TRAP for risk of death due to cerebral injuries corresponded to the upper limit of the reference range (145 units).
Conclusion(s): Platelet aggregation values lower or higher than reference range were common in trauma patients, but there was no simple association with injury severity. A high aggregation response to TRAP was significantly associated with death due to cerebral injuries when corrected for ISS and platelet counts.

6AP1-6

The implementation of a flow chart reduce the haemoglobin transfusional trigger in surgical patients

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Background and Goal of Study: The goal of the study was to reduce inappropriate blood transfusion through the implementation of a flow chart in the prescription process.
Materials and Methods: The authors presented a two-stage program to reduce the red blood cell(RBC) transfusions in the surgical patients. In the preimplementation period (Feb 3rd to June 15th,2010), patient clinical conditions were retrospectively collected from the electronic records for each RBC prescription (pre and postransfusion haemoglobin-Hb-, age, cardiovascular risk factors, critical status, clinical hipoperfusion signs, lactate and pH). In this audit prescription was interpreted as appropriate or inappropriate according to the presence or not of clinical or analytical parameters of anaemia. The results of the clinical audit were presented to the prescribing team of physicians and a flow chart was proposed to assist RBC prescription. In a second stage (March 3rd to July 15th, 2011)the impact of intervention was analyzed.
Results and Discussion: Two similar time periods of 135 days were matched. The amount of surgical interventions was higher in the first than the second stage (4062 vs 2729). In the 1st period there were 577 prescriptions and 1078 units of RBC were transfused in 318 patients. In the 2nd period 277 prescriptions corresponding to 527 units of RBC in 195 patients. Due to reduction of surgical procedures, incidence of transfusion was the same in both periods (7.83% vs 7.15%,$p > .05$). Conversely, the transfusion trigger and the post-transfusional Hb were statistically lower in the 2nd period (8 gr/dl and 9.6 gr/dl vs 7.8 gr/dl and 9.4 gr/dl,$p < .05$). Anaesthesiologist were the most involved physicians: ordered 59% of transfusions during 1st period and 87% in the 2nd period. In the 1st period anaesthesiologists prescribed transfusion with higher Hb than other physicians (8.3 vs 7.6 gr/dl;$p < .05$) but in the 2nd period anaesthesiologists significantly reduced the transfusional trigger compared to the 1st period (Hb 7.9 gr/dl, $p < .05$). The inappropriate prescription was reduced after the intervention but not statistically (9% vs 7.9%;$p = .58$).
Conclusion: Implementation of a flow chart in the prescription process of RBC can contribute to the reduction of the Hb trigger in the surgical patients. Our results show a non statistical reduction in the percentage of inappropriate prescription and suggest that a benefit in the incidence of transfusion is possible.
Acknowledgements: M.Comas

6AP1-7

Prospective observational study of different regimes of tranexamic acid in cardiac surgery

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Background and Goal of Study: Anti Fibrinolytics have shown to reduce blood loss, transfusion requirements and Re- explorations in cardiac surgery. BART trial [1] led to withdrawal of aprotinin for cardiac surgery. This has led to different regimes of tranexamic acid. There is no consensus on the ideal dose. Our goal was to compare the different regimes of tranexamic acid used at castle hill hospital against blood loss, transfusion requirements and re exploration rates.
Materials and Methods: This was a prospective observational study. 97 consecutive patients having various types of cardiac surgery were included. All the data were collected as per agreed standardised format. The different regimes were compared against re-exploration rates, blood loss and transfusion requirements.
Results and Discussion:

Average Age[yrs.]	**68**
Sex [%] M/F	56/54
Average Duration of Bypass [mins]	89

[Demographics]

TXA Bolus with infusion	**6%**
TXA Bolus only	16%
No Bolus or infusion	16%

[Reexploration rates]

Regime	Numbers	Blood loss In litres	Transfused Blood [Units]	Transfused platelets [Units]	Transfused FFP [Units]
Bolus 1,1.5 or 2g	6	1.187	2.16	1	1.66
None	12	0.901	1.66	0.66	1.33
1g +1mg/kg/hr	28	0.84	1.42	0.5	1.23
1.5g+1mg/kg/hr	19	0.78	1	0.52	1.05
2g+1mg/kg/hr	10	0.79	0.7	0.4	0.8
1.5g+200mg/hr	8	0.38	0.25	0	0
2g+200mg/hr	12	0.67	0.41	0	0.33

[Blood loss and transfusion requirements with diffe]

Tranexamic acid acts by binding to the lysine binding site of plasminogen. Tranexamic acid concentration of 20 microgram/ml inhibits fibrinolysis in vitro [2].Fiechtner et al have recommended 10mg/kg followed by 1mg/kg/hr consistently provides plasma values of 20 microgram/ml. Murkin et al have shown convulsions in patients who have had greater than 60 mg/kg[3]. Our study shows that 1.5 gm bolus followed by 200mg/hr for less than 10 hrs meets the recommended plasma levels, does not cross toxic range and produces maximum clinical benefit.

Conclusion(s): Tranexamic acid1.5 gm with 200mg/hr gives the best result.

References:

1. Ferguson et al; A comparison of Aprotinin and lysine analogues in high risk cardiac surgery: NEJM; 2008; 358; 2319-2331.
2.Fiechtner et al:Plasma concentration of tranexamic acid on CP bypass; Anesthesia and Analgesia; Dec 2000
3.Murkin et al; High dose tranexamic acid associated with clinical seizures; Anesthesia and Analgesia;Aug 2010; 580-581

6AP1-8

Does thromboelastogram could predict blood loss in patient undergoing cardiac surgery?

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Background and Goal of Study: Thromboelastogram (TEG) is used during cardiac surgery for coagulation assessment. However, sensitivity and specificity of TEG data to predict postoperative bleeding remains unclear. This study aims to evaluate if TEG parameters could predict postoperative bleeding in patients undergoing cardiac surgery.

Materials and Methods: In this retrospective analysis of prospectively collected data, 34 patients were included. Patients scheduled for elective cardiac surgery with extracorporeal circulation (ECC) were included. Exclusion criteria: age <18 years old, circulatory arrest, emergent surgery, preoperative coagulopathy. Fresh frozen plasma (FFP) and platelets (PLT) were transfused in case of bleeding. TEG were performed before ECC, after ECC start, at the end of ECC, and after protamine administration. Blood loss that exceeds 750 ml within the first 6 postoperative hours was considered as significant bleeding. Univariate and multivariate regression analyses were performed. P values < 0.05 were considered statistically significant.

Results and Discussion: According to bleeding definition, 10 patients were included into “bleeding” group and 24 into “non-bleeding” group. Univariate regression analysis shows that “bleeding“ patients received more FFP (p=0.0005) and PLT (p=0.002) transfusion, were more exposed to blood products (p=0.008), and re-exploration rate was increased (p=0.02). TEG data were not statistically significant.

The best model obtained with our multivariate regression analysis is presented in table 1.

Variables	Coefficient	Std Error	T	P
Constant	0.18802	0.73686	0.26	0.8012
FFP	0.42520	0.11143	3.82	0.0011
PLT	-0.51023	0.23197	-2.20	0.0398
TEG r - Protamine	-0.05383	0.02445	-2.20	0.0396
ICU stay	0.12867	0.05509	2.34	0.0300
aPTT ICU h6	0.02878	0.01039	2.77	0.0118
Exposition to blood product	0.31120	0.14461	2.15	0.0438
RBC	-0.25130	0.07507	-3.35	0.0032
TEG MA - Protamine	-0.01105	0.01027	-1.08	0.2949

[Multivariate regression analysis]

These results shown that only r value after protamine administration was associated with bleeding in the postoperative period (p=0.03).

Conclusion(s): In this study, TEG values were poorly correlated with postoperative bleeding. Due to the small number of patients included, further prospective studies are needed. Moreover, TEG should probably be considered to guide transfusion in bleeding patients, more than a predictive tool.

6AP1-9

Transfusion requirements and identification of their predictive factors in pediatric patients submitted to posterior scoliosis surgery

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Background and Goal of Study: Posterior scoliosis surgery in pediatric patients is associated with high rate of blood products transfusion. The goal of the present study was to identify factors that influenced transfusion requirements in children undergoing this surgical procedure.

Materials and Methods: A retrospective chart review of all pediatric posterior scoliosis surgery, during the period from February 2011 to July 2012, was performed. Patients with age less than 10 years were excluded. The data reviewed were analysed by SPSS 20.00. T-student test, Pearson and Spearman correlation tests were used.

Results and Discussion: Forty six patients submitted to posterior scoliosis surgery were analyzed. In 43 patients, packed red blood cells (PRBC) were administered intraoperatively, with a mean±standard deviation (SD) of 19,9±12,06 ml/Kg. In 26 patients fresh frozen plasma (FFP) were administered during surgery, with a mean±SD of 8,96±5,20 ml/Kg.

High PRBC requirements were associated with lower body weight (rho=-0,577; p< 0,001), lower age (rho=-0,422; p=0,005), higher grade of American Society of Anesthesiologists (ASA) Physical Status Classification (rho=+0,509; p< 0,001) and secondary scoliosis (p=0,008). 38 patients registered international normalized ratio (INR) higher than normal values (< 1,2) in immediate postoperative analyses (only 3 patients had INR≥1,2 preoperatively).

Higher difference between pre and immediate postoperative INR was noticed in children administrated with larger amounts of colloids (ml/Kg) (r=+0,475; p=0,001) and PRBC (ml/Kg) (rho=+0,427; p=0,004).

Conclusions: In this study, transfusion requirements in children undergoing posterior scoliosis surgery were substantial. Predictive factors for PRBC transfusion were low body weight, low age, higher ASA Physical Status Classification and secondary scoliosis. Implementation of blood management protocols, by anesthesiologists, orthopedists and hematologists, and a special attention to population that congregate risk factors may reduce transfusion needs and ensuing consequences.

6AP1-10

Should we optimize all patients at the same preoperative Haemoglobin level to avoid transfusion in total primary knee arthroplasty?

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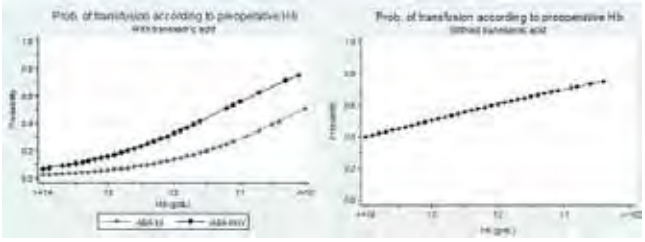
Background and Goal of Study: Knee arthroplasty is associated with high transfusion rates, and blood saving techniques are highly recommended. We investigated clinical and surgical factors predicting the need for perioperative transfusion.

Materials and Methods: This is an observational, retrospective study including all patients undergoing primary knee arthroplasty during 2010-2011 at our centre. Preoperative Haemoglobin (Hb) was evaluated and optimized when required. Tranexamic acid was administered intraoperatively, except for those patients with contraindication, in whom a postoperative cell savage was used. Transfusion threshold was established at Hb < 9 g/dL. The probability of transfusion was obtained from multivariate logistic regression, evaluating age, sex, ASA score, preoperative Hb, tranexamic acid use and limb ischemia time.

Results and Discussion: 929 patients were analyzed. Median age was 73 years and 74% were women. 784 (84.4%) patients received tranexamic acid. Exposure to blood transfusion occurred in 127 (14%) patients who required 240 packed red blood cell units. Preoperative Hb was 12.8 g/dL for transfused and 13.6 g/dL for not transfused patients. The need for transfusion was related to preoperative Hb < 14 g/dL (OR:2.1; 95% CI:1.6-3.5); to the use of tranexamic acid (OR:0.1; IC:0.1- 0.2), and to ASA score III/IV (OR:2.6; IC:1.6-

4.2). Figure 1 shows the probability of being transfused whether tranexamic acid was used (1.a) or not (1.b).



[Figures]

Conclusion(s): Not all the patients undergoing primary total knee arthroplasty could need the same preoperative Hb optimization. In patients not receiving tranexamic acid it is advised to maximize the Hb optimization because the probability of transfusion is high and depends only on preoperative Hb. In patients receiving tranexamic acid, Hb optimization could be particularly recommended when the ASA score is III/IV.

6AP2-1

The age of transfused blood is not associated with increased postoperative adverse outcome after pediatric cardiac surgery

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Background and Goal of Study: The storage duration (age) of transfused red blood cells (tRBC) has been shown to associate with morbidity and mortality in critically ill patients. However, there is few study to assess its relationship in pediatric cardiac surgery patients. Accordingly, we studied the association of age and number of donors of tRBC with the risk of postoperative serious adverse events (SAEs) in pediatric cardiac surgery patients.
Materials and Methods: This is a retrospective observational study conducted in teaching hospital from 2009 to 2011. We included all pediatric patients (< 18 years olds) admitted intensive care unit (ICU) after congenital cardiac surgery, who received RBC transfusion in operation room and ICU on the day of surgery. We retrieved age of all tRBC from electrically stored blood product database. We obtained maximum (RBC_{MAX}) and average (RBC_{AVE}) age of tRBC. We also calculated the total number of donors for tRBC (N_{donor}). We defined primary outcome as incidence of at least one of eight serious advance events (SAEs); 1) death, 2) pulmonary hypertension crisis, 3) requirement of renal replacement therapy, 4) requirement of ECMO, 5) cardiac arrest, 6) chest opening for bleeding, 7) hemodynamic instability with steroid administration and 8) serious arrhythmia. We have prospectively collected these SAEs as part of an established quality assurance activity. We compared RBC_{MAX}(days old), RBC_{AVE} (days old) and N_{donor}(/patients) between patients with and without SAEs using t-test or Mann-Whitney test, which is appropriate. Also, multivariate analysis was conducted and assessed correlation with primary outcome. P-value less than 0.05 was considered to be significantly difference.
Results and Discussion: In study patients, RBC_{MAX} was 9.5±3.1, RBC_{Ave} was 8.5±2.7 and $N_{donor}$was 2.2±1.1. Out of 554 patients, 117 patients(22.6%) had SAEs. RBC_{MAX} and RBC_{AVE} was not significantly differed between patients with and without SAEs (RBC_{MAX}; 9.9±3.1 vs. 9.4±3.2, p=0.15, RBC_{AVE}; 8.2±2.5 vs. 8.6±2.7, p=0.24). N_{donor} in patients with SAEs was 2.6±1.3, which is significantly more in compared with 2.0±1.0 in patients without SAEs (p< 0.0001). In multivariate logistic model, there was significant association difference only in N_{donor} (OR 6.2, p=0.01), but not in RBC_{MAX} and RBC_{AVE} (RBC_{MAX}; OR 0.11, p=0.74, RBC_{AVE}; OR 0.04, p=0.84).
Conclusion(s): In pediatric cardiac surgery patients, age of tRBCs was not significantly associated with the risk of SAEs.

6AP2-2

Lean transformation of intra-operative cell salvage (IOCS) practice in a teaching hospital birth centre: an audit of efficacy and cost

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Background and Goal of Study: CEMACE has highly recommended the use of intra-operative cell salvage (IOCS) during Caesarean section (LSCS). In view of its efficacy and cost further refinement of the guidance for its use is required.[1] A previous retrospective audit of IOCS use showed wastage of 64% of disposable components.[2] As a result of this lean practice was introduced in 2010. The aim of this prospective audit was to evaluate the efficacy and cost benefits of the changes we had made to our practice.
Materials and Methods: IOCS was indicated for women having LSCS with the following: placenta praevia, fibroids, previous myomectomy, and three or more previous LSCS. Lean transformation of our practice involved initially using the IOCS disposable suction unit. If the yield were significant then the processing unit would be used. We prospectively audited the volume of blood collected, processed and transfused over one year.
Results and Discussion: IOCS was used for 59 women during LSCS between October 2010 and September 2011. There was insufficient yield of blood for processing in 43 (72%) cases. Only 17 (28%) women had sufficient blood loss that resulted in a high yield collection for processing. The median volume of blood collected in the suction bottle was 980ml (range 600-2700ml). The median total volume of autologous blood after processing was 263ml (range 150-784ml).
A total of 20009ml blood was processed and 6647ml (equivalent to 27 units of allogeneic packed red cells) of autologous blood was transfused back to women. This has resulted in a yield of 33.2%. Only one woman required allogeneic transfusion. The cost of autologous blood transfused was £4050. The total cost of disposables used was £2790. This will give an actual saving of £1260 per annum.
Conclusion(s): Introduction of lean practice has reduced the wastage of disposables and helped to widen the indications and use of IOCS. There are also cost savings associated with the reduced wastage and decreased requirement for allogenic transfusion. We are now using cell salvage more frequently and efficiently in elective and emergency LSCS compared to two years ago.
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6AP2-4

Is less more? Restrictive intraoperative fluid regimen reduces blood loss and perioperative need for blood transfusion in patients undergoing open radical cystectomy

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Background and Goal of Study: Despite improvements in surgical techniques and perioperative care, open radical cystectomy is associated with substantial intraoperative blood loss and a high incidence for blood transfusion (up to 60%). Implementing intraoperative strategies to reduce blood loss and blood transfusion should be established. The objective of the study was to determine the influence of a restrictive deferred crystalloid fluid administration on blood loss and intra- and postoperative need for packed red blood cells (PRBC) transfusions.
Materials and Methods: This is a secondary analysis of a double-blind randomized clinical trial, single-centre study of 166 patients undergoing open radical cystectomy with urinary diversion.
Patients were equally randomly assigned to 1ml/kg/h of balanced crystalloid combined with norepinephrine until bladder was removed and followed by a rate of 3ml/kg/h (restrictive group) or 6ml/kg/h of crystalloid throughout surgery (control group). PRBC were transfused in order to maintain a haemoglobin >80gr/l in all patients during surgery.
Postoperatively, a haemoglobin level between 70-100gr/l combined with relevant anemia symptoms or relevant risk factors such as cardiac disease or cerebral ischemia was considered an indication to receive PRBC transfusion. Intraoperative blood loss, intraoperative and postoperative need for PRBC transfusions were recorded for all patients.

Results and Discussion: Baseline characteristics were well balanced between the groups. Median blood loss was 800ml [range: 300-1800] in the restrictive group vs 1200ml [400-3000] in the control group ($P < 0.0001$). Fewer patients in the restrictive group (7/83 [8%]) needed less intraoperative PRBC transfusions and blood units per patient (1.1 units/patient) than in the control group (26/83 [31%], 2.6 units/patient; ($P < 0.0001$). Twenty-three patients (28%) in the restrictive group needed postoperative PRBC transfusions (1.8 units/patient) vs 40 (48%) in the control group (2.0 units/patient) ($P=0.01$).
Conclusion: In patients undergoing open radical cystectomy with urinary diversion, an intraoperative restrictive deferred fluid management reduces blood loss and the incidence of intra- and postoperative PRBC transfusions.
Acknowledgements: This work was supported by a grant from Else Kröner Fresenius Foundation, Germany. The sponsor did not influence any aspect of the study.

6AP2-5

Risk of transfusion and readmission in patients with preoperative anaemia in fast-track hip- and knee arthroplasty

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Background and Goal of Study: Preoperative anaemia is common and has been associated with increased postoperative morbidity and mortality. However, most studies have focused on large mixed surgical cohorts and included patients undergoing emergency surgery. The prevalence of preoperative anaemia and its association with risk of transfusion and readmission has not been reported in relation to fast-track elective hip- (THA) and knee arthroplasty (TKA). Thus this study aimed to explore the association between preoperative anaemia and risk of transfusion and readmission within 90 days after elective fast-track THA and TKA.
Materials and Methods: Observational database study with data obtained from five high-volume fast-track surgical centers in Denmark.
Preoperative haemoglobin (Hb) and patient demographic variables was collected prospectively while data on red cell transfusion within 30 days of surgery and readmissions within 90 days of surgery were collected from regional blood banks and the Danish National Patient Registry, respectively.
All readmissions were scrutinized using electronic discharge forms and patient charts. Preoperative anaemia was defined according to thresholds established by the WHO (< 13 g/dl for men and < 12 g/dl for women). Multivariate logistic regression was performed to obtain adjusted risk estimates for transfusion- and readmission risk according to preoperative anaemia status.
Results and Discussion: 5165 procedures (2463 TKA and 2702 THA) from jan 2010 to dec 2011 with a median patient age of 68 year and length of stay of 2 days were included for analysis. The prevalence of preoperative anaemia was 12,6 % (663 patients). Overall rates of transfusion within 30 days and readmission rates within 90 days were 12.0% and 8.4%, respectively. Preoperative anaemia was associated with increased risk of receiving transfusion within 30 days of surgery, OR 4.7 95% CI (3.8—5.8) and was associated with increased risk of readmission within 90 days of surgery OR 1.4 (1.1- 1.9) after adjustment for patient demographics and comorbidities.
Conclusion(s): Even in elective fast-track hip- and knee surgery preoperative anaemia is still prevalent and remains a risk factor for transfusion and increased postoperative morbidity. Future efforts should be made to ensure proper preoperative investigation and treatment of low haemoglobin prior to elective THA and TKA.
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6AP2-6

Oxygen-carrying ability of intraoperative cell salvaged RBC

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Background and Goal of Study: Since the cell salvage machine was invented in 1970s, many clinical trials have proved that intraoperative cell salvage can effectively decrease the exposure rates to allogenic bloods and amount of stored red blood cells (RBC). But the studies related to oxygen-carrying ability of washed bloods were not satisfied.
The objective of the study is to evaluate the oxygen-carrying ability of intraoperative washed RBCs according to the whole oxyhemoglobin dissociation curve (ODC).
Materials and Methods: 30 patients, planned to do cell salvage during operation, were included. The ODC of each washed RBC was traced using standard mixing method and compared with venous blood of the same patient sampled pre-operation as standard control. We also measured 2,3-disphosphoglycerate (2,3-DPG) of the washed RBCs' and Venous bloods' by colorimetric technique, ATP enzyme by bioluminescent method, rheology by laser diffractometer, plasma ions by electrode method.
Results: ODC of the washed RBC's was the same with the venous blood ($P=0.12$). There was no significant difference in 2,3-DPG concentration ($P=0.08$) and ATP enzyme concentration ($P=0.83$) between washed RBC and preoperative venous blood. After washing, the rheology of RBC had no significant change ($P=0.23$). Potassium ($P=0.00$), calcium ($P=0.00$) and chloride ($P=0.03$), three plasma ions disturbed in washed bloods.
Conclusions: The results suggest that washed RBCs have the same oxygen-carrying ability compared with peripheral RBCs. After washing, Potassium, calcium ions decrease, and chloride ions increase in washed bloods, but these changes have no influence on RBCs'oxygen-carrying ability.

6AP2-7

Implementation of a program to reduce allogeneic blood transfusión in total hip arthroplasty

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Background and goal of study: we proposed a program to reduce transfusion index and volum in patients operated of Total Hip Arthroplasty (THA) based in a multimodal strategy developed in three steps.
Materials and Methods: between 2008-2011, consecutive patients operated of THA were distributed in 3 groups: Control Group (**CG**) before implementation of the program; Treatment Group (**TG**) were distributed with regard to preoperative Hb value and received preoperative treatment (A:Hb>150 g/L, no treatment; B:Hb 130-149.9 g/L, 200mg iv iron 1 week before surgery; C:Hb 110-129.9 g/L, 200mg iv iron + erythropoietin (rhEPO) 40.000UI sc 2 weeks and 200mg iv iron 1 week before surgery and D:Hb< 110 g/L, 200mg iv iron + rhEPO 40.000UI sc 3 weeks and 2 weeks before surgery).
All patients received 200mg iv iron after surgery. Tranexamic Acid Group (**XG**) patients were treated like TG and we added 2 doses of Tranexamic Acid 10mg/kg iv just before surgery and 3 hours later. Allogeneic Blood Transfusion (ABT) was performed if Hb value < 85g/L.
We recorded ABT and number of packed red blood cells. Also demographic data, ASA, length of surgery and length of stay (LOS), Hb and haematocrit preoperative values before and after assigned treatment and in postoperative days 1, 2 and 3.
Results and Discussion: 316 consecutive patients were included (CG 42 patients, TG 206 patients and XG 68 patients). They were similar in demographic data, ASA, length of surgery and preoperative Hb value between groups. Transfusional Hb value was 83.7g/L. Transfusional rate: CG 30.1%, TG 33.0%, XG 16.2% ($p=0.03$). Transfusional volume CG 0.7 ± 1.2 units/patient, TG 0.8 ± 1.3 u/p and XG 0.3 ± 0.7 u/p in XG ($p=0.01$). No adverse effects were recorded.
Conclusion(s): Perioperative treatment with iron iv and rhEPO sc didn't change transfusional rate or volum but the introduction of tranexamic acid decreased the transfusional rate in 46.2% and the transfusional volume in 59.2%. Then, this multimodal strategy based on optimization of preoperative Hb value, acceptation of a lower transfusional trigger and antifibrinolytic treatment has significantly improved transfusion practice.

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6AP2-8

Implementation of patient blood management program in Spain: evaluation survey

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Background and Goal of Study: In order to know the availability of a specific *Patient Blood Management* (PBM) program in different hospitals in Spain, we designed a survey that included the features of the preoperative evaluation, the availability and design of different blood-saving techniques in each center and the limiting factors in implementation for different types of scheduled surgery.
Methods / Design: The design the survey was made by the members of the Section of Hemostasis and Transfusion Medicine of the SEDAR (Spanish Society of Anaesthesia) and was distributed through the sales network of Vifor Pharma®, which provided one for each Department of Anesthesiology in Spanish hospitals during the months of September to November 2012.
Results / Discussion: 91 Anaesthesia Departments received the survey and 82 responses were obtained. Preoperative evaluation proceeded normally in 86.6% of hospitals. The time from the pre-anesthetic evaluation for surgery was between one week and two months. 77 hospitals (93.9%) have Transfusion Committee, and involving the anesthesiologist participation 90.2%.
There is a blood management program in 79.3% of hospitals and the techniques more used were the use of Tranexamic Acid in 75.3% of hospitals, followed by intra-and postoperative blood cell salvage and reinfusion in equal proportion 67%.
For treatment of preoperative anaemia, treatment with intravenous iron performs regularly in 39.5%, and occasionally in 60.5% of hospitals, and treatment with erythropoietin is performed routinely at 28.4%, and occasionally in 65.4% of hospitals.
Limiting factors for implementing or improving blood conservation program in hospitals were in order of importance: first, to establish the preoperative optimization circuit (64 centers), second, surgical team collaboration (61 centers), third, the insufficient interest of the anesthesiologist (57 centers), and fourth, the economic cost of some techniques (32 centers).
Conclusions: The implementation of PBM requires liaison and partnership between all personnel and organizations responsible for perioperative care, including Blood Service authorities. Currently, the implementation of PBM in Spanish is limited. It is hoped that this report also aids the wider implementation of PBM in Spain.
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6AP2-9

Analysis of factors involved in transfusion requirements in hip and knee arthroplasty

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Introduction: The hip and knee arthroplasty are very often interventions are done in our midst. As highlights the main features of the same embodiment in a population of elderly and high risk normally characterized by the need for blood transfusion.
Objective: To analyze the main factors that influence the need for blood transfusion in the intervention population of hip and / or knee in our health sector.
Materials and Methods: This is a prospective, observational, descriptive study. We have analyzed the medical records for 12 months for all patients treated in our center hip and knee.
Value the evolution of hemoglobin compared to the postoperative preoperative within 24 hours. It was established as analysis group patients with a loss equal to or greater than 3 g / dl of hemoglobin in the first 24 hours postoperatively compared to preoperative point.
In total we analyzed 320 patients, excluding those who required preoperative and intraoperative transfusion. Anthropometric variables analyzed, preoperative hemoglobin, postoperative hemoglobin, taking anticoagulants and / or antiplatelet agents, preoperative treatment with iron, duration of intervention. Through SPSS quantitative variables are analyzed with the test of analysis of variance and chi square test for qualitative variables, setting a significance level of $p = 0.05$.
Results: Mean age was set at 72.1 ± 8.2 years. 71% (227/320) were knee replacements and 29% of hip arthroplasties. All patients received neuraxial anesthesia, 17% only spinal, epidural only 3% and 80% intra-epidural combination. 65% were high-risk patients. The anticoagulants were 4.7% and 16.9% antiplatelet agents. The increased blood loss (down from more than 3 g / dl preoperative Hb) was associated with younger age (70.8 vs. 73.9, $p = 0.0001$) the ASA, the high-risk patient had a minor loss ($p = 0.010$). The knee arthroplasty had a blood loss greater than the hip ($p = 0.0001$). Patients with higher preoperative Hb had higher blood loss ($p = 0.0001$) and those who did not receive iron preoperatively ($p = 0.038$). Younger patients was greater in supply of blood for blood loss ($p = 0.0001$).
Conclusions: Our data establish a reduced need for blood transfusions in patients undergoing hip or knee arthroplasty as older, higher risk, and those who have been treated preoperatively with iron. The suppression of anticoagulation and antiplatelet therapy preoperatively with adequate time does not increase the risk of bleeding.

6AP2-10

Risk factors for blood transfusion in patients undergoing hip fracture surgery

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Background and Goal of Study: Hip fracture management continues to place a great burden for healthcare systems. Recognition of risk factors for blood transfusion requirement may help to develop better perioperative strategies towards rationalization and avoidance of the risks associated with its use. The aim of this study was to identify patient and other perioperative factors which determine blood transfusion requirement in hip fracture surgery.
Materials and Methods: The records of 157 consecutive patients undergoing hip fracture surgery (January 2011-November 2012) were retrospectively reviewed. Factors potentially related to transfusion requirement were recorded, including patient age, gender, ASA classification, type of anesthesia, type and timing of surgical procedure, preoperative anemia (Hb< 10g/l) and other co-morbidities (cardiac or respiratory disease, high blood pressure, chronic renal disease, diabetes, stroke, dementia or use of anticoagulants). Univariate analysis was performed using the Chi-square test, or the Fisher's exact test when appropriate. Factors showing a strong association ($p< 0.05$) were then examined using multiple logistic regression (stepwise procedure).
Results and Discussion: In the univariate analysis, female gender ($p=0.016$), ASA classification III/IV ($p=0.042$), preoperative anemia ($p=0.02$) and performing surgical procedure beyond 48 hours of admission ($p=0.013$) were considered significant. After performing the stepwise binary logistic regression model, the factors associated with increased blood transfusion were female gender (OR = 0.339, $p=0.030$, 95% CI 0.128-0.898), preoperative anemia (OR =0.249, $p=0.023$, 95% CI 0.075-0.824) and timing of surgery beyond 48 hours (OR 0.403, $p=0.027$, 95% CI 0.179-0.904).
Conclusions: Blood transfusion requirement during hip fracture surgery is associated with female gender, preoperative anemia and performing surgery beyond 48 hours of hospital admission. These data suggest that strategies aiming to decrease the use of blood components should include efforts towards preoperative optimization of hemoglobin levels and achievement of recommended admission-to-surgery time.

6AP3-1

Does a low protamine-to-heparin ratio antagonize heparinization after pediatric cardiac surgery: a ROTEM-based analysis

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Background and Goal of Study: The protamine-to-heparin ratio remains a matter of ongoing controversies. (1) Residual heparin or protamine overdose can be both associated with increased postoperative bleeding. In this study, we aimed to assess if a low protamine-to-heparin ratio can be associated with full heparin antagonisation after weaning of cardiopulmonary bypass (CPB) in pediatric cardiac surgery. For this purpose, two point-of-care monitors were used.
Materials and Methods: This retrospective evaluation of prospectively collected data included 163 patients without acquired or congenital coagulopathy and/or liver/kidney failure undergoing scheduled cardiac surgery with CPB. Anesthesia and CPB technique were standardized. Before CPB, 4 mg/kg heparin was administered in order to obtain an activated clotting time > 480 sec. (ACT, ACTII monitor,
Medtronic BV, Kerkrade, The Netherlands) This ACT value was maintained throughout the CPB with additional heparin boluses (1 mg/kg), if required. An additional bolus was added in the prime of the CPB (50 mg/L). At the end of the CPB, children were rewarmed to a rectal temperature of 36°C. After CPB weaning and a first surgical revision of hemostasis, protamine was administered. The dose was calculated as 50% of the total amount of heparin administered throughout the CPB. Adequacy of heparin antagonisation was assessed with heparinase-containing cartridges (Medtronic BV) and rotational thromboelastometry (ROTEM, PENTAPHARM Gmbh, Germany) derived parameters comparing the clotting time (CT) obtained with the HEPTEM and INTEM tests. As collected data were not normally distributed, data are presented as median and interquartile range (IQR) and compared with the Mann-Whitney U test.
Results and Discussion: The total amount of heparin administered was 42.5 mg (30.0 to 65.5) and of protamine was 22.5 mg (15.0 to 35.0). The protamine-to-heparin ratio in the studied population was 0.5 (0.50 to 0.53). There was no significant difference between ACT values with or without heparinase (144 (130 to 158) vs. 141 (128 to 152), p=0.19). Similarly, no difference was observed between INTEM and HEPTEM CT (224 (205 to 253) vs. 221 (200 to 256), p=0.44)
Conclusion(s): Using a protamine to heparin ratio of 0.5 was totally effective to neutralize heparin anticoagulation after CPB in children undergoing cardiac surgery.
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6AP3-2

Diffuse bleeding after multiple trauma in a patient treated with Dabigatran

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Background: Dabigatran is a competitive direct thrombin-inhibitor (DTI) which has been introduced for anticoagulation in patients with paroxysmal nonvalvular atrial fibrillation (AF) [1]. However, the lack of reversal agents may pose a threat to patients with severe injury.
Case report: We report a 75-year old man involved in a head-on motor vehicle collision, with a history of intermittent AF, cardiomyopathy and stroke. On arrival of emergency medical services, he was unconscious and had to be intubated. On admission to our hospital, he was ventilated and in hemorrhagic shock. He required fluid resuscitation and vasopressors. Diagnostic imaging revealed right serial rib fractures with hematopneumothorax, lung contusions and a fractured left iliac wing. He received a thoracic drain. Laboratory findings showed a partial thromboplastin time (aPTT) of 142s, a thrombin time (TT) of more than 150s and an international normalized ratio (INR) range of 3.2, hemoglobin concentration and platelets were normal. In the thrombelastography (TEG) we found a prolonged clotting time (CT) in the INTEM (454s) and EXTEM (420s) tests. Other parameters were within normal limits. Due to increasing circulatory instability, the patient received a mass transfusion with packed red blood cells, fresh frozen plasma and platelet concentrates as well as fibrinogen and prothrombin complex concentrates. Hyperfibrinolysis was treated with tranexamic acid. Only after receiving information about the patient's daily medication, we realized that he was taking dabigatran. Thus, we initiated a therapy with 0.9 μg/kg activated recombinant factor VII (rFVIIa). Nevertheless, the patient had to receive a thoracotomy due to a progressive bleeding from the thoracic drain. Intraoperatively, only diffuse bleeding was identified. Although aPTT, TT, INR, INTEM and EXTEM tests now within normal limits except for the CTs, we were unable to stop the bleeding. The patient died 10 hours after admission in hemorrhagic shock.
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Learning points/discussion: In this case, administration of previously recommended drugs [2] did not stop the diffuse bleeding in a patient treated with dabigatran. In the presence of prolonged CTs in TEG tests, elevated PTT and INR with coagulopathy of unknown reason, DTIs should be kept in mind as cause.

6AP3-3

Intravenous ferric carboxymaltose utility for the treatment of preoperative iron deficiency anaemia in hip and knee arthroplasty

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Background and Goal of Study: Preoperative anaemia is a common condition in major orthopaedic surgery and it is an independent risk factor for blood transfusion and worse postoperative outcome. The aim of this study is to assess if the treatment with ferric carboxymaltose (FCM) is as safe and effective as iron sucrose (IS) for the treatment of preoperative iron deficiency anaemia (IDA) in lower limb arthroplasty.
Materials and Methods: A retrospective analysis of all consecutive patients with preoperative IDA scheduled for total hip and knee replacement in the last five years that were treated with intravenous iron according to institutional protocol. We used PAS online database (www.awge.org) that includes: age, sex, weight, ASA, iron metabolism parameters, evolution of haemoglobin (Hb), iron type and dosage, transfusion and adverse effects. We evaluated two cohorts of patients: a cohort of patients that received preoperative IS (from 2007 to 2009) and another cohort treated with FCM (from 2009 to 2012).
Results: We included 86 patients, 25 treated with IS and 61 with FCM treatment. Both groups were comparable in demographic, laboratory data and calculated total iron requirements (842 mg versus 886 mg). Preoperative administration of IS or FCM were equally effective in increasing haemoglobin target levels (1.45± 0.98 versus 1.63± 1.18 g/dl p=0.7). The FCM group received a greater total dose of iron (865 mg vs. 688 mg, p = 0.011) with fewer sessions (1.3 vs. 3.4, P = 0.001). An additional dose of erythropoietin (EPO) needed to reach the target Hb level was used in 28% of IS versus 17% of FCM patients. Few adverse effect and of mild intensity were observed.
Conclusions: Because of the low incidence of side effects and the rapid increase of haemoglobin levels, FCM and IS intravenous iron emerge as safe and effective drugs for the treatment of preoperative iron deficiency anaemia in major orthopaedic surgery. However, as less treatment sessions and EPO additional doses are required, FCM could offer significant cost savings, less resource utilisation and time benefits for the patient and the hospital.
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6AP3-4

Successful living donor liver transplantation with continued dual antiplatelet therapy

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Background: Liver transplantation in patients on dual antiplatelet therapy greatly increases risk of bleeding but withdrawal of antiplatelet therapy leads to major cardiac events.
Case report: 58 year old male on clopidogrel and aspirin with ESLD scheduled for LDLT, had a history of CAD and DES. Labs were within normal limits except bilirubin 7.2 mg/dl and INR 1.5, MELD 16. Preoperative platelet mapping showed no suppression to both drugs. TEG revealed normal clot strength, growth rate and stability. Stress echo showed mild fixed defect of inferior wall, no inducible ischemia, EF 57%. Patient had general anesthesia with placement of arterial line and Swan-Ganz catheter and TEE. He remained stable throughout the dissection phase. During reperfusion ST segment de-

pressions and PAP elevation was observed, then normalized after nitroglycerin infusion. TEE stayed unchanged. Estimated blood loss was 600cc. The patient received no blood and his postoperative course was uneventful.
Discussion: Coagulopathy is common in patients presented for liver transplantation. During operation hemorrhage may occur due to pre-existing hypocoagulable state, thrombocytopenia and portal hypertension. All these factors increase risk of bleeding during the surgery. Our patient required dual anti-platelet therapy for DES. Both clopidogrel and aspirin cause platelet dysfunction.
Studies showed that antiplatelet drugs are not universally effective and there is significant pharmacogenetic variability iamong the patients (1). Thromboelastography and platelet mapping are useful assays which help to assess the necessity of preoperative platelet transfusion. In our patient the tests were normal and preoperative platelet transfusion deemed unnecessary. Platelet transfusion during LDLT has been associated with decreased graft survival, increased morbidity and mortality (2).
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Learning points: LDLT can be performed safely in a patient on dual antiplatelet therapy. Preoperative evaluation of coagulation and platelet function allows avoiding transfusion, improve graft survival and patient's safety.

6AP3-5

The important role of fibrinogen in bleeding during brain meningioma resection

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Background and Goal of Study: Meningiomas represent 34%of intracranial brain primary tumors in our hospital. Bleeding during surgery is common. Goal of the study is to identify factors that independently influenced in perioperative bleeding (decrease hemoglobine ≥25% related to preoperative value) and transfusion requirements.
Materials and Methods: Observational prospective study 2 years(2011-12) of patients with brain meningioma who underwent tumor removal surgery.We have analyzed these variables:demographyc data,size,previous embolization,drugs that can influence haemosthatics disorders(selective serotonin reuptake inhibitor-SSRI), analytical data (hemosthasis and coagulation preoperative,intraoperative and 24hours postoperative), time of surgery and perioperative transfusion. We performed statistical data analyses with ROC curves and stepwise multivariate logistic regression analysis to disclose which variables are involved in bleeding and transfusion.
Results and Discussion: 52 patients have been included: 22 men (42%), 30 women (57%), mean age 56 (24-81) years old, 10 patients with SSRI (19%). 35 patients had blood loss (67%) 22 of them (42%) needed transfusion. After ROC curve analysis about the total variables only a low intraoperative fibrinogen value increase the probability of bleeding (p=0,021) and transfusion (p=0,005). A fibrinogen value of 2,6g/dL would result in a high sensitivity for bleeding 81%(IC 64-91%)and specificity of 67%(IC 39%-86%). A fibrinogen value of 2,5g/dL would result in a 80%(IC 58%-92%)of sensitivity for transfusion and 57%(IC 37%-74%)of specificity. The multivariate logistic regression analysis disclosed only one independent variable simultaneously associated with bleeding(p=0,011) and transfusion (p=0,004): a low intraoperative fibrinogen value increased the probability of these events. Additionally, higher surgery time is associated with greater chance of transfusion in the multivariate analysis (p=0,011).
Conclusions: During brain meningioma surgery removal an important bleeding can take place and the value of intraoperative fibrinogen is the most significant variable that is independently responsible for bleeding and transfusion. Maybe we can ask: Is fibrinogen suffering from intraoperative fibrinolysis?Would those patients have benefit of preventive antifibrinolytic drug? In order to confirm these hypothesis as well as to find the critical intraoperative fibrinogen value, more prospective randomized studies with a high number of patients need to be performed.

6AP3-6

Oral anticoagulant therapy in cirrhotic patients and two cases of liver transplantation

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Background: Haemostatic alterations in cirrhosis involve mechanism that promote and stabilize blood clotting and also, pathways that mediate clot dissolution(1). Imbalance favoring thromboembolic complications are not uncommon.
Case report: We present two cases of patients underwent liver transplantation (LT) treated with oral anticoagulant therapy (OAT) until the day of surgery. Samples were collected for Rotem extem (clotting time, clot formation time, maxim clot firmness and lysis at 45 min), Coagulation test (PT, aPTT, platelets, fibrinogen) and hemoglobin. Case1:Basal [83 sc, 91 sc, 60 mm, 1%, 3.15, 1.43,132000 mm3, 2.07 g/L, 95 g/L]; Anhepatic [77 sc, 89 sc, 61 mm, 0%, 2.96, 1.3,125000 mm3, 2.06 g/L, 8.9 g/L]; Reperfusion [77 sc, 143 sc, 51 mm, 0%, 3.45, 1.63, 90000 mm3, 1.47 g/L, 7 g/L]. Case2:Basal [176 sc, 269 sc, 40 mm (Fibtem 11mm), 0%, 2.79, 1.11,58000 mm3, 2.40 g/L, 11.6 g/L]; anhepatic [92 sc, 144 sc, 54 mm, 2%, 2.45, 1.02, 84000 mm, 2.43 g/L, 12 g/L]; reperfusion [91 sc, 147 sc, 54 mm, 0%, 2.54, 1.15, 78000 mm3, 2.21 g/L, 11.5 g/L].None of the two patients were treated with plasma during the whole procedure.First case required two RBC's packets. Both patients properly recovered.
Discussion: During LT, PT and aPTT have a poor correlation with Rotem test (2), and it is accepted that thromboelastometry monitorization may help to guide haemostatic and coagulation corrections. Clinical observation of the surgery field help us to manage patients. Some open questions related to the need of plasma correction when patients are on oral anticoagulation therapy: Is it necessary to correct it when dynamic tromboelastometry show a strong thrombus formation? Isolated long PT ratio caused by oral anticoagulant therapy, in otherwise normal haemostatic and fibrinogen plasma values, is an indicator of risk of bleeding in open major surgery? Should we determinate Fresh Frozen Plasma or Prothombine complex correction on basis to Rotem parameters?
References:
1. The two tales of coagulation in liver transplantation. Curr Opin Organ Transplant 2008.
2. Monitoring of haemostasis in liver transplantation: comparison of laboratory based and point of care test. Anaesthesia, 2010
Learning points: Thrombin generation is normal in most of LT candidates; therefore, preventive correction is not necessary. Intraoperative management with Rotem may help to conduct haemostatic corrections. As more patients will be treated with OAT, more cases will be reported on the topic.

6AP3-7

Hepcon HMS Plus® reduced intraoperative protamine dosages following weaning from cardiopulmonary bypass

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Background and Goal of Study: It has been known that a certain number of patients present heparin resistance. Patients with heparin resistance are likely to require additional heparin due to inadequate activated clotting time (ACT) prolongations. Therefore, Hepcon HMS plus® (Hepcon®) was developed. Hepcon® is a point-of-care device, which calculates the required heparin and protamine dosages *in vitro* using blood samples during cardiovascular procedures. Although its overall accuracy in estimating required heparin dosages has been well researched, its overall usefulness has not been evaluated. The purpose of this study is to evaluate the clinical advantage of Hepcon® regarding necessary heparin and protamine dosages.
Maerials and Methods: Data between May 2011 and May 2012 were obtained and 235 patients undergoing cardiovascular surgery were analyzed in this study. Hepcon® was set up by medical engineers who have sufficient experience with this device. Data were analyzed using SPSS.
Results and Discussion: Post-heparin ACT did not reach the targeted levels in 46% (22 out of 48 patients) in patients with targeted ACT of 250 seconds and 66% (67 out of 101 patients) in those with the targeted ACT of 480 seconds. There was no significant difference in preoperative antithrombin levels in patients who reached beyond the targeted ACT levels and those who did not (103±13 v.s. 102±12, respectively), which implies that other factors may have played a part in this discrepancy. Compared with conventional methods (required protamine doses: 10-15mg/kg at targeted ACT=250s or 20-25mg/kg at targeted ACT=480s), Hepcon® significantly reduced the amount of prot-

amine administered after weaning off CPB ($P < 0.05$). ACT levels following the administration of protamine were lower than baseline levels in 87% (45 out of 52 patients) at the targeted ACT of 480s and 75% (15 out of 20 patients) at the targeted ACT of 250s. Heparin dosages did not differ significantly.
Conclusions: Protamine dosages were significantly reduced since Hepcon® was introduced in our hospital. This may reduce intra- and post- operative bleeding. Heparin dosages did not change significantly since its introduction. In patients who did not reach targeted ACT levels, preoperative antithrombin levels were within normal limits. Hepcon®-based protamine dosage estimations were clinically advantageous in most of the patients.

6AP3-9

Intra-articular administration of tranexamic acid in total knee arthroplasty in Hospital Clinico San Carlos (HCSC), Madrid

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Background and Goal of Study: Total knee arthroplasty has high risk of increased blood loss and transfusion, the use of antifibrinolytic agents is an alternative to reduce perioperative blood losses. Our study aims to compare the efficacy of TNA administered intravenously (i.v) versus intra-articularly (i-A) to reduce post operative blood loss and transfusion needs, patients undergoing unilateral total knee arthroplasty (UTKA) in HCSC.
Materials and Methods: Prospective cohort study in 93 patients who underwent UTKA from June to October 2012 in HCSC. Using data from clinical records the cohort was divided into 3 groups.
Group I: n=35(37,6%) 1,5g of i-A TNA diluted in normal saline (NS) upon ischemia release and surgical area irrigation plus 500 mg of TNA diluted in 10cc of NS through a drain clamped for 30 minutes.
Group II: n=32 (34.4%) 10mg/kg of i.v TNA 30 minutes before ischemia release.
Group III: n=26 (28%) no TNA administered.
The groups were compared in reference to ml of blood loss at 3, 6 and 24 hours and hemoglobin levels at 6, 24 and 48 hours after surgery. Needs of both autologous and allogenic transfusions were quantified in each group. Association between qualitative variables was evaluated with the x^2, or the exact Fisher test whenever necessary. Quantitative variables were analyzed with the Student T test and non parametric Mann-Whitney U test, the ANOVA test was used for the associations among groups.
Results and Discussion: Total 24 hour blood loss mean: GROUP I=172 ml (SD ± 183ml), GROUP II=242ml (SD± 228ml), GROUP III=531ml (SD±389ml). This shows that the blood loss was highest on group III ($p < 0.05$), without statistical significance in the difference between group I and II. Autologous transfusion mean was higher on group III with total transfusion mean of 350 ml (SD±396) ($p < 0.05$), groups I and II didn't reached the minimal required blood volume for autotransfusion, (group I: 57ml, group II:71ml), No differences were observed with allogenic blood transfusion, or with Hb levels. No major complications were encountered.
Conclusion(s): Our cohort showed reduced post operative blood loss using TNA in UTKA regardless of the administration route, without developing significant adverse effects on the study population. We conclude that using TNA and blood recuperator after surgery are efficient techniques to reduce transfusion needs.

6AP3-10

Laparoscopic surgery in a patient with platelet storage pool disease (SPD)

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Background: Platelet storage pool disease is a rare inherited bleeding disorder. Prevalence in the general population has yet to be estimated. In Poland, there are only 47 cases of all thrombocytopathies diagnosed. There is no known report in literature of a case of laparoscopic surgery in a patient with SPD. Safety of such a procedure is still to be assessed.
Case report: A 36 year old female with an ovarian cyst was admitted for elective laparoscopic surgery. She had a diagnosis of inherited SPD. Family history was positive.
The patient had no surgical intervention before. There were no abnormalities in laboratory tests before the operation. She received desmopressin DDAVP (0,4ug/kg) 90 minutes before the intervention. She had general anesthesia. Mild bleeding was observed during intervention. There was no need for platelet concentrate transfusion. In postoperative care, the patient received DDAVP for the following three days. In postoperative analgesia we avoided NSAIDs. In control laboratory tests there was a decrease of haemoglobin (130g/l v 116g/l), haematocrit (40%v36%) and platelets (247G/l v 169G/L).
The patient remained in a good general condition. After three days she was discharged home. Large bruising around the umbilicus was observed for four weeks.
Discussion: The clinical presentation of SPD is variable, ranging from mild bleeding diathesis to severe coagulation disorders. Excessive trauma- or surgery-related bleeding is a common feature of this pathology.[1] Patients with SPD do not present abnormalities in routinely performed laboratory tests.[2] Laparoscopic intervention in these patients is related with high risk of haemorrhage because of hindered haemostasis control.
Learning points: Proper diagnosis in patients with bleeding disorders and their relatives is crucial for the adequate preparation for a surgical intervention. Patients with inherited thrombocytopathy should be operated in specialist units with easy access to anti-haemorrhagic drugs. Adequate preparation and proper perioperative care allows us to avoid complications such as haemorrhage after laparoscopic interventions especially in patients with SPD.
References:
1. Campbell J, Yentis S. The use of thromboelastography for the peripartum management of a patient with platelet storage pool disorder. Int J Obstet Anesth. 2011;20:360.
2. Nurden P, Nurden A T. Congenital disorders associated with platelet dysfunctions. Thrombosis and Haemostasis 2008;99:253-263

6AP3-11

Tranexamic acid obviates need for postoperatively salvaged autologous drainage blood retransfusion as part of a blood management programme for total hip and knee arthroplasty

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Background and Goal of Study: Tranexamic acid (TA) reduces blood loss and allogenic blood transfusion after major lower limb arthroplasty.
The objective of this study was to assess whether TA reduces postoperative autologous drainage blood retransfusion after total hip (THA) and knee (TKA) arthroplasty in a clinical setting with initially low (< 15%) allogenic blood transfusion rates and a restrictive blood management programme.
Materials and Methods: After Ethical Committee approval and signed informed consent 101 patients undergoing THA and TKA were randomized to receive an intraoperative intravenous loading dose of 1,0g tranexamic acid followed by another 1,0g dose 3 hours later (TA group) or a matching volume 0,9% saline placebo (control group).
A postoperatively shed autologous blood recovery system (Drentech Surgical®, Redax) was used in all patients and the minimum reinfusion volume set at 250ml collected by 6 hours postoperatively. Packed allogenic red blood cells were transfused if Hb < 8 gdL^{-1} or 8-10 gdL^{-1} with symptoms of anemia. No erithropoietin or IV iron supplementation was used in any of the patients.
Results and Discussion: Ninety-eight patients were included in the final analysis (49 TA; 49 controls). There were no differences regarding patient characteristics, fluid management and surgery type (20 THA in TA vs. 22 in control group).
In the TA group 5 patients received an average of 300ml autologous blood retransfused (range 200-400ml) with an average total estimated 24 hour blood loss (EBL) of 634ml (range 330-1680ml) compared to 42 patients ($p < 0,001$) in the control group receiving an average of 607ml (275-1400ml) retransfused and an EBL of 1337ml (540-2900ml) ($p < 0.001$). Three patients in the TA group received an allogenic blood transfusion compared to 5 patients in the control group (NS; $p=0.714$)
Conclusion(s): TA significantly reduces postoperatively collected autologous drainage blood retransfusion after total hip and knee arthroplasty. This obviates the need for routine drainage blood salvage system use as part of a blood management programme in primary lower limb arthroplasty, entailing significant savings and reducing blood retransfusion related risks.

Neurosciences

7AP1-1

The locomotor and behavioral patterns following both a single-injection and double-injection rat model of subarachnoid hemorrhage

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Background and Goals of Study: Subarachnoid hemorrhage (SAH) has been described in humans to be associated with depression, anxiety and post-traumatic stress disorder. Yet, possibly due to the lack of experimental studies, little is known of the mechanism for post-SAH emotional and behavioral disturbances.
Therefore, there is a great need for the development of animal models for post-SAH behavioral abnormalities. This study describes the neuro-behavioral profile of rats following both a single-injection and double-injection model of SAH.
Materials and Methods: SAH was induced in 48 rats by 0.3 ml injection of autologous arterial blood into the cisterna magnum (single-injection model). Post-SAH vasospasm was induced in 24 of these rats by a second injection of blood into the cisterna magnum after 24 hours (double-injection model). 0.3 ml of saline was injected into the cisterna magnum of 24 additional rats (sham group). Neurological performance was measured at 24, 48 hours, 1, 2 and 3 weeks following SAH. 3 weeks after SAH, four behavioral tests were performed for the duration of 6 consequent days: open field test, sucrose preference test, elevated plus maze test and swimming test.
Results and Discussion: There was impaired neurological performance by 24 hours following SAH ($P < 0.0001$). For the open field test, the double-injection model was associated with less total travel distance ($P < 0.005$), reduced mean velocity ($P < 0.005$), and less travel distance and time spent in the central part of the field ($P < 0.05$). Sucrose preference was impaired after SAH ($P < 0.01$). For the plus maze test, the single-injection model was associated with less open arm entries ($P < 0.005$), decreased time spent in open arms ($P < 0.0005$), decreased closed arm entries ($P < 0.01$), and decreased platform entries ($P < 0.005$). There was decreased time spent on the platform in rats after SAH ($P < 0.005$). There was more immobility time during the swimming test in both the single-injection ($P < 0.005$) and double-injection ($P < 0.05$) groups compared to the control group.
Conclusions: The main finding of this study was that both, the single and double injection rat models of SAH, were associated with considerable behavioral disturbances including locomotor abnormalities, increased anxiety and depressive behavior.
Acknowledgements: This work was supported by the grant awarded to Alexander Zlotnik MD, PhD from the European Society of Anesthesiologists in 2010.

7AP1-2

The effect of dexamethasone on cerebral edema after cardiac surgery: a randomized trial

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Background and Goal of Study: Early postoperative magnetic resonance imaging (MRI) studies in cardiac surgical patients have demonstrated transient cerebral edema. Cerebral edema is a potential etiologic factor in postoperative cognitive dysfunction after cardiac surgery. The influence of corticosteroids on cerebral edema following cardiac surgery has not been studied. We hypothesized that high-dose intraoperative dexamethasone attenuates the development of cerebral edema after cardiac surgery.
Materials and Methods: After institutional review board approval, early postoperative cerebral MRI-scans were obtained from a subset of patients from the randomized, double-blind, placebo controlled, DExamethasone for Cardiac Surgery (DECS) trial, who received either dexamethasone 1mg/kg or placebo at induction of anesthesia. All patients underwent coronary artery bypass grafting (CABG). Outcomes observed were severity and incidence of cerebral edema.
Results and Discussion: 20 patients were included. In each study group, 9 patients could be analyzed. Patients were on average 66 years old [range 43 - 79], and spent 87 minutes [range 27 - 194] on cardiopulmonary bypass. The average delay between end of surgery and MRI-scanning was 80 minutes [range 37 - 129 min]. In the 18 CABG patients included in this study, we could not detect relevant degrees of cerebral edema. Only one patient in the dexamethasone group had slight cerebral edema.
Conclusion(s): Because we were unable to replicate older studies showing cerebral edema early after cardiac surgery, it seems unlikely that cerebral edema plays a role in the pathogenesis of postoperative cognitive dysfunction. The large difference in incidence of cerebral edema in our sample, compared to previous studies, might be due to medical and technological advances that were made in the last two decades.
References:
Dieleman JM, Nierich AP, Rosseel PM, van der Maaten JM, Hofland J, Diephuis JC, et al. Intraoperative high-dose dexamethasone for cardiac surgery: a randomized controlled trial. JAMA. 2012 Nov.7; 308(17): 1761-7.

7AP1-3

Perioperative management of aneurysmal subarachnoid hemorrhage (SAH): a European survey

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Background and Goal of Study: Many aspects of SAH therapy remain controversial. The European Neuroanaesthesia and critical care Interest Group (ENIG group) conducted a survey to determine the clinical practices of physicians treating SAH, and to evaluate the discrepancy between practice and published evidence.
Materials and Methods: The research team generated a 31-item online questionnaire, which was distributed by the ENIG Group. The survey remained online from early October to the end of November 2012. Fisher's exact test was used for the analysis of responder subgroups.
Results and Discussion: There were 262 completed surveys from in 14 European countries. Regarding criteria for intensive care unit (ICU) admission, 72% (98% in Germany vs 49% in Italy, $P < 0,001$) of respondents admitted all patients after SAH in ICU and 28% only high-grade patients (WFNS 3-5). In our sample, 81% asserted that aneurysm repair was conducted early (< 24 h of SAH), 15% within the 48 h and 4% within the 72 h after admission. Regarding aneurisms repair methods, a significant proportion of the center (65%) treated more than 60% of SAH by coiling (95% in UK vs 38% in Italy, $P < 0,001$), only 19% have a high-volume clipping (>60% of clipping) and 16% equally used both methods.
Regarding the anesthetic technique, more than 70% of respondents used total intravenous anesthesia. The most commonly used narcotic was remifentanil (70%) whereas sufentanil was used by 19% of respondents (45% in France; none in Italy, Spain, UK). Regarding neuroprotective strategy during temporary clipping, 35% of respondents used burst suppression (>50% in Spain and Austria), 3% hypothermia (13% in Switzerland). No clear threshold for blood pressure target could be identified during coiling, temporary clipping and in patients without vasospasm after the aneurysm is secured.
During the procedure, the most commonly used vasoconstrictor was noradrenaline (56%) whereas metaraminol was used only in UK (65%). Antiepileptic agents were administered only in patients with a history of seizures by 50 % of respondents whereas only 20 % used systematic prophylaxis.
Conclusion: This study found striking variability in practice patterns of European physicians involved in SAH. These heterogeneous practices are frequently at variance with available guidelines on SAH management. The lack of clear evidence on several clinical practices (for example the blood pressure target) would justify prospective trials.

7AP1-4

On the brink - from organ donation pathway to independent functioning following subarachnoid haemorrhage: case report

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Background: Surviving with excellent neurological function after a large subarachnoid haemorrhage is rare. Knowing which patients are going to beat the odds is a challenge for both the neurosurgeons and intensivists.
Case report: A previously healthy 61 year old female was found collapsed and unresponsive at home. On admission she had a GCS of 3/15, unreactive pupils and bilaterally up going plantar reflexes. A CT scan diagnosed a large right sided parietotemporal intracerebral bleed with an associated subdural collection. Her case was discussed with the local neurosurgical centre but treatment was felt to be futile. The poor prognosis was discussed with her family and their desire for organ donation expressed. She was taken to the intensive care unit whilst organ procurement was organised. To our surprise, during her stay in ITU, a vast and rapid improvement in her GCS was witnessed. A cerebral angiogram demonstrated an 8mm aneurysm arising from the right middle cerebral artery. At this point she was urgently transferred for an aneurismal clip and craniotomy. After a slow neurological recovery she had minimal residual disability.
Discussion: There are currently 7,546 patients awaiting organ transplants in the United Kingdom.[1] The demand for organs far out strips the supply. After brainstem death marked physiological instability can threaten the viability of organs for donation. [2] It is therefore essential that suitable donors are identified promptly. The organ donation pathway remains a balancing act between preserving the life of the donor and rapid organ procurement. Unusually in this case the desire to keep the organs donatable actually preserved the life of the donor. Survival following a Fisher's grade four subarachnoid haemorrhage with a GCS of 3 is rare. Had the patient's family not consented to organ donation, extubation would almost certainly have resulted in her death. The question, should all apparently fatal subarachnoid haemorrhages be admitted to critical care units? remains.
References:
1. Organ Donation and Transplantation Activity Data: United Kingdom: NHS, 2012.
2. McKeown DW, Bonser RS, Kellum JA. Management of the heartbeating brain-dead organ donor. *Br J Anaesth* 2012;108 Suppl 1:i96-107.
Learning point:
1. Clinical severity on admission does not always correlate with prognosis.
2. The organ donation pathway must remain adaptable.

7AP1-5

Gender impacts cognitive performance after experimental subarachnoid hemorrhage in rats

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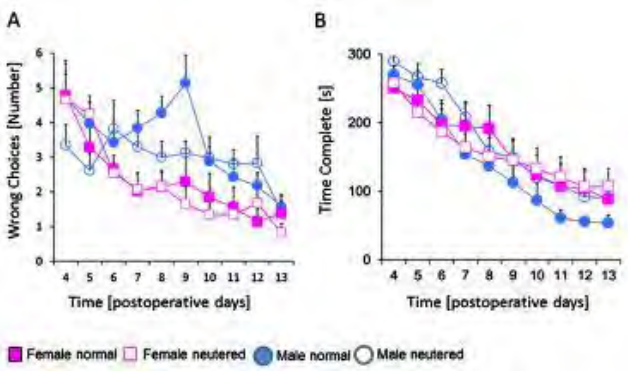
Background and Goal of Study: Incidence of and outcome after subarachnoid hemorrhage (SAH) differ between men and women. Women especially after menopause run a higher risk in developing an SAH compared to men and/or premenopausal women. While clinical studies report inconsistent results concerning a gender effect on mortality after SAH, no data exist yet about post SAH cognitive performance. Aim of this study was therefore to investigate long term neurocognitive outcome after experimental SAH in female and male, intact and neutered rats.
Materials and Methods: With institutional review board approval animals were assigned to 4 groups: female-intact, female-neutered, male-intact and male-neutered.
Animals were sham-neutered or neutered according to group assignment 4 weeks prior to induction of SAH. SAH was induced using the filament method (1). During 14 days after SAH, cognitive performance was assessed using the modified Hole Board-Test (mHBT). Data were analysed for the potentially predictable variables gender, neutering and SAH using general linear models ($p < 0,05$).
Results and Discussion: Cognitive performance, assessed by the number of mistakes made was stronger impaired in male animals compared to females (fig. A, "wrong choices"). Over 14 days however, male rats recovered quicker and more thoroughly than female rats (fig. B, "time complete"). Interestingly, there was no difference in cognitive performance between male intact and neutered or female intact and neutered rats. Hormonal status did not impact cognitive performance after SAH in either male or female rats.



[Figure A depicts the number of mistakes ("Wrong Choices") per 3 trials per day over 14 days following SAH in all four groups. "Wrong Choices" were significantly influenced by the factors time ($P<0.001$) and group ($p=0.002$)

*Figure B depicts the total time needed to perform a trial per day over 14 days following SAH in all four groups. "Time Complete" was significantly influenced by time ($p<0.001$ and time * gender ($p=0.02$)]*

Conclusion: Gender influences long term learning and memory function following experimental SAH in rats. While impairment is more prominent in male animals, they also recover better. Whether this functional outcome is mirrored by the underlying brain morphology will have to be determined in the upcoming analyses.
Reference:
1. Stroke 1995;26:1086-91; discussion 91-2

7AP1-6

Effectiveness of intraoperative admission of thiopental sodium during temporary clipping of cerebral vessels with aneurysms in patients with subarachnoid hemorrhage

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Objective: To estimate the effectiveness of the protection of the brain with sodium thiopental during temporary clipping bearing aneurysms vessels in patients with subarachnoid hemorrhage
Materials and Methods: A total of 47 patients aged 37 to 64 years with subarachnoid hemorrhage due to rupture of cerebral aneurysms (anterior and middle cerebral artery), who underwent osteoplastic craniotomy, clipping of the aneurysm. Severity was rated on a scale Hunt-Hess, NIHSS, multislice computed tomography data on the scale of Fischer. Diagnostics and dynamic assessment vasospasm performed by transcranial Doppler, estimating the average speed of blood flow in the concerned basin.
Premedication consisted of diazepam 0.15-0.2 mg / kg and promedol (trimeperidine hydrochloride) 0.2-0.3 mg / kg. Induction was carried out with sodium thiopental 4-6 mg / kg fentanyl 2.5-3 mg / kg.
General anesthesia was performed by sevoflurane (1.1-1.4 MAC) with fentanyl (3-4 mkg / kg per hour). Intraoperative monitoring included assessment of blood pressure, ECG, SpO2, PetCO2. Before the imposition of a temporary clip on cerebral vessels that carry aneurysm was administered intravenously at the rate of sodium thiopental 9-10 mg / kg, but not more than 1 gram. Neurological assessment was performed in the recovery of consciousness extubation and subsequently during the first day at least 1 time per 4 hours.
Results: On admission the severity of the patients on a scale of Hunt-Hess was 2.2 ± 0.7, the degree of neurological deficit NIHSS 5.9 ± 3.1 tomographic signs of *subarachnoid hemorrhage* scale Fischer 2.5 ± 0.8. The duration of surgery ranged from 240 to 340 minutes (265 ± 45 min), and the duration of an interim clips from 4 minutes to 47 minutes (25.4 ± 14.9 min). Time from the operation to restore consciousness to the level of RASS -2 from 15 to 37 minutes (25.4 ± 6.5), the time from the end of surgery to extubation from 37 to 123 minutes (70.4 ± 28.6 min).
At all stages of postoperative neurological assessment there was not a rise of cerebral symptoms, or the appearance of new focal symptoms.
Conclusion: Intravenous administration of sodium thiopental before applying a temporary clip on cerebral vessel bearing the aneurysm, the maintenance of adequate perfusion pressure was enough for an effective method of preventing the development of ischemic brain damage.

7AP1-7

Subarachnoid hemorrhage and electrocardiographic abnormalities: case report and literature review

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Background: Subarachnoid hemorrhage (SAH) is an emergent neurologic disorder caused by aneurysm or arteriovenous malformation rupture. In 25-90% of patients it may be associated with electrocardiographic (ECG) changes unexplained by preexisting disease, and these seem to relate with a poorer outcome[1,2].
Case report:
- ♀, 40 year-old, ASA I, admitted to hospital with headache, nausea and photophobia for 5 days.
- The laboratory data was normal but the ECG showed T wave inversion in DII, DIII, aVF, V4-V6. The CT scan showed a right frontoparietal SAH and the angiography revealed a 2,5mm saccular aneurysm of the right middle anterior cerebral artery. With the diagnosis of SAH Hunt Hess 2, Fischer 2 she was transferred to an ICU.
- 48 hours later surgical clipping occurred under total intravenous anesthesia. Intraoperatively, ST depression and *apparent* prolonged QTc were noted for 15 minutes but reverted spontaneously and were not associated with hemodynamic compromise. Postoperatively, only the T wave inversion persisted.
Discussion: The most common morphologic ECG changes in SAH patients involve the ST segment, T wave and QT interval[1,2]. The variation of their prevalence range may be due to differences in study design or the timing of data collection. Both Brouwers *et al* and Pasquale *et al* found that the abnormalities were more prevalent in the first 72 and 48 hours, respectively[1,2]. Whether they are transitory or enduring it's not clear but ST elevations apparently disappear while T wave inversions persist, as in this case[2]. Although less common, there's a risk for malignant arrhythmia development[1,2].
Huang *et al* showed that non-specific ST/T wave changes and prolonged QT diagnosed in the ED are independently associated with in-hospital mortality in adults with spontaneous SAH[2]. However, in our case the outcome was favorable.
ECG changes are often misdiagnosed as myocardial ischemia which may result in delayed treatment, wasteful investigations and increased costs. In cases of dead patients with SAH they may also cause erroneous rejection of the donor's heart due to fear of cardiac disease[2].
References:
1. Sommargren CE. Electrocardiographic Abnormalities in Patients With Subarachnoid Hemorrhage. Am J Crit Care (2002) 11: 48-56
2. Chatterjee S. ECG changes in Subarachnoid Haemorrhage: A Synopsis. Neth Heart J (2011) 19:31-4
Learning Points: If kept in one's memory, these ECG anomalies may be useful when evaluating a patient with SAH and in organ donation circumstances.

7AP1-8

Analysis of cerebral spinal fluid and plasma after aneurysmal subarachnoid hemorrhage by evaluating a metabolomic profile as biomarkers for early detection of arterial vasospasm

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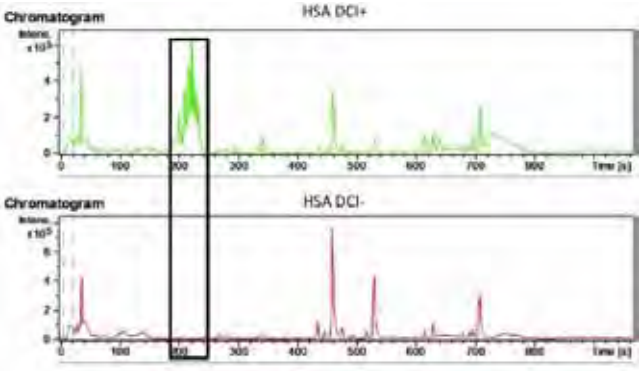
Background and Goal of Study: Delayed cerebral infarction (DCI) due to vasospasm is an important cause of complications and death after aneurysmal subarachnoid hemorrhage (SAH). Almost 30% of patients with SAH develop DCI within the first 2 weeks after the hemorrhage, being responsible for a poor neurological outcome [1]. There is currently no reliable biochemical marker for identify patients at risk of DCI. Metabolomics aim to identify and quantify the concentration of all metabolites of a biological system at a time and in a given circumstance.
The aim of the study was to identify plasma and cerebral spinal fluid (CSF) biomarkers predictive of DCI using a metabolomic screening method by fingerprinting.
Materials and Methods: We enrolled 34 consecutive SAH admitted in our intensive care unit with high intracranial pressure requiring external ventricular drainage. Blood and CSF were sampled in the first 24 h (T1) and between 48-72 h (T2) after admission. The occurrence of DCI was systematically sought according criteria of international guidelines [2]. The analyzes were performed on a chromatographic system (RRLC, Agilent) coupled to a high resolution mass spectrometer (ESI micrOTOF-Q, Bruker). Statistical analysis (ANOVA) and ROC curve were performed with SIMCA-P+ 12.0 (Umetrics).
Results and Discussion: At T1, plasma metabolomic analysis identified two metabolomic profiles with a significant difference between patients who have developed or not DCI (Fig1, $p < 0.05$). The presence of a spectral peak corresponding to polymeric forms of polyethylene glycol (PEG) is particularly discriminant. At T1, ROC curve analysis of the selected metabolite demonstrated a 84.6% sensitivity and 87.5% specificity to predict DCI. A spectral peak was also found in the CSF but was not significantly associated with DCI.



[Chromatographic profile in plasma at T1]

Conclusion(s): In this preliminary study, we identified the first day after SAH, a specific plasma metabolomic profile in patients who will develop DCI. Further analyzes are needed to precisely identify the metabolites which could be used as a biomarker to predict DCI.
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7AP1-9

Roles of testosterone and androgen receptor in the formation of intracranial aneurysms in male mice

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Introduction: Experimental and clinical studies suggest that sex steroids modulate cardiovascular diseases. Recently we have developed a mouse model of intracranial aneurysms. In this model, a combination of hypertension and a single stereotaxic injection of elastase into the cerebrospinal fluid results in aneurysm formation. Using this model, we studied roles of testosterone in the formation of intracranial aneurysm in male mice.
Methods: We used 8-week-old C57BL/6J male mice. DOCA-salt model was used to induce hypertension. Mice received unilateral nephrectomy. 7 days later deoxycorticosterone acetate (DOCA) pellet (2.4mg/day) was implanted subcutaneously, and they started to drink 1% sodium chloride solution.
On the same day of implantation of DOCA, elastase (25 milli-units) was injected stereotaxically into the cerebrospinal fluid in the right basal cistern to disrupt elastic lamina.
We tested whether testosterone would prevent intracranial aneurysms in our mouse model. Five groups of mice were studied. All of mice except those in the sham surgery group underwent orchiectomy on the same day of nephrectomy. The first group received orchiectomy alone (n=49). The second group received testosterone therapy (25ug/day, n=29). Mice in the third group received sham orchiectomy (n=33). To test if the protective effects go through androgen receptor, we prepared a group treated with testosterone and flutamide (25ug/day), which is specific inhibitor of androgen receptor (n=22) and another group treated with dihydrotestosterone (DHT, 8.3ug/day. n=19), which is the pure ligand of androgen receptor. 4 weeks after elastase injection, all mice were sacrificed.
Results: There was significant difference in the incidence of intracranial aneurysms between the mice received orchiectomy alone (87%) and orchiectomized mice with testosterone treatment (51%). The incidence of intracranial aneurysms significantly higher in the mice received orchiectomy alone than sham orchiectomized mice (51%). The incidence of testosterone and flutamide administered group (81%) was significantly higher than that of testosterone administered group. Incidence of DHT administered group (53%) was significantly lower than that of the group which received orchiectomy alone.
Conclusion: These findings suggest that testosterone has protective effects against the formation of intracranial aneurysms in male mice. Activation of the androgen receptor may exert these beneficial effects.

7AP2-1

Influences of p-glycoprotein on brain Bcl family proteins and cytokines in case of transient cerebral ischemia

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Background and Goal of Study: The P-glycoprotien (P-gp), which is produced from multidrug resistance 1a (mdr1a) gene, presents in vascular endothelial cells and astrocytes in brain to suppress the migration of the specific drugs, such as cyclosporin A, into the brain. Therefore, the modulation of the function of P-gp is a very important for drug treatment to brain injury. We have reported that absence of mdr1a P-gp reduces ischemic damage in brain using mdr1a knockout (KO) mice[1].
In the present paper, in order to examine how P-gp exacerbate ischemic damage in brain, both mdr1a KO mice and wild-type mice were subjected to transient focal ischemia and Bcl family proteins and cytokines in both mice were measured.
Materials and Methods: The experimental protocol was approved by the Tokyo Medical University Institutional Review Committee for the Use of Animal Subjects. Experiments were performed using male mdr1a KO mice and wild-type mice. Mice of both groups were subjected to transient focal ischemia by using 6-0 monofilament to occlude the middle cerebral artery. At pre-ischemia, 4h and 48h after reperfusion, mice of both groups were decapitated. Brains were used to assess the protein expressions of Bcl-2 and Bax by Western blot. Blood was collected from the mice 3h and 6h after reperfusion and we measured IL-1β and IL-6 by ELISA using plasma extracted from the blood. Data were presented as mean ± SD. One way ANOVA followed by Scheffe's test was used to compare for time-dependent change in each group and the Mann-Whitney was used to compare between groups at each time point.
Results and Discussion: At 48h after reperfusion, the expression of Bcl-2 protein in brain of mdr1a KO mice was significantly more than that of Wild mice. The expression of Bax protein in brain of mdr1a KO mice was significantly lower than that of Wild mice. At 6h after reperfusion, expression of IL-6 of plasma of mdr1a KO mice was significantly lower than that of Wild mice.
The results indicate that P-gp derived from mdr1a gene acts as the proapoptotic function through Bcl family proteins and increases IL-6 to induce the exacerbation of ischemic damage in brain.
Conclusion(s): Above all results conclude that the inhibition of the functions of P-gp on ischemic damage is a very effective strategy to protect the brain.
References: 1) Murozono et al., (2009)Reduction of brain infarction induced by a transient brain ischemia in mdr1a knockout mice. Neurochem Res. 34(9): p. 1555-61.

7AP2-2

The initial state mind and risk factors for fatal outcome in critically ill patients with acute cerebrovascular pathology

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Background and Goal of Study: We explore the relationship with a fatal outcome indicators of purine metabolism, and other diagnostic and therapeutic factors at baseline, "comatose" and "non-comatose" patients in the "acutest" period of stroke.
Materials and Methods: In 175 adult patients of intensive care unit or stroke unit, in the most acute period of cerebral stroke (regardless of type, variant), admitted to hospital in a coma or sopor and 451 similar patients admitted to hospital in a clear consciousness or shallow stunning, along with the generally accepted clinical, instrumental and laboratory tests in samples of CSF and venous blood was performed spectrophotometric determination of adenine, guanine, hypoxanthine, xanthine, uric acid (UA).
Results and Discussion: Most are high chances of occurrence of fatal complications during stroke in initially "comatose" patients ($p < 0.05$ in all cases) developing pneumonia (OR=3.0), respiratory failure (OR=3.7), shock (OR=11.2), revealing to 3rd day elevated concentrations in serum hypoxanthine (OR=4.0), xanthine (OR=8.0), UA (OR=24.0), a combination of high levels of uric acid in serum and CSF (OR=11.7).
Most are high chances of occurrence of fatal complications during stroke in initially "non-comatose" patients developing pneumonia (OR=10.5), respiratory failure (OR=7.4), shock (OR=14.2), revealing the 1st day stroke, high concentrations of serum uric acid (OR=3.9) or a combination of high levels of uric acid in serum and cerebrospinal fluid (OR=4.3), elevated serum uric acid (OR=15) by the end of the acutest period of stroke.
Conclusions: In "comatose" patients with acute stroke oxypurines is a highly offensive predictors of death. In "non-comatose" patients regarding laboratory factors are important adenine, guanine, uric acid. The level of uric acid is the most "powerful" of the studied clinical and laboratory factors instrumental in the original "comatose" patients, surpassing the severity of all other factors.

7AP2-3

Dynamics of the concentration of uric acid in the cerebrospinal fluid and death in cerebral stroke

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Background and Goal of Study: Uric acid (UA) - the most important hydrophilic antioxidant of the human body. We hypothesized that patients with different dynamics of the UA in the cerebrospinal fluid (CSF) during the acute period of stroke in different ways to respond to treatment.
Materials and Methods: In 626 adult ICU patients in the acute period of cerebral ischemic and haemorrhagic stroke, along with conventional clinical, and laboratory tests, the samples of CSF and venous blood on the 1st, 3rd, 7th day the onset of illness was performed spectrophotometric determination of the concentration of adenine, guanine, hypoxanthine, xanthine and UA, malondialdehyde (MDA).
Calculated activity of xanthine oxidase (XO) in the CSF and blood serum: total - as the ratio UA/hypoxanthine (XOsumm), primary - as the ratio xanthine/hypoxanthine (XO1), secondary - as the ratio UA/xanthine (XO2). Considered fairly significant results with $r(\chi 2) < 0.05$.
Results and Discussion: In patients with a reduction of UA in CSF in the acute period of stroke (54% patients) significantly important factors contributing to death, were: on the 1st day high XOsumm in CSF (OR=5.0), low XO2 (OR=7.7) and high XO1 (OR=12.2) , as well as in blood serum UA (OR=5.1), xanthine (OR=6.5), MDA (OR=8.0). The factors, significantly contributing to the survival, were: increased activity in 1st day in CSF XO2 (OR=11.8), hyperglycemia (OR=5.0) and hyperadeninemia (OR=5.1).
In the absence of reducing UA in the CSF in the acute period of stroke (46% patients), parameters, is significantly associated with a fatal outcome, were not found.
In patients with a reduction in UA significantly clinical factors, contributing to death, were: initial tachypnea (OR = 8.0) and depression of consciousness (OR=9.0), in without reducing UA in CSF - COPD (OR=8.6) and CHD (OR = 5.0). Drugs, significantly contributes to death by reducing UA in CSF, were osmodiuretics (OR=4.5), haemostatics (OR=5.0). In the absence of reducing UA in CSF influence of pharmacotherapy on death was absent.
Conclusion(s): Probably, in patients with a reduction UA in CSF in acute period of stroke, osmodiuretics and hemostatics not want to use, and it is desirable to maintain moderate hyperglycemia (6-10 mmol / L).

7AP2-4

Anesthetic preconditioning with sevoflurane to improve brain function post-resuscitation following experimentally induced global cerebral ischemia in rats

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Background and Goal of Study: To investigate mechanisms of anesthetic preconditioning of central nervous system in experimental setting in rats.
Materials and Methods: 39 male outbred white rats were randomly assigned to undergo anesthesia with sevoflurane (S; n=20) or chloral hydrate (CH; n= 19). Global cerebral ischemia was then induced by closed chest compression of the main cardiac blood vessels resulting in cessation of cerebral circulation [1]. After 10 (n=22) or 20 (n=5) min of cardiac arrest, rats were resuscitated with external cardiac massage and mechanical ventilation with air. Control animals (C; n= 6+6 in each group) did not undergo cerebral ischemia. Neurologic function was assessed daily for three days using the neurologic deficiency scoring system including visual and acoustic parameters, locomotion, reaction to the pain and capabilities to eat, drink and keeping themselves tidy. Quantification of total GSK-3 and phosphorylated (Ser^9) GSK-3beta (pGSK3b), the mitochondrial permeability transition pore key modulation enzyme, in brain tissue was performed by Western blotting [2]. Data were analyzed using the analysis of variance (ANOVA) and Wilcoxon-Mann-Whitney non-parametric test for mean comparison of groups.

Results and Discussion: In nonischemised brain, S increased phosphorylation of GSK3beta 2-fold. 20-min ischemia was lethal in nearly all experimental animals and associated with abrogation of pGSK3b concentrations in the brain leaving total GSK-3 content unaffected. After 10-min ischemia group, treatment with S decreased neurological deficiency, promoted the neurological recovery, increased weight gain vs. CH. In 10-min ischemia group resulted in more than 5-fold increase pGSK3b content in brain tissue. In this group, S preserved the concentration of pGSK3b at the control level (22,5±5 vs. 31±4 in C) relative units.
Conclusion(s): Preconditioning with S results in an improvement of neurological function and a limitation of the ischemia-reperfusion induced raise of pGSK3b.
References:
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7AP2-5

Brain tissue oxygenation in traumatic brain injury patients diagnosed with brain death

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Background and goal: Brain death (BD) is a clinical diagnosis. Although confirmatory tests are not mandatory in most situations, additional testing may be necessary for declaration of BD in patients in whom the results of specific components of clinical testing cannot be reliably evaluated.
Brain tissue oxygenation (PbtO2) is being increasingly used in the adult neurocritical care; however, data in BD patients is limited.
Therefore, we examined our experience with PbtO2 monitoring and BD in patients with traumatic brain injury.
Material and methods: This study was an institutional review board-approved, review of consecutive multimodal neuro-monitored brain-injured patients who were BD from 2008 to 2012.
Inclusion criteria were nonpregnant adults 18 years of age or older. All patients had a neurologic examination consistent with BD as performed by a board-certified neurosurgeon, anesthesiologist-intensivist and neurophysiologist, and, a confirmatory test (Electroencephalography (EEG) or somatosensory evoked potentials (SSEP).
Intracranial monitoring comprised an intracranial pressure monitor Camino [Integra Neurosciences, Plainsboro, NJ]) and PbtO2 monitor (Licox [Integra Neurosciences, Plainsboro, NJ]).
Results: Brain death occurred in twenty-four patients while PbtO2 monitoring was in progress. In all cases, PbtO2 deteriorated to 0 mmHg before the clinical diagnosis of BD was made, it was also characterized by a failure of response to an increased inspired fraction of oxygen.
Therefore, all patients who developed BD had PbtO2 of 0 mmHg at the time of brain stem testing, and it did not recover in any of the cases. Attempts to increase PbtO2 by increasing the FiO2 are reflected in high arterial partial pressure of oxygen values at the time of diagnosis of BD.
Conclusion: Limitations of our study is local (spanish) criteria for a diagnosis may differ from those used at other centers. Actual area of brain tissue monitored by the PbtO2 monitor is small (17mm^2) and conceivably, it may not reflect global brain tissue oxygen tension.
However, in this small series case, PbtO2 of 0 mmHg shows a strong association with traumatic brain death. In addition to its clinical utility in managing patients at risk of hypoxic/ischemic injury, PbtO2 monitoring has potential to support diagnosis of BD in traumatic brain injury patients.
References:
1. Neurology 2010;74:1911-1918.
2. J Neurosurg 2006;105:568-75.

7AP2-6

Monitoring of cerebral oxygenation and cognitive function in elective carotid endarterectomy

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Background and Goal of Study: Carotid endarterectomy can be associated with transient cerebral ischemia and the changes in cognitive function. The aim of this study was to explore the changes in cerebral oxygenation and cognitive function during different operative approaches for carotid endarterectomy.
Materials and Methods: Forty-five adult patients were subjected to elective carotid endarterectomy and enrolled into an ongoing prospective study. The patients were randomized into two groups: with temporary carotid bypass (the bypass group, $n = 24$) and without bypass (the control group, $n = 21$). All patents were monitored using cerebral tissue oxygen saturation ($SctO_2$, Fore-Sight cerebral oximeter, Casmed, USA) for intact ($SctO_{2INT}$) and operated ($SctO_{2OPER}$) sides separately. Invasive mean arterial blood pressure (MAP), SpO_2, $EtCO_2$ and arterial blood gases were registered. All variables were measured intraoperatively and at 3 and 6 hrs after the surgery. The target $SctO_2$ was maintained > 55%. All patients were tested for cognitive function using Montreal Cognitive Assessment Score (MoCA) 12 hrs before the intervention and postoperatively at 6 and 24 hrs.
Results and Discussion: In the control group, MAP was lower after the induction of anaesthesia, at 5 mins after primary clamping and after secondary unclamping ($p < 0.05$). In the bypass group, $SctO_{2INT}$ was increased after the induction of anaesthesia: 74 (72-80)% *vs.* 72 (66-76)%, and at 5 mins after primary carotid unclamping: 67 (65-70)% *vs.* 62 (61-66)% ($p < 0.05$ compared with the control group). There were no intergroup differences in $SctO_{2OPER}$ and the MoCA scores. We found relationship between MoCA results before and after the interventions ($rho = 0.65$-0.73; $p < 0.0001$) and between respective $SctO_{2INT}$ and $SctO_{2OPER}$ values ($rho = 0.32$-0.79; $p < 0.05$) except for 3 hrs postoperatively. In addition, $SctO_2$ correlated after induction, at 30 and 45 minutes with respective MAP values ($rho = 0.34$-0.38; $p < 0.05$). The MoCA scores reduced significantly in both groups after the surgery compared with preoperative values.
Conclusions: When $SctO_2$ was maintained > 55%, the transient bypass during elective carotid endarterectomy did not improve cognitive function despite decreased $SctO_2$ values over the intact hemisphere in the control group. The values of $SctO_2$ demonstrate associations between intact and operative sides and correlation with mean arterial pressure.

7AP2-7

Effects of xenon anasthesia on somatosensory evoked potentials in patients undergoing carotid endarterectomy

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Background and Goal of study: Xenon (Xe) anaesthesia is associated with stable blood pressure and rapid recovery from general anaesthesia. Thus, it appears favourable to apply Xe-based anaesthesia in patients at cardiovascular risk, e.g., during carotid endarterectomy. However, volatile anaesthetics frequently interfere with routine neuromonitoring, like somatosensory evoked potentials (SSEP). Thus, we test the hypothesis that SSEP amplitude and latency were not altered during Xe anaesthesia in patients prior to carotid endarterectomy.
Material and methods: Following IRB-approval, general anesthesia was induced in 20 unpremedicated patients by intravenous propofol (Prop)/ remifentanil and rocuronium. Patients were intubated and mechanically ventilated (F_IO_2 0.35) to normocapnia. Invasive arterial pressure, heart rate, and Narcotrend® depth of anaesthesia were continuously recorded. Arterial pressure was maintained by titration of intravenous norepinephrine. Median nerve SSEP amplitudes and latencies were repeatedly assessed over both hemispheres. Following recording of reference values during Prop, Xe was administered targeting end-tidal 60% in oxygen. Values during Xe were compared to Prop prior to surgical stimulation. *Statistics:* Mean ±SD, Student's t-test, $P < 0.05$.
Results and Discussion: Mean arterial pressure (Prop 91 mmHg ±15; Xe 93±10), heart rate (Prop 57 min^{-1} ±12; Xe 54±13), and anesthetic depth (Prop 38±6; Xe 38±6) did not differ between groups. Intravenous norepinephrine demand was significant larger during Prop (Prop: 0.067 μg kg^{-1} min^{-1} ± 0.042 Xe: 0,028 ± 0.021; P< 0.001). SSEP amplitudes were decreased by Xe (Prop: 3.6 μV ±1.7; Xe: 1.4±0.7; P< 0.001), while SSEP latencies were not

altered (Prop: 22.9 ms ±2; Xe: 22.6±2.9; P=0.49) A too low SSEP amplitude during Xe anaesthesia rendered SSEP monitoring impossible in one case, which had a baseline amplitude during Prop below 0.5 μV.
Conclusion: Anaesthetic concentrations of Xe decrease SSEP amplitude to 43 percent of baseline while SSEP latencies remain unaltered, thus preserving the value of SSEP monitoring as a tool for guiding surgical strategy.

7AP2-8

Brain death and cerebral oxygen saturation mesured by near-infrared spectroscopy

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Background: Brain death (BD) is a clinical diagnosis. Classically, includes the presence of coma, absence of brainstem reflexes and apnea. While confirmatory test is not mandatory, it's performance always takes place when you can not perform thorough clinical examination or during observation period (6 hours) under Spanish law.
Multimodal neuromonitoring is increasingly common in neurocritical patients, especially in severe traumatic brain injury (TBI). A noninvasive monitor for estimation of regional cerebral tissue oxygen saturation (rSO_2) by use of near-infrared spectroscopy (NIRS) (INVOS 5100® Cerebral Oximeter, Somanetics, Covidien, Mansfield, MA) is part of our diagnostic monitors.
Our group wanted to assess NIRS values in patients diagnosed with brain death.
Materials and Methods: We retrospectively reviewed patients diagnosed of BD after severe TBI between 2008-2012. This study was approved by an institutional review the Clinical Research Ethics Committee of our hospital, which included all patients with the criteria previously described. All patients were diagnosed of BD by three different specialists (Anesthesiologist-resuscitator, neurosurgeon and neurophysiologist) performing a confirmatory test (Electroencephalogram and somatosensory evoked potentials) in all of them. All patients at the time of diagnosis were monitored (intracranial pressure, brain tissue oxygen pressure, Bispectral Index and NIRS).
Results and Discussion: Twenty-four patients were diagnosed of BD after suffering TBI in our unit between 2008-2012 period. Values of regional noninvasive cerebral oximetry (rSO_2) were 68.74 ± 6.14 (mean ± SD). The tissue indexed oxygen extraction (SaO2- rSO_2) / SaO2) was 0.32 ± 0.07 (mean ± SD).
Conclusions: Our results show that values of regional cerebral oxygen saturation (rSO_2) measured by NIRS (INVOS 5100® Cerebral Oximeter, Somanetics, Covidien, Mansfield, MA) are within normal limits in patients diagnosed of BD after TBI. Likewise, variables derived from indexed cerebral oxygen extraction are also normal values.
In patients diagnosed of BD, where by definition there is no cerebral blood flow, is very striking these normal values. In view of these results, we must be extremely cautious assessing BD diagnose from noninvasive cerebral oximetry values.
References:
1. Neurology 2010;74:1911-1918.
2. J Neurosurg 2006;105:568-75

7AP2-9

Inhibition of pro-inflammatory enzyme soluble epoxide hydrolase exerts a neuroprotective effect after cardiac arrest and cardio-pulmonary resuscitation in mice

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Background and Goal of Study: Many survivors have neurologic deficits after cardiac arrest and cardio-pulmonary resuscitation (CA/CPR). Memory deficit is one of the biggest problems to be solved for them. Inflammation damages neurons and exacerbates outcome following partial brain ischemia. Activation of microglia, the brain resident immune cells, contributes to brain injury in brain stroke mice model. However, the role of microglial activation for neuronal damage after global ischemia during CACPR is not well defined. Inhibition of pro-inflammatory soluble epoxide hydrolase (sEH) reduces infarct size after stroke. We tested whether therapeutic inhibition of sEH after CA/CPR can reduce microglial activation and neuronal death, and improve memory function.
Materials and Methods: In male adult C57Bl/6 mice, 8 minutes of CA was induced by potassium chloride injection and CPR was performed with chest compression and epinephrine. The sEH inhibitor 4-phenylchalcone oxide (4-PCO; 5 mg/kg ip) or vehicle was injected at 5 minutes after CA/CPR and repeated daily. Neuro-scoring evaluation (NS) was performed 3 days after CAPR. Fear conditioning test (FCT) was performed 10 days after CA/CPR. Surviving CA1 hippocampal neurons were counted 1, 3 or 10 days after CA/CPR. Microglia activation was assessed by immunostaining for the activation marker Mac-2 at 1, 3, and 10 days.
Results and Discussion: Mice after CA/CPR (CA/CPR mice) showed some deficits on NS on day 3, whereas sham-operated mice didn't show any deficits. Delayed neuron death appeared on day 3 in CA/CPR mice in hippocampus CA1 area and persisted 10 days after CA/CPR. Activated microglia appeared on day 1, migrated to the injured hippocampus area CA1 on day 3 and persisted on day 10 in CA/CPR mice. 4-PCO administration surprisingly enhanced microglia activation on day 3 in CA/CPR mice, compared to vehicle mice. In the FCT, CA/CPR mice showed compromised contextual recall while cued recall was intact on day 10, suggesting a selective defect of hippocampus-dependent memory acquisition. 4-PCO treated CA/CPR mice froze more frequently to context, compared to vehicle treated mice (P=0.09), suggesting protected hippocampal memory function.
Conclusion: Experimental CA/CPR causes hippocampal neuronal death, microglial activation, and memory deficit in mice. Inhibition of sEH is a promising new approach to reduce neuronal death and improve memory function after CA/CPR.

7AP2-10

Comparisons of propofol and isoflurane at electroencephalographically equivalent doses on outcomes from severe forebrain ischemia in the rat

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Background and Goal of Study: The neuroprotective property of propofol has been established in focal and incomplete cerebral ischemia models, however, effects on global ischemia model has not been determined. Considering the anti-oxidant property and suppresion of brain metabolism, propofol might protect brain from global ischemic insult. We hypothetized that propofol would produce similar neurological and histological outcome from severe forebrain ischemic insult when administered electroencephalographically equivalent dose.
Materials and Methods: Fasted Male Sprague-Dawley rats, 8 - 12 weeks, were used. Anesthesia was induced with isoflurane. Surgery for two-vessel occlusion with sytemic hypotension was performed under strict physiological control with pericranial temperature control at 37°C. After surgery, animals were allocated to one of three groups; control (n=11), isoBSR (n=14), and propBSR (n=13). EEG burst suppression concentration (3 - 9 spikes/min) of either isoflurane or propofol was administered for 50 min. Control animals were administered 1MAC isoflurane. Then, severe forebrain ischemia was induced by hemorrhagic hypotension (MAP 30mmHg) combined with bilateral common carotid artery occlusion for 10 min. Anesthesia was maintained for 2 h after reperfusion. Morris water maze test (WM) was masured for 5 to 7 days post-ischemia. At 7 day, neuromotor score were measured, then, sacrificed with halothane. Brain slices were prepared and % dead hippocampal CA1 neurons were counted. Results are explessed as mean ± SD. Values were analyzed using ANOVA and Kruskal-Walis test. $P < 0.05$ was considered as significant.
Results and Discussion: Physiological parameters during stabilization were controlled as intended. Serum glucose was significantly elevated in IsoBSR (control: 116 ± 19g/dl, IsoBSR: 132 ± 16mg/dl, PropBSR: 91 ± 4mg/dl). MAP during EEG burst suppresion was significantly lower in isoBSR (control: 98 ± 12mmHg, isoBSR: 83 ± 14mmHg, propBSR: 94 ± 11mmHg). There were no differences among groups for WM and neuromotor score. IsoBSR and PropBSR had significantly higher %CA1 dead neurons compared to control (control: 16.9 ± 8.1%, IsoBSR: 74.8 ± 21.2%, PropBSR: 74.4 ± 11.6%).
Conclusion: Propofol did not protect brain against severe forebrain ischemia. Neuoronal effects of propofol and isoflurane were similar. Lack of neuroprotection by isoflurane might be due to elevated serum glucose level and lower MAP before ischemic period.

7AP2-11

Transient hypoxia regulates protein expression and phosphorylation in neuronal cells *in-vitro*

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Background: Transient episodes of cerebral ischemia are clinically highly relevant, as they are associated with various diseases and pathophysiological conditions. Nevertheless, the underlying mechanisms of the ischemia-reperfusion induced damage are still not fully understood, which is at least partially due to the lack of cell culture systems for the induction of rapid and transient hypoxic conditions.
Aim of the study was to establish a model that is suitable for the investigation of cellular and molecular effects associated with transient hypoxia and to gain insights into hypoxia mediated mechanisms employing a neuronal culture system.
Materials and Methods: Our recently described two-enzyme hypoxia model *(Huang et al., Anaesthesia 2012; Zitta et al., European Journal of Pharmacology 2010)* in combination with a semipermeable membrane insert system was employed to rapidly and reversibly induce hypoxic conditions (PO_2< 10mmHg) in the culture medium. Hydrogen peroxide assays, glucose measurements and Westernblotting were performed to evaluate the effects of hypoxia on neuronal IMR-32 cells.
Results: Using the two-enzyme model, hypoxic conditions were rapidly induced in the culture medium, while glucose concentrations gradually decreased and levels of hydrogen peroxide were not altered. Employing neuronal IMR-32 cells, we showed that 3h of hypoxia led to morphological signs of cell damage and significantly increased levels of LDH as a biochemical marker of cell damage (normoxia: 0.20 ± 0.05 a.u , hypoxia: 0.50 ± 0.08 a.u., P< 0.05). Expression of several proteins involved in cell damage and apoptosis was influenced by transient hypoxia (catalase: hypoxia: 1.71 ± 0.54, normoxia: 0.61 ± 0.08, P< 0.05; HIF-1 alpha: hypoxia: 1.88 ± 0.61, normoxia: 1.25 ± 0.36, n.s.; procaspase-3: hypoxia: 1.45 ± 0.19, normoxia: 0.98 ± 0.01, P< 0.05). Moreover, phosphorylation of the prosurvival kinase akt was significantly increased after hypoxia (normoxia: 0.05 ± 0.01, hypoxia: 0.65 ± 0.14, P< 0.05), while phosphorylation of stat5 and erk1/2 were not altered.
Conclusions: The two-enzyme hypoxia model in combination with a semipermeable insert is an excellent system for the investigation of cellular and molecular mechanisms associated with transient episodes of cerebral ischemia and may help to further unravel hypoxia associated pathomechanisms in various organs and tissues.

7AP3-1

Bumetanide, an inhibitor of NKCC1 (cation-chloride co-transporter isoform 1), inhibits the GABAergic excitatory action induced by midazolam in the hippocampus in neonatal rats

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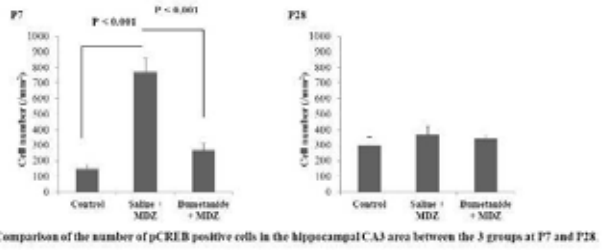
Background and Goal of Study: It has been shown that γ-aminobutyric acid (GABA) exerts excitatory actions on immature brain due to the increased expression of Na^+ - K^+ -$2Cl^-$ co-transporter isoform 1, NKCC1[1]. GABA is considered to induce Cl^- efflux through $GABA_A$ receptors leading to depolarization because high intracellular Cl^- concentration is maintained by NKCC1-dependent Cl^- uptake in immature neurons.
In this study, we sought to clarify if midazolam (MDZ), a GABA-mimetic hypnotic agent, causes neuronal excitation that can be blocked by bumetanide, a selective inhibitor of NKCC1.
Materials and Methods: We measured the effects of MDZ (0.1 μM) with or without bumetanide (20 μM) on the cytosolic Ca^{2+} concentration ($[Ca^{2+}]i$) in the hippocampal slices from rats at postnatal days 7 and 28 (P7 and P28) using Fura-2 micro-fluorometry. Neuronal activity in the hippocampus following intraperitoneal MDZ (20 mg/kg) with or without bumetanide (10 μmol/kg) was estimated by immunostaining of phosphorylated cAMP-response element binding protein (pCREB). Statistical comparisons were performed by two-way ANOVA followed by Dunnett's post hoc test for Ca imaging and one-way ANOVA followed by Tukey's post hoc test for immunochemistry.
Results and Discussion: MDZ significantly increased $[Ca^{2+}]i$ in the hippocampal CA3 area of P7 rats compared with the control in bicuculline-sensitive manner (P =0.029). In contrast, MDZ caused no significant changes in $[Ca^{2+}]i$ at P28. Bumetanide inhibited the increase in $[Ca^{2+}]i$ induced by MDZ at P7. The number of pCREB positive cells in the hippocampal CA3 area was significantly greater in MDZ group than in bumetanide+MDZ and control group in P7 but not P28 rats (Fig. 1). Data are given as mean ± SEM.



Comparison of the number of pCREB positive cells in the hippocampal CA3 area between the 3 groups at P7 and P28.

[Fig. 1]

Conclusion(s): Our results showed that MDZ exerted GABAergic excitatory actions on immature hippocampus both in vivo and in vitro. They indicate that NKCC1 underlies these actions, because bumetanide abolished both $[Ca^{2+}]i$ raise and up-regulation of pCREB induced by MDZ in P7 rats.
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7AP3-2

Dexmedetomidine alleviates short-term memory impairment through inhibiting apoptosis in the hippocampus following transient cerebral ischemia in gerbils

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Background and Goal of Study: Cerebral ischemia results from cerebrovascular occlusion, that leads to neuronal cell death and eventually causes neurological impairments. Dexmedetomidine is a potent and highly selective α_2 -adrenergic receptor agonist, and it has many actions such as sedation, anxiolysis, analgesia, and anesthetic sparing effects. In the present study, we investigated the effect of dexmedetomidine on the apoptosis in the hippocampus following transient global ischemia in gerbils.
Materials and Methods: Transient global ischemia was induced by ligation of both common carotid arteries in gerbils. Dexmedetomidine administrated intraperitoneally at respective dose (0.1 μg/kg, 5 μg/kg, and 10 μg/kg), once a day for 14 consecutive days, beginning one day after surgery. Short-term memory was determined using step-down avoidance task. Apoptosis was evaluated by terminal deoxynucleotidyl transferase-mediated dUTP nick end labeling (TUNEL) assay, immunohistochemistry for caspase-3, and western blot for Bax, Bcl-2, Bid, caspase-9, Apaf-1, and cytochrome c in the hippocampus.
Results and Discussion: Induction of global ischemia deteriorated short-term memory through enhancing of apoptosis in the hippocampus. Treatment with dexmedetomidine ameliorated ischemia-induced impairment of short-term memory with suppressing apoptosis in the hippocampus. The most potent anti-apoptotic effect of dexmedetomidine was appeared at 10 μg/kg. Under the normal conditions, dexmedetomidine exerted no significant effects on apoptosis in the hippocampus.
Conclusion(s): The present results suggest the possibility that dexmedetomidine is a useful therapeutic agent for the treatment of ischemia brain diseases.
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7AP3-3

Impact of hypothermia on emergence from isoflurane anesthesia in orexin neuron-ablated mice

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Background and Goal of Study: Orexin neurons regulate the sleep/wake cycle and are proposed to influence general anesthesia. In animal experiments, orexin neurons have been shown to drive emergence from general anesthesia. In human studies, however, the role of orexin neurons remains controversial, owing at least in part to the fact that orexin neurons are multifunctional. Orexin neurons regulate not only the sleep/wake cycle, but also body temperature. We hypothesized that orexin neurons do not directly regulate emergence from anesthesia, but instead affect indirectly through thermoregulation because anesthesia-induced hypothermia can greatly influence emergence time. To test our hypothesis, we used simultaneous measurement of body temperature and locomotor activity.
Materials and Methods: We used male orexin neuron-ablated mice (ORX-AB,n=6) and wild-type mice (WT,n=12). Body temperature was recorded using an intraperitoneally implanted telemetric probe, and locomotor activity was measured using an infrared motion sensor. Induction of anesthesia and emergence from anesthesia were defined behaviorally as loss and return of body movement for continuous 3sec. Mice received general anesthesia with 1.5% isoflurane in 100% oxygen for 30 min under three conditions: (1) The anesthesia chamber was warmed (32°C), ensuring a constant body temperature of animals during anesthesia. (2) It was maintained at room temperature (25°C), allowing body temperature to fluctuate. (3) In WT, it was cooled (23°C) so that their body temperature would decrease to the comparable value to ORX-AB at 25°C.
Results and Discussion: In the warmed condition, there was no significant difference between the ORX-AB and WT with body temperature, locomotor activity, induction time, or emergence time. In the room temperature condition, however, anesthesia-induced hypothermia was greater (-4.2±0.3 vs. -3.1±0.3ºC) and longer lasting in ORX-AB than that in WT . Emergence time in ORX-AB was significantly prolonged from the warmed condition (14.2±0.8 vs. 6.0±1.1 min) while that in WT was not different (7.4±0.8 vs. 4.9±0.2 min). When body temperature was decreased by cooling in WT, emergence time was prolonged as in ORX-AB. Induction time did not differ among temperature conditions or genotypes.
Conclusion: Impact of low body temperature on emergence time was so great that we should appropriately control the body temperature when studying the role of orexin neurons in emergence from anesthesia.

7AP3-4

Is the intraoperative cerebral oxygen saturation measured by the INVOS a predictor of postoperative cognitive dysfunction after cardiac surgery?

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Background and Goal of Study: The determination of intraoperative cerebral oxygen saturation (rSO_2) by means of near-infrared spectroscopy cerebral/somatic oximeter (INVOS®) allows a non-invasive assessment of the cerebral oxygen delivery and demand ratio in the frontal cortex region. It has been reported that rSO_2 may has prognostic relevance in cardiac surgery patients thus it is reflective of cerebral and systemic oxygen balance. We evaluated if intraoperative cerebral desaturation and depth of anaesthesia measured by bispectral index are related to postoperative cognitive dysfunction in cardiac surgery.
Materials and Methods: A prospective, before and after, longitudinal study in ASA II-IV patients scheduled for cardiac surgery undergoing intravenous general anesthesia with remifentanil plus propofol was done. Clinical and surgical parameters, cardiopulmonary function, intraoperative cerebral oxygen saturation (rSO_2) and bispectral index (BIS) were continuously recorded and corrected throughout surgery. Standardized test measuring capacity of attention, language, verbal and visual memory, visual-spatial orientation, executive, psychomotor and motor capacity as well as independence in daily life and the perception of the patient of their psychological situation (WAIS III, Mini Mental Test, trail making test a/b y digit & symbol, WSM III list of words, digit span, Stroop test, STAIC, EPQ-R, Yesavage, QOLIE-31 and Barthel test) were used to assessed the cognitive function before and 7 days after surgery.
Results and Discussion: Patients (n=16, 93.8% male, aged 55.5±4.2 years old) scheduled to coronary (43.8%), mitral valve replacement (12.5%), coronary plus valve replacement (25%) and others (18.8%) surgery, on pump 93.8% were enrolled. Reduction of rSO_2 higher than 10% at the end of the surgery compared with basal values were related with significantly lower values of concentration-auditive memory (WSM III) ($p< 0.05$), and with non-significant lower values of capacity of attention, language, visual-spatial orientation, visual memory and executive function 7 days after surgery. No differences were detected in motor capacity, physical dependence in daily life, anxiety levels and psychological evaluation at the end of the follow-up.
Conclusion: Reduced postoperative cognitive function, namely concentration-auditive memory, was weak associated with cerebral oxygen desaturation quantified by INVOS system in patients subjected to cardiac surgery.

7AP3-5

Changes of cortical connectivity during loss and return of consciousness

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Background and Goal of Study: There is prevailing evidence that altered states of consciousness are linked with changes of connectivity within cortical networks, in particular between frontal and parietal areas. For anaesthesia-induced loss and return of consciousness (LOC, ROC) the breakdown and recovery of fronto-parietal feedback connectivity has already been shown [1]. In the current study, a sequence of values between consciousness (baseline, BL), LOC and ROC was analysed by symbolic transfer entropy (STEn). STEn was used to assess changes of feedback (FB) and feedforward (FF) effective connectivity (EC).
Materials and Methods: Approved by the university's ethics committee, 15 healthy male volunteers participated. 32 channel electroencephalogram (EEG) was recorded. LOC was induced by propofol and defined clinically when subjects stopped squeezing the investigator's hand as requested. After LOC, propofol infusion was stopped. ROC was defined when subjects followed the investigator's requests again. Changes of EC were analysed by STEn, which quantifies the mutual information flow between two signals [2]. FB and FF connectivity was analysed at different sequences: during BL, 170s, 120s before LOC, during LOC, 120s and 170s after LOC, and 170s and 120s before and after ROC. STEn was computed over fronto-parietal EEG channel pair combinations (10 s length, 0.5-30 Hz total bandwidth, 50 ms time delay). A Wilcoxon test was used to identify differences between FF and FB EC (*: $p< 0.05$).
Results and Discussion: During BL there is a significant dominance of FB EC. This dominance decreases gradually during the transition of LOC, is reversed during LOC and increases again during ROC. The analysis at different time points shows that changes of FB and FF EC occur gradually during LOC and ROC. This suggests a continuous rather than a binary transition [3]. Interestingly, the clinically defined point of LOC and ROC corresponds with the turning point of FB/FF relationship. Although, as significant dominance of either FF or FB occurs later than the turning point (*: 120s, 170s after LOC, during LOC, 170s after ROC), it seems that conscious processing of external information fades, but is not abolished nor restored completely.
Conclusion(s): Changes of fronto-parietal EC correspond with the gradual transition between consciousness, LOC and ROC.
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7AP3-6

Postoperative delirium after anestesia with propofol, sevoflurane or desflurane: The Pinocchio trial. Interim analysis of safety and preliminary results

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Background and Goal of Study: Postopeartive delirium (PD) is a serious complication, associated with higher perioperative morbidity and mortality, increased demand for postoperative care and hospital costs. Various -modifiable and non modifiable- factors are associated with increased risk for PD, including the perioperative use of some drugs (i.e. atropine, benzodiazepines, ketamine, etc). Whether the use of propofol, sevoflurane or desflurane to maintain general anesthesia -any type of surgical procedure except cardiac and brain- is associated with a difference in the incidence of PD is currently

under scrutiny by the Pinocchio Trial. In this preliminary report we aim to describe the safety of the 3 tested regimens and the preliminary results on PD.
Materials and Methods: 275 patients (30% of the estimated sample size) were prospectively recruited in a multicenter international clinical trial. Mortality, cardiovascular (acute coronary syndrome: [ACS] and new onset atrial fibrillation [N-AF]) and pulmonary (acute respiratory failure [ARF] and pneumonia [PN]) complications that occurred within 7 postoperative days were recorded. In the postoperative period a diagnostic work up to assess cardiovascular and pulmonary complications (ACS, N-AF, ARF, PN) was completed only in patients that referred symptoms. The incidence of PD within 72 postoperative hours in the 3 treatment groups is also presented.
Results: In the 3 treatment groups there was no death within 7 postoperative days. The work up for cardiovascular and pulmonary complications was completed in 69/275 (25%) patients. Cardiovascular complications occurred in 12/275 patients (4.3%): ACS in 4/275 (1.45%) and N-AF in 8/275 (2.9%%); pulmonary complications occurred 18/275 (6.5%) patients: ARF in 7/275 (2.5%) and PN in 11/275 (4%), with no differences in the 3 treatment groups. The PD complicated 22/275 cases (8.3%), with an higher incidence in propofol group as compared to sevoflurane and desflurane (18.3% VS 6.9% and 2.5%; $p < 0.05$, by Fisher test).
Conclusions: In our study population, where preliminary data from Pinocchio Trial -as interim analysis- are presented, general anesthesia with propofol, sevoflurane and desflurane have similar safety profile as 7 days mortality, cardiovascular (ACS & N-AF) and pulmonary (ARF & PN) complications rate. The use of propofol as hypnotic to maintain general anesthesia, is associated with greater incidence of PD.

7AP3-8

Effects of medetomidine on basal excitatory synaptic transmission and on synaptic plasticity in mice hippocampal slices

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Background and Goal of Study: Alfa$_2$-adrenoceptors agonists are frequently used in veterinary and human anesthesia. Medetomidine, a α_2-adrenoceptors agonist, is a sedative/analgesic drug. However, it has been reported that the pharmacological manipulation of the noradrenergic system can affect the memory. Little is known about the effect of this drug on basal excitatory synaptic transmission and synaptic plasticity. Therefore we investigated the effects of different concentrations of medetomidine on basal excitatory synaptic transmission and on two forms of synaptic plasticity: paired-pulse facilitation (PPF) and long-term potentiation (LTP).
Materials and Methods: Evoked field excitatory postsynaptic potentials (fEPSP) were recorded in Schaffer fiber collaterals - CA1 pyramidal cell synapses of mouse hippocampal slices. Four slices per group and experiment were used. For basal synaptic transmission, and PPF, increasing concentrations of medetomidine (from 1 to 200 μM) were applied to each slice. For LTP experiments, individual slices were used for each medetomidine concentration (from 0.1 to 0.4 μM). LTP was induced by high-frequency stimulation (100 pulses at 100Hz). The synaptic transmission strength was assessed by measuring the initial slope of the fEPSP. LTP induction and maintenance were calculated. PPF was estimated as the ratio between the slopes of the second and first paired pulses, applied 50 milliseconds apart.
Results and Discussion: Medetomidine decreased basal excitatory synaptic transmission and LTP in a concentration-dependent manner. PPF only was affected by the highest concentration (200 μM) of medetomidine used.
Conclusion(s): Medetomidine decreased mainly LTP and basal excitatory synaptic transmission rather than PPF in the CA1 region synapses of the mouse hippocampus, suggesting the importance of postsynaptic mechanisms in detriment of presynaptic mechanisms for medetomidine-induced deficits in memory after sedation or analgesic procedures.
Acknowledgements: This research was funded in part by FCT (Lisbon, Portugal) and co-funded by COMPETE: 01-0124- FEDER-009497 (Lisbon, Portugal), through the project grants PTDC /CVT /099022/2008 and PTDC/SAU-NSC/122254/2010 and through a personal PhD grant (SFRH / BD/48883/2008).

7AP3-9

Surgery induces activation of indoleamine 2,3-dioxygenase, increases in pro-inflammatory cytokines and cognitive impairment in old rats

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Background and Goal of Study: Postoperative cognitive dysfunction is one of the most common complications in senior patients after surgery. However, the cause is largely unknown. Activation of indoleamine 2,3-dioxygenase (IDO), a rate-limiting enzyme of kynurenine pathway, which converts tryptophan into kynurenine in extrahepatic tissues, may contribute to cognitive impairment.[1,2] We therefore set out to assess whether surgery under anaesthesia can induce activation of IDO, neuroinflammation and cognitive impairment in old rats.
Materials and Methods: Male Sprague-Dawley rats (18-month-old) were randomly assigned into three groups: 40% oxygen inhalation, 1.8% isoflurane anaesthesia, left nephrectomy under 1.8% isoflurane anaesthesia. Cognitive function was assessed daily in Y maze. Levels of INF-r and IL-6, IDO, tryptophan and kynurenine in plasma and hippocampus were determined at 6 hour, 1, 3 and 7 days after anaesthesia or surgery by using MILLIPLEX MAP Rat Cytokine Panel, ELISA and HPLC.
Results and Discussion: Anaesthesia with 1.8% isoflurane for three hours increased IL-6 level in plasma at six hours, which returned to normal levels at 24 hours after the anaesthesia. The isoflurane anaesthesia alone did not induce cognitive impairment. Nephrectomy plus isoflurane elevated INF-r level in plasma, increased levels of IL-6 and IDO, and IDO activity, determined by the ratio of tryptophan and kynurenine, in both plasma and hippocampus, and finally induced cognitive impairment. These data show that surgery under isoflurane anaesthesia may induce activation of IDO, neuroinflammation and cognitive impairment in old rats.
Conclusion(s): These results suggest the potential role of IDO pathway in POCD pathogenesis, pending on further studies.
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7AP3-10

Comparison of postoperative learning deficit due to isoflurane exposure or propofol infusion

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Background: General anesthesia induces long-lasting deficits in cognition and learning, however, the mechanism underlying this phenomenon is poorly understood. We made isoflurane-exposured model and propofol-administrated model using young adult rat for comprehensive elucidation of postoperative cognitive dysfunction (POCD).
Materials and Methods: Seven days after 2-hour exposure to 1.8% isoflurane in Wistar-Imamichi rats (male young adult), we performed Inhibitory avoidance test (IA) to evaluate hippocampus-dependent contextual learning. We also peformed IA seven days after intraperitoneal administration of 150 mg/kg propofol. We measured extracellular field excitatory postsynaptic potentials (fEPSPs) of the hippocampal Schaffer collateral and the CA1 region after high-frequency stimulation of 100Hz, to test long term potentiation (LTP). We evaluated expression levels of GluA1 subunit of α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptor (AMPAR) of the dorsal hippocampus, which is a molecule modulating LTP formation.
Results and Discussion: In the IA test, isoflurane-exposured model showed significant decline (control [n=24] 230 ± 26 s; 1.8% isoflurane [n=24], 124 ± 23 s; t-test, $p < 0.01$), however, propofol-administrationed model didn't show declien (control [n=22] 318 ± 21 s ; propofol 150mh/kg [n=16], 351 ± 8 s; Student's t-test, $p = 0.14$). Hippocampal LTP was significantly suppressed (control [n=6], 126.51 ± 0.46%; 1.8% isoflurane [n=6], 104.98 ± 0.55%; Student's t-test, $p < 0.01$). Expression of GluA1 subunit was significantly increased in the dorsal hippocampus (control [n=8], 100 ± 9.7%; 1.8% isoflurane [n=7], 138.9 ± 8.9%; Student's t-test, $p = 0.012$). We revealed isoflurane exposure to adult rats suppress hippocampal LTP and bring about a delayed learning deficit (LD). We suggest that overexpression of GluA1 may

cause postsynaptic saturation of AMPAR and inhibit an additional insertion of learning-induced AMPAR into synapse. Isoflurane exposure may cause the overexpression or suppressed degradation of GluA1 in the hippocampus, however, the underlying mechanism still remains unclear. Also, it was suggested that the inhalation anaesthesia may constitute a major factor of POCD, because our model of propofol administration did not produce LD.
Conclusion: The isoflurane exposure to adult rat induces a delayed LD in contrast to propofol administration. Increase of GluA1 may be involved in LTP suppression in the hippocampus.

7AP4-1

The effect of intraoperative infusion of dexmedetomidine on the quality of recovery after major spinal surgery

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Background and Goal of Study: Surgery induces a variety of metabolic, endocrine, and immune changes collectively known as the "stress response," which may often lead to prolonged postoperative convalescence. Anesthetic management may modulate this physiological response, thus affecting the postoperative course. We hypothesized that the intraoperative administration of dexmedetomidine (DEX) would reduce the stress response and improve the quality of recovery in patients undergoing major surgery.
Materials and Methods: We conducted a prospective randomized double-blinded study of 54 patients undergoing multilevel spinal fusion. Anesthesia was maintained using either propofol/fentanyl/dexmedetomidine (PFD) or propofol/fentanyl/placebo-saline (PFS).The quality of recovery was assessed using a 40-item quality of recovery questionnaire and a 9-question Fatigue Severity Scores. The tests were carried out preoperatively and on postoperative days (POD) 1, 2, 3, and 30. Data were analyzed using SPSS software (version 18) using a multivariate and mixed model approach to test for the effect of surgery and drug group. Pairwise comparisons were assessed by means of the t test or rank tests after correcting for multiple comparisons.
Results and Discussion: The global 40-item quality of recovery questionnaire scores showed a significant effect of time ($F_{4,114}=22.63$, $P< 0.001$) and drug ($F_{1,51}=4.368$, $P=0.042$), with average scores decreasing to lower values on POD 1 (163.63±2.47) and POD 2 (170.94±2.38) compared with baseline (180.56±1.588, mean±SE, 2-tailed t tests, $P< 0.001$). By POD 3, scores were significantly lower (-13.74 point difference, $P=0.005$) in the PFS group (169.3±3.87) than in the PFD group (183.04±2.76). In both groups, plasma cortisol levels were highest in the postanesthesia care unit, whereas CRP levels were elevated on POD 1. Levels of cytokines IL-6, IL-8, and IL-10 were significantly higher immediately after surgery and at POD 1. Plasma levels of other cytokines were not affected by surgery. DEX delayed postoperative rise in IL-10 but not in IL-6 or IL-8.
Conclusion(s): DEX infusion during multilevel spinal fusions moderately improved the quality of recovery and possibly reduced fatigue in the early postoperative period. Moreover, it reduced plasma levels of cortisol and IL-10 in comparison with the control group. Our sample size was not sufficient to detect differences either in the incidence of complications or in clinically relevant outcomes.

7AP4-2

The effect of intraoperative infusion of dexmedetomidine on cognitive function after major spinal surgery

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Background and Goal of Study: Surgery induces a variety of metabolic, endocrine, and immune changes collectively known as the "stress response," which may often lead to prolonged postoperative convalescence. Anesthetic management may modulate this physiological response, thus affecting the postoperative course. We hypothesized that the intraoperative administration of dexmedetomidine (DEX) would reduce the stress response and improve the cognitive function in patients undergoing major surgery.
Materials and Methods: We conducted a prospective randomized double-blinded study of 54 patients undergoing multilevel spinal fusion. Anesthesia was maintained using either propofol/fentanyl/dexmedetomidine (PFD) or propofol/fentanyl/placebosaline (PFS). A mini-mental examination (MMSE), and digital span forward (DSF) and backward (DSB) were administered at baseline and on postoperative days (POD) 1, 2, 3. Data were analyzed using SPSS software (version 18) using a multivariate and mixed model approach to test for the effect of surgery and drug group. Pairwise comparisons were assessed by means of the t test or rank tests after correcting for multiple comparisons.
Results and Discussion: MMSE dropped significantly from BSL to POD 1 (-1.33, $P=0.034$), returning to near BSL values on POD 2 (-0.17 from BSL, $P=0.99$) and POD 3 (-0.09 from BSL, $P=0.99$). POD 1 and POD 3 differed by 1.44 U ($P=0.02$); hence, POD 1 was clearly different compared with both BSL and POD 3. On POD 3, there was a significant difference by study group (28.0 vs. 29.3; $P= 0.011$). Analysis of DSF and DSB showed no significance by time or drug group or by pairwise comparisons by drug group for a specific time. There were no clear and significant trends as with the previous metrics. However, both DSF and DSB showed a significant drop between BSL and POD 1 examining only PFS subjects. Thus, DSF reduced from 8.56 ± 0.40 to 7.67 ± 0.37, and DSB reduced from 5.26 ± 0.43 to 4.37 ± 0.37 for these patients ($P < 0.05$).
Conclusion(s): DEX infusion during multilevel spinal fusions moderately improved the quality of recovery and possibly reduced fatigue in the early postoperative period. Further, all quality of recovery domains including MMSE were numerically consistent with the 40-item quality of recovery questionnaire (QoR40) total results, with the exception of DSF and DSB tests. Our sample size was not sufficient to detect differences either in the incidence of complications or in clinically relevant outcomes.

7AP4-3

Effects of lidocaine mixed glucose on spinal neurotoxicity in rats

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Background and Goal of Study: Several studies have been reported that lidocaine spinal anesthesia can cause neurotoxicity. However, glucose is a common component of spinal anesthesia solution, so the present study is to investigate the morphological and functional changes of spinal cord and nerve roots after intrathecal injection of lidocaine mixed glucose and evaluate whether lidocaine mixed glucose can increas spinal neurotoxicity.
Materials and Methods: With our institutional approval of animal research and use committee. The male Sprague-Dawley rats were implanted intrathecal catheter at L3-4 vertebra in the caudal direction. And then 23 SD rats were randomly assigned to one of three groups: intrathecal lidocaine group (n=7), lidocaline mixed glucose group (n=8) and intrathecal normal saline group (n=8) which administrated 5% lidocaine 20μl, lidocaline mixed glucose (5% lidocaine +10% glucose, 20μl) and normal saline 20μl intrathecal injection, respectively. Four days after intrathecal injection in the three groups, sensory impairment was observed by using the tail-flick test. And then the rats were sacrificed, and the morphological changes of spinal cord and nerve roots were evaluated and scored by electron microscopy and light microscopy.
Results and Discussion: Four days after intrathecal injection, the elevation in tail-flick latency differed significantly in lidocaine mixed glucose-treated group from baseline and from latencies in lidocaine-treated group and saline-treated animals (Fig.1) ($P< 0.05$). Neuropathologic evaluation revealed more serious nerve root injury in lidocaine mixed glucose-treated group than that in lidocaine-treated group and saline-treated group ($P< 0.01$). Neuropathologic evaluation revealed minimal to mild nerve root injury in lidocaine-treated group and saline-treated group, there was no significant difference (Fig.2) ($P>0.05$).
Conclusion(s): These results suggest that 5% lidocaine can induce spinal neurotoxicity and 5% lidocaine mixed glucose may increase spinal neurotoxicity.
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7AP4-4

Straight forward and automated sleep scoring tool using electroencephalographic recordings in mice

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Background and Goal of Study: In order to study different sleep stages or to compare electrophysiological properties of sleep with effects of anaesthetic drugs, a clear separation of sleep stages is essential. Manual sleep scoring is very time-consuming and hence inefficient and expensive but also commercial scoring software is costly. We present a LabView-based auto-

mated scoring routine using recorded EEG and EMG signals from mice that is designed to reliably assign EEG/EMG episodes to the sleep stages awake, NREM-sleep, or REM-sleep.

Materials and Methods: EEG and EMG recordings of 10 hours from male C57BL/6-mice during the inactive period, (lights on at 9pm, 12:12 light-dark cycle) were used to design and evaluate the scoring routine. Sleep scoring software consists of a scoring and a rescoring routine. In the scoring routine 4s episodes of EMG (0-47Hz) and EEG (frequency bands: δ: 0.5-5Hz, (ii) θ: 6-9Hz, (iii) α: 10-15Hz, (iv) μ: 16-22.75Hz and (v) β: 23-31.75Hz) signals are processed as well as EEG median frequency. The scorer sets thresholds for EEG and EMG parameters processed according to [1, 2] and the routine runs a logic assigning the EEG/EMG episodes to a sleep stage. In the rescoring routine the scorer can select single stages or transitions, e.g., from NREM to REM and manually rescore the recordings. The results of four mice then were compared to EEG/EMG recordings from 15 mice at the same conditions that were scored using commercially available software.

Results and Discussion: The commercial software scored 24.3% (3.0%, mean and standard deviation) of the analysed EEG/EMG sequences as awake, 66.8% (2.6%) as NREM, and 8.9% (1.4%) as REM sleep. The LabView-based software calculated following fractions for 4 other animals at the same conditions: 26.0% (7.0%) awake, 65.6% (6.4%) NREM, and 8.4% (1.0%) REM sleep. The two scoring programmes did not lead to significant different results (x^2-test, $p=0.96$).

Conclusion(s): The presented software demonstrates an appropriate and fast solution to reliably detect sleep stages from EEG/EMG recordings in mice. With small modifications to the implemented algorithm the software could be easily adapted for EEG/EMG recordings from other sources than mice. The LabView-based routine can be effortlessly transformed into an executable file that runs on every computer without having to use any charged programmes.

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7AP4-5

Transient receptor potential ankyrin 1 alarms diverse inhalation stimuli in mice

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Background and Goal of Study: Transient receptor potential ankyrin 1 (TRPA1), a member of the TRP superfamily, is expressed in a subset of sensory neurons such as trigeminal and dorsal root ganglia and implicated as a mediator of nociception evoked by diverse peripheral stimuli including pungent chemicals. TRPA1 in airway is an important factor to trigger nociception and reduce respiration. TRPA1 has been proposed to be a mediator of airway irritation by those volatile anesthetics, such as Desflurane and Isoflurane 1). We hypothesized that TRPA1 would be involved in detecting environmental chemicals to avoid taking in such a threat.

Materials and Methods: To test our hypothesis, we did place preference/avoidance test using TRPA1 knockout mice (KO) and age matched wild-type mice (WT). On ahead the mice were allowed to freely explore a homemade apparatus that contains two chambers and the connecting tubes. The number of entry times and the amount of time spent in each chamber were recorded. None of the mice had initial bias for either chamber.

Then, each chamber was randomly assigned to a chamber in which a piece of cotton paper soaked with a test solution was placed. We first tested a TRPA1 agonist, formaldehyde. Next, we examined whether the loss of avoidance behavior in KO could be reproduced by pharmacologic blockade of TRPA1 (AP18) in WT. We also tested possible effect of other agonists of TRPA1, allyl isothiocyanate (AITC) and acrolein on avoidance behavior. Furthermore, a pathway of TRPA1 from the nostril was examined in the trigeminal ganglion by double immunohistochemical staining for TRPA1 and DiI.

Results and Discussion: During a test period of 20 min, WT never tried to enter the chamber with formaldehyde. KO entered the chamber without hesitation and even stayed there. Nasal but not subcutaneous administration of AP18 significantly reduced avoidance behavior in WT. AITC and acrolein also failed to induce avoidance behavior in KO. TRPA1-like immunoreactivity was detected in the trigeminal ganglion neurons that were antegradely labeled by intranasal injection of DiI.

Conclusion(s): This result indicates that the mice detect and avoid irritant substances via TRPA1. TRPA1 in the trigeminal nerve seems to participate in the avoidance behavior.

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7AP4-6

Local anaesthetics ameliorate kainic acid-induced neurodegeneration in rats

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Background and Goal of Study: Local anaesthetics have long been used for regional anesthesia and antiarrhythmia. Several recent studies have also demonstrated that antiarrhythmic dose of local anaesthetics possess neuroprotective properties. To further elucidate the possible neuroprotective mechanism of local anaesthetics, we examined the effect of local anesthetics in response to an excitotoxin kainic acid (KA)-induced neurodegenerative model in rats.

Materials and Methods: Sprague-Dawley rats were pretreated intraperitoneally with lidocaine (4 or 0.8 mg/kg), bupivacaine (2 or 0.4 mg/kg), or saline 30 minutes before KA (15 mg/kg) injection. KA-induced behavioral seizure activity was rated by Racine's scale. Animals were killed 3 days later and hippocampal slices were examined using Fluro-Jade B, neutral red, and CD11b immunohistochemistry staining.

Results and Discussion: Rats treated with lidocaine and bupivacaine significantly reduced KA-induced seizure behavior. Both lidocaine and bupivacaine protected against KA-induced neuronal degeneration assessed by Fluro-Jade B and neutral red staining in rat hippocampus. KA-induced microglial activation in rat hippocampus analysed by CD11b immunohistochemistry staining was also attenuated by both lidocaine and bupivacaine.

Conclusion(s): Our results collectively indicate that local anaesthetics may exhibit the neuroprotective effect via reducing excitotoxicity.

7AP4-7

Patients with chronic complete spinal cord injuries require less thiopental for induction of anaesthesia and subsequent endotracheal intubation

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Background and the Goal of the Study: Dose requirements of thiopental depend on patient characteristics and infusion rate. We determined thiopental dose requirements for induction of anaesthesia, and the effects of remifentanil on cardiovascular and bispectral index (BIS) responses to tracheal intubation in spinal cord-injured (SCI) patients undergoing general anaesthesia.

Methods: Twenty patients with traumatic complete SCI undergoing elective surgery were enrolled. Twenty patients without SCI served as control. Anaesthesia was induced with thiopental, followed by remifentanil 1 μg/kg and rocuronium 0.8 mg/kg, and maintained with 2% sevoflurane and 50% nitrous oxide in oxygen after tracheal intubation. Thiopental was administered at a rate of 50 mg/15 s until abolition of the eyelash reflex. Thiopental doses, BIS values, systolic arterial blood pressure (SAP), heart rate (HR) and plasma catecholamine concentrations were measured.

Results: Total thiopental dose required to abolish the eyelash reflex based on total body weight (BW) (5.26 ± 0.87 vs. 3.91 ± 1.07 mg/kg, $P < 0.001$) or lean BW (6.56 ± 1.37 vs. 5.24 ± 1.36 mg/kg, $P < 0.01$) were significantly smaller in the SCI group than in the control. SAP was decreased by induction of anaesthesia with thiopental and remifentanil, and increased by tracheal intubation in both groups. However, the peak SAP after intubation was smaller in the SCI patients. HR increased significantly above baseline values following intubation in both groups with no significant intergroup differences. Hypertension was more frequent in the control group. Norepinephrine concentrations remained unaltered following intubation in both groups.

Conclusions: These results suggest that the dose requirements of thiopental for induction of general anaesthesia and subsequent tracheal intubation are reduced in the SCI patients.

7AP4-8

Postnatal exposure to phenytoin, but not phenobarbital, results in decreased seizure threshold in two experimental models of epilepsy in adult rats

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Background and Goal of Study: Glutamate and GABA are major neurotransmitters in the mammalian brain. Many drugs used in daily anesthetic practice interact with glutamate and GABA receptors to produce their desired effects. The possibility of anesthesia-induced neurotoxicity in neonates or infants has become the subject of heated debate within the anesthesiological society. The evidence for anesthesia-induced neurodegeneration and resulting long-term adverse effects in animal models are compelling.
Our previous experiments clearly showed that neonatal exposure to phenobarbital, but not phenytoin, results in decreased learning and memory skills in adult rats. The aim of the present study was to evaluate the impact of neonatal exposure to phenobarbital and phenytoin on epileptogenesis in the adult rat.
Materials and Methods: The experimental protocol was approved by the Ethical Committee of the Medical University of Lublin, and all the procedures were in compliance with the European Communities Council Directive of 24 November 1986 (86/609/EEC). All experiments were carried on male Wistar rats. In order to induce apoptosis rat pups were treated with phenobarbital (50 mg/kg *ip*) or phenytoin (50 mg/kg *ip)* during the first two postnatal weeks of life (day 3,5,7, and 9). Long-term effects of phenobarbital and phenytoin exposure on epileptogenesis in adulthood (at the age of 2-3 months) were assessed with the use of two experimental models of epilepsy: pilocarpine- and pentylenetetrazole-induced seizures.
Results and Discussion: Phenytoin pretreatment during synaptogenesis resulted in a significant decrease of the 50% convulsive doses (CD_{50}) of pilocarpine (314,7 vs. 278 mg/kg) and pentylenetetrazole (84 vs. 68,4 mg/kg) indicating lowering of the seizure threshold. The free plasma and brain levels of studied proconvulsants remained were not statistically different between phenytoin treated rats and controls. Surprisingly, we did not observe any changes in susceptibility to seizure tests in rats exposed to phenobarbital.
Conclusion(s): Our findings indicate that the long term adverse effects produced by drugs interfering with neurogenesis during the neonatal period may determine the seizure susceptibility in the adult life.
Acknowledgements: This study was financed by the Polish Ministry of Science and Higher Education (2010/2011)

7AP4-9

Early brain mitochondrial dysfunction in a mouse model of sepsis

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Background and Goal of Study: The pathogenesis of sepsis-induced multiple organ failure is complex and our understanding of the pathophysiology is incomplete. The theory of cytopathic hypoxia suggests mitochondrial dysfunction as part of the etiology caused by an inability to utilize available oxygen. It has been shown that sepsis can induce brain mitochondrial dysfunction by increased uncoupling of the oxidative phosphorylation system. The aim of the present study was to evaluate the temporal dynamics of brain mitochondrial function in a mouse model of sepsis.
Materials and Methods: The ethical committee of animal experiments at Tokyo Medical University (H-24013) approved the study. Sepsis was induced by cecal ligation and puncture (CLP) and controls were sham operated. Using high-resolution respirometry (Oroboros Oxygraph-2k) brain homogenates from 30 C57BL/6 mice were analyzed at either 6 h or 24 h. ROS-production was measured simultaneously using fluorometry (Oroboros LED2 module). An analysis protocol of complex-specific substrates and inhibitors examined the role of the individual respiratory complexes as well as the uncoupled maximal respiratory capacity not restricted by phosphorylation.
Results and Discussion: In the 6-hour group there was a statistically significant increase in the oligomycin-induced LEAK state in septic mice compared to controls ($P = 0.037$) and a trend to lower complex I function in the sepsis group ($P = 0.124$) which resulted in a decreased respiratory control ratio ($P = 0.043$). At the 24-hour time point there was also a trend to lower complex I function in the sepsis group ($P = 0.077$) and a minor non-significant increase in the LEAK state ($P = 0.262$) resulting in a statistically significant decreased respiratory control ratio ($P = 0.029$). The convergent complex I+II, maximum uncoupled capacity of the electron transfer system, uncoupled complex II and complex IV showed similar results when comparing septic mice to controls at both time-points. Furthermore the data indicates that there was no difference in ROS-production between the groups.
Conclusion(s): The present study demonstrates that sepsis induces an early brain mitochondrial dysfunction by reducing the respiratory efficiency, i.e. the coupling of oxidative phosphorylation.

7AP4-10

Thresholds of cerebrovascular autoregulation under sevoflurane based general anaesthesia: a comparison between young and elderly patients

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Background and Goal of Study: Cerebrovascular autoregulation (CA) is thought to be efficient between mean arterial pressure (MAP) values ranging from 50 to 150 mmHg (autoregulatory plateau). In patients without intracranial or cerebrovascular disease undergoing surgery under general anaesthesia the individual thresholds of CA have never been determined so far. In contrast to static CA which seems to be intact even with sevoflurane concentrations > 1 MAC, we and others have previously found that dynamic CA may be disturbed (1, 2) and may be more altered in elderly patients. Goal of this study was to determine the thresholds of CA under sevoflurane based general anesthesia in young and elderly patients.
Materials and Methods: 133 patients (18-40 yr: n=49, >65 yr: n=84) undergoing elective major surgery under standardized general anaesthesia (penthotal, fentanyl, atracurium, sevoflurane) were investigated. Cerebral blood flow velocity (FV) was assessed in the middle cerebral artery using transcranial Doppler. MAP was measured continuously using a plethysmographic method. Curves of CA were created by calculating the mean Mx-index at different MAP values (5 mmHg intervals) during the surgical procedure. Mx is based on changes in FV due to variations in MAP, $Mx \geq 0.4$ was defined as a loss of CA. Induction and emergence were excluded from analysis.
Results and Discussion: The proportion of patients having a preserved CA over the whole range of MAP's observed during the intervention was low but identical in both groups (14%). Conversely, elderly patients were more susceptible to have an absence of CA at all MAP values than younger patients (16% vs 6%). Younger patients tended to have a lower inferior and a higher superior threshold of CA than elderly patients.
As a consequence, the autoregulatory plateau was wider in young than in elderly patients, however, this difference did not reach statistical significance ($p = 0.16$). A linear regression analysis showed that the repartition of inferior and superior thresholds cannot be attributed to age.
Conclusion(s): These data suggest that under sevoflurane a relevant number of patients has a shortened plateau of their individual CA curve. This seems to be independent of age. The effect of sevoflurane on intraoperative autoregulation needs to be studied in more detail.
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7AP5-1

Functional status predicts short-term outcome in elective neurosurgery: a prospective study of 366 consecutive craniotomy patients

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Background and Goal of Study: There are few reports on reliable preoperative risk assessment scales in elective cranial neurosurgery. The modified Rankin scale (mRS) describes the patient's functional status on a scale of 0 to 6, with a decrease in the functional capability as the score increases. We evaluated the ability of the mRS to predict the short-term outcome of elective craniotomy patients.
Materials and Methods: The study was approved by the Ethical Review Board of the Helsinki and Uusimaa Hospital District. Adult patients (18 years and older) undergoing elective craniotomy in Helsinki University Central Hospital between 7.12.2011 and 30.10.2012 were eligible to be included in the study. The follow-up period was 30 days. The mRS and the ASA class were evaluated preoperatively by one anesthesiologist. Major morbidity was defined as the occurrence of hemiparesis, thromboembolic complications (deep vein thrombosis, pulmonary embolism), cardiac complications (acute

myocardial infarction, new ventricular arrhythmias, cardiogenic shock, cardiac arrest) or major infection (meningitis, pneumonia, sepsis) at any time during the 30-day follow-up. Data was collected from patient questionnaires and hospital records. The 30-day follow-up status was obtained by a structured phone interview to the patient or proxy. The predictive values of the mRS and the ASA class were determined by Pearson Chi square test.

Results and Discussion: The informed consent was obtained from 366 (75.3%) out of 486 consecutive patients, who were thus included in the study. The median age was 55.9 years (range 18 to 87 years), and 62.0% of the patients were female. 30-day mortality was 1.4%, and 30-day major morbidity rate was 13.6%. Due to the low mortality rate, statistical analyses for mortality were unreliable. The mRS predicted 30-day major morbidity (p=0.007). The predictive value of the ASA class did not reach statistical significance.

Conclusion(s): This first large scale study on an unselected patient population suggests that the mRS is a reliable predictor of major short-term morbidity in elective cranial neurosurgery. Further studies are necessary to assess whether these results are widely applicable and suitable for increasing patient safety.

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7AP5-2

Does sevoflurane preserve regional cerebral oxygen saturation better than propofol?

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Background and Goal of Study: Sevoflurane and Propofol reduce the Cerebral Metabolic Rate for Oxygen similarly but Propofol reduces Cerebral Blood Flow more than Sevoflurane (MAC 1.0)[1]. We examined the effects of these anesthetics on cerebral oxygen using Regional Cerebral Oxygen Saturation ($SrcO_2$).

Materials and Methods: After institutional approval and signed, informed consent, fifty-four patients undergoing elective minor surgery (tumorectomy for breast cancer or inguinal hernia repair) were randomly assigned to receive Sevoflurane (Group S) or Propofol (Group P) anesthesia. Exclusion criteria included preexisting cerebrovascular diseases, age less than 18 or more than 65, American Society of Anesthesiologists physical status ASA IV or V, blood loss more than 200 mL or hemodynamic instability. $SrcO_2$ (INVOS^{å} 5100C ,Somanetics Corporation, Troy, MI, USA), deep anesthesia (BIS VISTA^{å} Aspect Medical Systems, Massachusetts, USA). and hemodynamic parameters (blood pressure, heart rate) were measured before and during the surgical procedure every 5 minutes.

Results and Discussion: A total of fourty-eight patients (age 47.3±12.2, BMI 27.2±5.6, male 73%, ASA I 23%, ASA II 69% ASA III 8%) were studied between September 2009 and September 2010.There were no significant differences in hemodynamic parameters and deep anesthesia between the two groups. Both had similar baseline $SrcO_2$ (Group P 63.4±9.9 and Group S 61.4±11, p=0.52). The relative maximum decrease was 9.6±10.7% in Group P and 4.2 ±7.2 in Group S (p=0.048). Cerebral desaturation (SrcO2 < 80% of baseline or absolute value < 50% during 15 seconds) occurred in 4 patients in Group P exclusively. $SrcO_2$ adjusted for baseline was higher in group S (67.3 ± 1.8%) than in Group P (4.2 ± 1.6%,p= 0.018).These findings suggest that Sevoflurane anesthesia may provide a wider margin of safety against impaired cerebral oxygenation[2].

Conclusion(s): $SrcO_2$ is better preserved with Sevoflurane than with Propofol anesthesia. Further studies are required to investigate whether our observed results reflect fewer incidence of postoperative cognitive dysfunction using sevoflurane.

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7AP5-4

Dexmedetomidine for DBS in Spain

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Background: Dexmedetimidine is a drug that has not yet been approved in Spain. It is commonly administered as a loading dose (0.5-1 $\mu g \times kg^{-1}$ in 10 min) followed by an infusion (0.2-1 $\mu g \times kg^{-1} \times h^{-1}$). The loading dose may associate bradycardia and hypertension, and the infusion dose is most commonly associated to mild hypotension. In deep brain stimulation (DBS) surgery, adequate blood pressure management is crucial.

We present our initial experience, reviewing the hemodynamic characteristics and management of 12 patients sedated exclusively with this protocol of dexmedetomidine for DBS.

Materials and Methods: Prospective observational study, approved by the IRB of the University Hospital of Navarra, where 12 patients underwent DBS for abnormal movements. These patients consented in receiving dexmedetomidine knowing that it was a labeled by the Spanish ministry of Health as a "foreign drug" and thus required a special consent and process. All patients received the loading dose followed by infusion titrated according to the sedation level of each individual patient, and to microelectrode recording (MER) requirements. We recorded heart rate, systolic and diastolic non-invasive blood pressure basally, after loading and during infusion. A difference of 20% to basal was considered significant. Data were analyzed using SPSS™ 15.0.

Results and Discussion: Of the 12 patients 3 had previous high blood pressure. After the loading dose 50% developed bradycardia but required no treatment. No events were reported regarding systolic hypertension during the loading dose, and only 1 case (8.3%) had a >20% increase in diastolic blood pressure (DBP). 2 cases (16.6%) required treatment right after finishing the loading dose. 4 patients (33%) were on dexmedetomidina during the whole procedure (mean 342.5 min) while the rest had a pause during the recording phase (mean 72 and 47 min respectively). No adverse effect or perioperative incident related to dexmedetomidine was encountered.

Conclusions: Dexmedetomidine is a safe drug and allows adequate neurophysiologic evaluation without affecting MER quality. Some patients may develop bradycardia and hypertension with the loading dose, but few as we see in this series will require treatment. Continuous infusion does not cause these problems and can be used without loading in higher risk patients. Anxyolisis and hemodynamic stability are two important factors in this patient population.

7AP5-5

Dexmedetomidine provides smooth and safe sedation for awake craniotomy

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Background and Goal of Study: Nowadays awake craniotomy is becoming more and more popular. This method can sufficiently improve safety of neurosurgical manipulations near eloquent areas of the brain. Dexmedetomidine is a highly selective α_2-agonist with dose dependent sedative effect, which also has no ventilation depression. We aimed to verify its effectiveness and safety for awake craniotomy.

Materials and Methods: Our team performed 12 awake craniotomies under dexmedetomidine infusion in 2012. The analgesic component of the anesthesia included regional scalp block by ropivacain. The level of consciousness was being evaluated by BIS monitoring. Hemodynamic monitoring included invasive blood pressure measurement. The respiratory function was assessed by blood gases analysis. No airway protection devices were used. Results were expressed as median [quartile values], and statistical analysis included Wilcoxon matched pairs test.

Results and Discussion: There were 6 men and 6 women from 28 to 75 years old in the study. Dexmedetomidine infusion 0,7-1,4 mkg/kg/h with small boluses of propofol (1-2 ml) used at times of maximal patient stimulation provided comfortable sedation and anxyolisis for the patient during the surgical approach in every case. No respiratory depression was observed and $PaCO_2$ was stable during the infusion (38 [37;40] mmHg). The variation of ABP_{mean} during dexmedetomidine infusion was insignificant with tendency to decrease (p>0,05). Heart rate significantly decreased by 17% (p< 0,05), but rare episodes of bradycardia were successfully treated by atropine. Brain mapping was successful in 10 out of 12 cases. The first unsuccessful case was associated with the development of generalized seizures which led to consciousness and respiratory disturbances. The second unsuccessful mapping was

due to the progress of aphasia in 75 year old patient with preoperative moderate speech disorders that made mapping unreliable. In cases of successful mapping infusion of dexmedetomidine was maintained at rates 0,1-0,2 mkg/kg/h for neurological monitoring during tumor resection. Patients didn't have any complaints of severe discomfort during all procedures. No negative recalls were reported by patients in postoperative period.
Conclusion: Dexmedetomidine provides optimal sedation level and anxyolisis for awake craniotomy. It maintains stability of vital signs and provides quick awakening for brain mapping or neurological assessment.

7AP5-6

Variants of hypothalamic disruptions in neurosurgical patients

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Background and Goal of Study: As a result of the extensive studies of the neurophysiology and brain biochemistry during the last 10 years it has been proven that hypothalamus has a leading role in the sustaining the homeostasis and formation of the adaptive reactions. When system (CNS) is damaged then the reflexive, integration and regulative functions of the oral parts of the brain can be disrupted.
Materials and Methods: We observed 156 patients, of both sexes and between 10 and 75 years old, who had had CNS damaged with life-threatening homeostasis disruptions of varaying origins in the cource of 10 years. We noted the following critical homeostatic failure manifestations: arterial hypertension 30% above normal level, arterial hypotension below 60 mmHg, arrhythmia, hyperthermia>39,hyperglycemia>20 mmol/l, hyponatriemia < 120 mmol/l, hypoosmolality of serum< 260 mosm/kg, hypernatriemia>170 mmol/l, hyperosmolality of serum >350 mosm/kg. All patients were divided in 2 groups. The first one comprised 80 people who had 1 or 2 of the symptoms. The second group included 76 patients with the combination of several (more than 2) symptoms.
Results and Discussion: In the first group we didn't observe any impairment of consciousness (GCS - 14-15 d.). We achieved the successful results by applying symptomatic, replacing, and hormonal therapy. Lethality rate for this group was 1.5%.
In the second group we observed the subdued consciousness up to 5-12 d. of GCS. This complex of symptoms was regarded as sympathetic storming syndrome. The effect of symptomatic therapy was minor and short-living. At the same time vegetative stabilization treatment that used opioid analgetics, ά2-adrenoagonist - clonidine, benzodiazepines, *propofol,* allowed correction of homeostatic failures for most of the cases, sometimes without using symptomatic treatment (glucose level stabilized in 72% of the cases w/o insulin injections). 12 patients died despite the treatment (9.7%).
Conclusion(s):
1. Isolated symptoms (group 1) represent "focal" hypothalamic-pituitary disruptions (e.g.hyponatremia at CSWS). Timely and sufficient symptomatic therapy assures a favorableprognosis.
2. Symptoms of sympathetic storming (group 2) develop as a result of the neuroregulation disruption, and in the most severe cases is a result of disruptions of the integrative functions of the hypothalamus structures and require neurovegetative corrective treatment. The prognosis is less favorable

7AP5-7

Is ketamine alone and in combination with midazolam or dexmedetomidine safe regarding post-anaesthetic memory?

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Background and Goal of Study: Surgeries and minor procedures may induce anxiety, pain, and neurotoxicity due to anaesthetic drugs that may influence behaviour[1]. Ketamine alone and in combination has been considered hemodynamically safe, although little is known about their effects on behaviour of adult subjects. Hence our goal is to study the effects of the anaesthetic ketamine alone and with midazolam or dexmedetomidine on memory in a rat model.
Materials and Methods: Male Wistar rats were randomly distributed in four groups: control (saline solution), 100 mg/kg ketamine, 100 $mg.kg^{-1}$/5 $mg.kg^{-1}$ ketamine/midazolam, and 100 $mg.kg^{-1}$/0.25 $mg.kg^{-1}$ ketamine/dexmedetomidine; each received one intraperitoneal injection. Radial maze test and the novel object recognition and location test (NOR/L) were performed 48 hours post-anaesthesia, with different batches of rats (n=6 , except in control group of radial maze where n=8).
An estimated treatment effect of 50%, a power of 0.8 and α=0.05 were considered. For parametric data analysis, one-way ANOVA with Tukey post-hoc test, or paired Student's t-test were used, while nonparametric data were analyzed with Kuskal-Wallis and Man-Whitney test with Bonferroni correction.
Results and Discussion: In the radial maze task, no differences between groups were found in the number of working ($p \geq 0.312$) and reference memory ($p \geq 0.105$). During NOR/L, all animals recognized the novelty by exploring more the new object ($p \leq 0.017$) and the object in new location ($p < 0.0001$) than the familiar ones. The differences in objects exploration were similar between groups as showed by the discrimination ratio ($p \geq 0.114$). In the first training session of NOR/L, rats faced an object for the first time, and control rats approached it more often (3[1.75-4.25]) than the rats from group ketamine/midazolam (0.5[0-1.25];p= 0.012) and ketamine/dexmedetomidine (1[0-1];p= 0.016).
However, this difference was not observed two minutes later, indicating that all treatment groups quickly adapted to the environment.
Conclusion(s): We conclude that an acute administration of ketamine alone, and combined with midazolam or dexmedetomidine are safe regarding behavioural changes in memory in adult rats.
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7AP5-8

Investigation of the homeostasis parameters during neurosurgery under condition of neurovegetative stabilization

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Background and Goal of Study: to study biochemical and coagulation indexes, system inflammatory response features (including cytokines), and hormonal status under condition of neurovegetative stabilization by fentanyl (3.5-5 μg/kg-hour), clonidine (1-2 μg/kg-hour) and propofol (3-5 μg/kg-hour) during neurosurgery. To compare of these data with clinical features of the surgery and postoperative period.
Materials and Methods: we have examined 48 patients (30 females, 18 males) with the mean age of 48,2 ± 5,5 y.o. All of them have undergone neurosurgery at the RNISI due to the tumor of the posterior fossa.
Evaluation of the humoral status include biochemical, coagulation and hormonal (TSH, T3, T4, ACTH, cortisone, STH, PRL) indexes and cytokines (IL-8, IL-6, IL-10, TNF). Blood sampling was performed five times: day before surgery, in the day of surgery before anaesthetic induction, after induction, after elimination of the tumor (blood stasis stage) and the day after surgery. During surgery haemodynamics, brain elasticity and quality of the haemostatis in the wound have been evaluated. In the postoperative period we have paid special attention to the quality of the awakening, neurological state restoration and presence of the pyoinflammatory complications.
Results and Discussion: hormonal status, coagulation and biochemical indexes have been remain stable during whole postoperative period. Significant elevation of the IL-10 level on the blood stasis stage, as well as IL-6, CRP day thereafter have been observed. Furthermore levels of the ACTH, cortisone and PRL were elevated significantly at the blood stasis stage.
Conclusion(s): Therefore by keeping sufficient response of the humoral system against surgical stress under conditions of the neurovegetative stabilization caused by fentanyl, clofelin and propofol all principles of the adequate anesthesia for the neurosurgery have been preserved.

7AP5-9

Comparison of sevoflurane-fentanyl anesthesia and propofol-fentanyl total intravenous anesthesia during major abdominal surgery in patients with increased intracranial pressure

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Background and Goal of Study: Increased intracranial pressure may adversely affect the anesthesia and recovery period due to a disturbed cerebral blood flow. This study was designed to compare the safety of propofol-fentanyl total intravenous anesthesia and sevoflurane-fentanyl anesthesia during the major abdominal surgery in patients with increased intracranial pressure (ICP).

Materials and Methods: One hundred and thirty-nine ASA III patients with ICP>12 mmHg due to cervical ostheochondrosis and vertebrobasilar insufficiency, undergoing major abdominal surgery (duration 7.3 (5-8.1) hours), were allocated randomly to receive propofol-fentanyl total intravenous anesthesia (TIVA group, 67 patients) or sevoflurane-fentanyl anesthesia (SFA group, 72 patients). Initial ICP was evaluated the day before surgery by a venous ophthalmodynamometry. ICP, mean arterial pressure (MAP) and cerebral perfusion pressure (CPP=MAP-ICP) were assessed every hour of anesthesia. Time of recovery of consciousness after anesthesia, complications and length of stay in the ICU and in the hospital were also evaluated.
Results and Discussion: Initial ICP was 14±2 mmHg and 15±2 mmHg in TIVA and SFA group, respectively. During the anesthesia ICP increased in SFA group with the total increasing of 47% (from 15±2 to 22 mmHg ($p< 0.05$)). In TIVA group ICP decreased from 14±2 mmHg to 9±3 mmHg ($p< 0.05$). Decreasing of MAP after induction of anesthesia was similar in two groups (25% in SFA group and 24% in TIVA group). MAP was stable during the anesthesia in both groups. CPP was stable in TIVA group (it was above 70 mmHg during the anesthesia), but in SFA group CPP decreased significantly (from 80 mmHg to 61 mmHg ($p< 0.05$)). Time of recovery of consciousness in TIVA group was almost two times higher than in SFA group (38±5 min vs. 21±4 min ($p< 0.05$)). The incidence of postoperative delirium was higher in SFA group (24% vs. 10% in TIVA group ($p< 0.05$)). There were no significant differences between the groups in other complications. The total length of stay in the ICU and in the hospital was higher in SFA group (6±2 days vs. 4±2 in TIVA group ($p< 0.05$) and 17±3 days vs. 12±2 in TIVA group ($p< 0.05$)).
Conclusion: The method of propofol-fentanyl total intravenous anesthesia compared with sevoflurane-fentanyl anesthesia in patients with increased intracranial pressure provides a significantly earlier recovery from anesthesia with a lower incidence postoperative delirium and lower length of stay in the ICU and in the hospital. The main cause of these differences is a decreasing of CPP during sevoflurane-fentanyl anesthesia.

7AP5-10

The association between previous stroke and the incidence of recurrent stroke during perioperative period

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Background: Stroke is costly and causes major morbidity and mortality in general population.About 795,000 people in US suffered from new or recurrent stroke yearly. Recurrent stroke accounted for 25~30% of all strokes. Stroke is a significant predictor of perioperative stroke. Data are lacking on the safe time interval between previous stroke and the following surgical procedure. We aim to investigate a reasonable stroke-to-surgery time interval that is safe for stroke patients.
Materials and Methods: Data source is the longitudinal National Health Insurance Research Database 2002~2009 in Taiwan with original claims data for 1,000,000 randomly sampled beneficiaries.
A total of 9,414 first-time stroke patients who subsequently underwent surgical procedures one months later were included in the sample. SAS 9.1 was used for statistics to generalize the effects of time-interval and related factors on perioperative recurrent stroke.
Results: A total of 626 (6.65%) samples experienced recurrent stroke. Female (OR=0.744) showed lower odds of perioperativerecurrent stroke. Hypertension (OR=1.584), atrial fibrillation (OR=2.648), and hypercholesterolemia (OR=3.398) exhibited higher, among first-time stroke patients receiving elective surgeries. Chi-square and logistic regression results both proved that longer stroke-to-surgery time interval was significantly associated with lower odds of perioperative stroke recurrence. Stroke-to-surgery time interval at 10-12 months (OR=0.625) and ≧12 months (OR=0.645) showed evidence of lower perioperative stroke recurrence.
Conclusion(s): A safe ≧10 months of stroke-to-surgery time interval significantly lowered the likelihood of perioperative stroke recurrence. Therefore, elective surgeries with no urgency should not be performed until 10 months of stroke-to-surgery time interval is reached. We also suggest that the implication of stroke-to-surgery time interval on preventive medicine merits more attention among stroke practitioners.

7AP5-11

Proseal laryngeal mask airway attenuates systemic and cerebral hemodynamic response during awakening of neurosurgical patients. A randomized controlled trial

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Background and Goal of Study: Extubation and emergence from anesthesia may lead to systemic and cerebral hemodynamic changes that can cause cerebral edema and hemorrhage in neurosurgical patients. The hemodynamic profile on emergence from anesthesia is more favorable with the laryngeal mask airway (LMA) than the endotracheal tube (ETT). We aimed to compare the impact of awakening neurosurgery patients with the ETT or with a ProSeal LMA.
Materials and Methods: Forty-two patients undergoing supratentorial craniotomy under general anesthesia with ETT were included. At the end of the surgery, patients were randomized to awaken with the ETT in place or after its replacement with an LMA. We recorded mean arterial pressure (MAP), heart rate (HR), middle cerebral artery (MCA) flow velocity, regional cerebral oxygen saturation (rSO_2), norepinephrine plasma concentrations, and coughing.
Results and Discussion: All hemodynamic variables increased significantly from baseline in both groups during emergence. Mean differences between groups were significant and higher in ETT group for MAP (11.9 mmHg; 95%CI: 2.1 - 21.8) (P=0.017), HR (7.2 bpm; 95%CI: 0.7 - 13.7) (P=0.03) and rate-pressure product (1045.4; 95%CI: 1650-440.8) (P = 0.001).
The percent increase in rSO_2 was greater in the ETT group by 26.1% (95%CI: 43.2-9.1%) (P = 0.002), but no difference between groups were found in MCA flow velocity. Norepinephrine plasma concentrations rose over baseline in both groups at the end of emergence (P=0.007) but no differences between groups were found. The incidence of cough was higher in the ETT group (87.5%) than in the LMA group (9.5%) (P< 0.001).
Conclusion(s): The use of the LMA Proseal during emergence from anesthesia in neurosurgical patients results in a more favorable hemodynamic profile, less cerebral hyperemia and a lower incidence of cough compared to the ETT.
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Regional Anaesthesia

8AP1-1

The effect of the adductor canal block vs. femoral nerve block on quadriceps muscle strength and pain after total knee arthroplasty: a randomized study

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Background: The femoral nerve block (FNB), which is considered gold standard for postoperative pain treatment following total knee arthroplasty (TKA), reduces quadriceps muscle strength, essential for mobilization. In contrast, the adductor canal block (ACB) is predominately a sensory nerve block. In this study we hypothesized that the ACB preserves quadriceps muscle strength compared with FNB (primary endpoint), in patients following TKA. Secondary endpoints were effect on morphine consumption, pain, adductor strength, morphine-related side effects, and mobilization ability.
Methods: We performed a double blind, randomized controlled study, including patients scheduled for TKA in spinal anesthesia. The trial was approved by the local Regional Ethics Committee (H-3-2011-090) and registered at www.clinicaltrials.gov (NCT01470391). According to randomization the patients received either a continuous ACB or a continuous FNB via a catheter with a bolus of 30 ml 0.5% ropivacaine given initially, followed by a continuous infusion of 0.2% ropivacaine, 8ml/h. Additional analgesics consisted of paracetamol, ibuprofen, and patient controlled analgesia with intravenous morphine. Muscle strength was assessed with a hand-held dynamometer preoperatively and 24 h postoperatively. Pain, morphine consumption and morphine related side effects were assessed at 2, 4, 8 and 24 h postoperatively. Mobilization ability was assessed at 24 h postoperatively.
Results: Fifty-three patients were randomized and 48 patients analyzed. Quadriceps strength was significantly lower in the FNB group compared with the ACB group (median [range] percent of baseline, 18% [4-48] versus 52% [31-71], respectively, P=0.004). There was no difference between the groups regarding morphine consumption (mean ± SD, 22 mg ± 21 vs. 22 mg ± 9, respectively, P=0.94), pain at rest (AUC 2-24 h, P=0.21), pain during flexion of the knee (AUC 2-24 h, P=0.16), or adductor muscle strength (mean ±SD, 74% ± 29 vs. 85 % ±54, respectively, P=0.39). There was no difference between the groups regarding morphine-related side effects or mobilization ability (P>0.05).
Conclusion: TKA in itself has influence on quadriceps muscle performance and causes functional limitations. In this study, the ACB preserved quadriceps muscle strength better than the FNB, without any difference in pain relief. The ACB may therefore be considered an alternative to the FNB for postoperative pain treatment following TKA.

8AP1-2

Ultrasound-guided continuous interscalene block: the influence of local anesthetic delivery method (automated bolus versus continuous infusion) on postoperative analgesia after shoulder surgery

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Background: Compared with a continuous infusion, an intermittent bolus regimen has been recently shown to reduce local anesthetic (LA) consumption and improve analgesia involving continuous sciatic and epidural block. During a continuous interscalene block (CISB), the influence of LA delivery method on pain relief and side-effects has been the subject of little investigation. This prospective, randomized study tested the hypothesis that, in CISB, automated boluses of LA combined with PRN (pro re nata) boluses would provide better analgesia after shoulder surgery compared with continuous infusion in conjunction with PRN boluses.
Methods: One hundred and one patients, scheduled for elective shoulder surgery under general anesthesia with continuous interscalene analgesia were recruited. All the nerve blocks were ultrasound-guided using an out-of-plane approach and nerve stimulator in sentinel mode (> 0.5 mA). Following ultrasound confirmation of the catheter tip immediately lateral to C5/C6 roots, ropivacaine 0.5%+lidocaine 1% (50:50) 20 ml were administered preoperatively via the catheter before surgery. They were randomly assigned to receive via interscalene end-hole catheter either a continuous infusion of 0.2% ropivacaine at an infusion rate of 4ml/h (group CI, n=50) or an automated hourly 4 ml bolus of the same LA (group AB, n=50). Both method deliveries are combined with 5 ml patient controlled boluses of 0.2 % ropivacaine with a lockout time of 30 min. Postoperative pain scores, incremental doses delivered by PCA, LA consumption, rescue morphine analgesia and side-effects were recorded.
Results: Data were compared using Mann-Whitney or Chi Square as required and are presented in median with IQR or % of patients. Postoperative analgesic characteristics of the 2 groups are depicted in table 1.

	CI (n=50)	AB (n=51)	P value
Average VAS at 24H	2 (0-3)	2 (0-3)	0.985
Average VAS at 48H	4 (2-6)	3 (2-5)	0.548
Ropivacaine boluses at 24h	16.5 (8.25-29.5)	10 (5.5-15.5)	0.601
Ropivacaine boluses at 48h	18.5 (11-25.25)	17 (8.5-29)	0.802
Morphine consumption at 24h (mg)	20 (0-40)	0 (0-30)	0.088
Morphine consumption at 48h (mg)	25 (0-60)	20 (0-40)	0.220

[Anesthetic and Analgesic Outcomes of Both Groups]

Conclusions: In CISB under ultrasound guidance, automated regular bolus of LA combined with PRN boluses provide similar quality of analgesia after shoulder surgery without reduction of LA and morphine consumption as compared with continuous infusion technique combined with PRN boluses.

8AP1-3

Ultrasound-guided periconal blockade

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Background and Goal of study: Periconal anesthesia has long been the choice technique for ophthalmic surgery. Currently, there are limited published data on ultrasound-guided ophthalmic anesthesia. Nevertheless, as in other areas of regional anesthesia, ultrasonography may contribute to improve the safety of ophthalmic blocks, particularly by reducing globe perforation or penetration incidence associated with the needle-based techniques. [1] This study aimed to evaluate the benefit of the ultrasound as a guide in ophthalmologic periconal block with regard to the feasibility, positioning of the needle and occurrence of complications.
Material and methods: Upon the approval of the Institutional Ethics Committee, a prospective clinical study was carried out. One hundred and twenty-nine patients (ASA I-II) undergoing cataract surgery were randomly assigned to have their eyes anesthetized using either the Real-Time Ultrasound-Guided Periconal Blockade (USG_{block}, n=69) or the Conventional Periconal Blockade Technique (C_{block}, n=60), followed by ultrasound examination of the eye. Patients with single eye and with high myopia (axial length greater than 26 mm) with the presence of staphyloma, were excluded. The *Chi-square* and *Fisher's exact tests* were used for *qualitative variables* and the Student's t-test for quantitative variables. The significance level was 5%.
Results and Discussion: There was higher incidence of unintentional intraconal block in C_{block} Group than in USG_{block} Group (p=0.009). The distance (mm) between the needle's tip and the optic nerve was higher in USG_{block} Group ($p < 0.0001$) whereas the insertion depth (mm) of the needle and the needle length (mm) displayed in ultrasound image were greater in C_{block} Group ($p< 0.0001$). No complications were seen in any of the groups. It was possible to visualize the needle insertion in real time, as well as the needle shaft, the muscular cone, the optic nerve and the local anesthetic spread.
Conclusions: Real-time visualization of the needle reduces the chance of having unintentional intraconal block and the placement of the needle inadvertently close to the optic nerve. Further studies are necessary to prove the real potential of the ultrasound for reducing the incidence of complications associated with ophthalmic blocks, especially when anatomic disorders of the eyeball could potentially increase the risk.
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8AP1-4

Minimum effective anaesthetic volume of 1.5% mepivacaine in ultrasound-guided popliteal block at sciatic nerve division

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Background: Ultrasound-guided regional anaesthesia has significantly reduced the local anaesthetic volume required to achieve an effective block. The aim of this study was to determinate if a reduction of volume to 5ml would accomplish an effective surgical popliteal block within 30 minutes after injection.
Methods: Twenty-two ASA physical status I-II patients scheduled for bunion surgery under popliteal block were enrolled. Popliteal block was performed in an OOP-posterior approach at the level of division of the sciatic nerve. Initial volume of 20 mL of 1,5% mepivacaine was set and according with Up&Down method, the volume administered was reduced/increased in 1 mL depending on the success/failure of the previous block within 30 minutes, to a minimum volume of 5 mL. The study was stopped upon achieving five consecutive successful blocks with 5 mL. A successful block was defined as an absence of pinprick sensation in all nerve territories within the established timeframe. The length of proximal and distal diffusion of local anaesthetic was assessed immediately after the injection.
Results: The volume could be reduced until 5 mL. With this volume proximal spread was observed 4±1.9 cm and distally to tibial and peroneal nerves were 5,4±1,2 and 3,2±1,3 cm, respectively. Surgical block was achieved in 14±6,6 min and block duration was 4,2±1 hours. Significant correlation was observed within the volume administered and proximal spread (R: 0.58; p=0.005) and time to achieve block success (R: -0.46; p=0.036), bud not within distal spread and duration of the block.
Conclusions: Injection of 5mL of local anaesthetic at the level of division of sciatic nerve achieves successful surgical anaesthesia for bunion surgery within 30 minutes.Correlation between volume and block onset suggest further reduction of volume may not be recommended.
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8AP1-5

Ultrasound-guided periconal blockade in rabbits

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Background and Goal of study: Regional anesthesia is the standard procedure for most ophthalmic surgeries in adults. The needle is blindly introduced into the orbital cavity. Complications arising from the insertion are rare, but often devastating. Currently, ultrasound-guided regional anesthesia has been widely used. However, there are few reports about ophthalmologic blocks guided by ultrasound. A study involving the performance of ultrasound-guided periconal blockade in rabbits was developed as a pre-clinical human study. This particular animal was chosen based on the anatomical similarities of its ocular region with that of the human eye.[1] This study aimed to evaluate the ultrasound as a guide in periconal ophthalmologic blocks with regard to the feasibility and occurrence of complications.
Material and methods: Upon the approval of the Institutional Animal Care Committee, a prospective experimental study was carried out. Ten rabbits (Oryctolagus cuniculus) were submitted to ultrasound-guided periconal blockade after being adequately anesthetized. Eighteen eyes were evaluated by using an artificial light source for the presence of direct and consensual fotomotor reflexes. Regarding intraocular pressure, three consecutive measurements (up to 30 minutes after the periconal block) were made by applanation tonometry and corneal analgesia or pain sensitivity was assessed using a Cochet & Bonnet esthesiometer. All the animals were allowed full recovery from general anesthesia and were examined after one hour.
Results and Discussion: Ultrasound images clearly showed the anatomy of the eye region required for the development of the periconal block, as well as the adjacent structures intact in all eighteen eyes of ten rabbits. It was possible to visualize the needle shaft near the muscular cone in the periconal space in real-time ultrasound image, as well as the local anesthetic spread. No complications were observed.
Conclusions: Eye ultrasonography allowed visualization of all anatomic structures necessary to perform a periconal block, as well as the real-time needle insertion and the anesthetic spread. Further human studies should be developed to prove the real potential of the ultrasound for reducing the incidence of complications associated with ophthalmic blocks, especially when anatomic disorders of the eyeball could potentially increase the risk.
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8AP1-6

Success rate of infra-clavicular blocks: comparison of ultrasound guided catheter placement with stimulating catheter placement

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Background: Peripheral nerve stimulation (PNS) and ultrasound-guided placement techniques have been described for infraclavicular brachial plexus perineural catheters. We tested the hypothesis that US guided catheters produce better block success.
Methods: A total of 210 patients undergoing elective hand or elbow surgery were randomly allocated to receive continuous infraclavicular brachial plexus block using ultrasound guided needle and catheter placement (group US, n=105) or PNS guided stimulating needle and catheter placement (group ST, n=105). Posterior cord stimulation was considered to be an end point in ST group whereas spread of drug in the posterior cord location as observed by ultrasound imaging was an end point in US group. All drug was administered through the catheter in both groups. Motor and sensory blocks were assessed every 5 min and block success was determined at 30 min. Complications and need for intraoperative supplements were noted. Primary outcome was block success at the end of 30 minutes. during the surgery. The secondary outcomes were block success for surgery, intraoperative analgesia requirement and the catheter insertion duration.
Results: Due to protocol violations, 8 patients were excluded. Catheters placed with ultrasound guidance took a significantly shorter time (7.0 min (±2.5) compared with 10.5 min (±3.6) for stimulation (P < .01). In 5 patients of US group and 16 of ST group, we were unable to establish a complete block and this was statistically significant (p< .001). On sub group analysis, all successful blocks in ST group had a posterior cord twitch elicited from needle or catheter or both versus lateral cord in those that were unsuccessful. In three patient from ST group, US guidance was used as no twitches could be elicited. One patient from ST group had vascular puncture leading to hematoma formation. There were no differences in procedure-related pain scores and patient satisfaction.
Conclusions: In this prospective randomized controlled trial, we found that placement of infraclavicular perineural catheter is more successful with ultrasound guidance and takes less time. Interestingly, we found out that if PNS stimulation is used for guidance and posterior cord twitch is elicited via the stimulating catheter, there is no difference in block success rate.
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8AP1-7

Benefits of postoperative analgesia using a continuous transversus abdominis plane (TAP) infusion over a single-injection TAP block in patients undergoing post-bariatric abdominoplasty

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Background and Goal of the Study: TAP block provides effective postoperative analgesia and reduces opioid requirements, however limited to the early postoperative hours in patients undergoing abdominoplasty (1). This prospective study compares the efficacy of continuous TAP blockade after post-bariatric (PB) abdominoplasty to a single-shot injection.
Materials and Methods: After written consent, 26 patients, 18 to 65 years old, scheduled for PB abdominoplasty, were randomly allocated in 2 groups. In the continuous TAP block group (study group, n = 13), ultrasound-guided bilateral catheter placement at the end of the surgery was facilitated by hydrodissection. Continuous 5 ml/hour infusion of ropivacaine 0.1% delivered a total content of 300 ml per side. In the single-shot group (control group, n = 13) patients received ultrasound guided bilateral TAP block with a 200 mg of ropivacaine 0.5%. Supplemental analgesia consisted of patient-controlled

analgesia (PCA), paracetamol and NSAIDs in both groups. Primarily, we assessed pain scores with the Visual Analogic Scale (VAS) at 2, 4, 6, 12, 24, 48, 72 and 96 hours after surgery and total morphine consumption at 96 hours. Time to mobilization, incidence of nausea, vomiting and complications of TAP catheters were also recorded. Data were compared using Chi-Squared, *t*-test (mean values, $p < 0.05$ significant) and Fisher's exact test.

Results: Demographics did not differ between the two groups ($p > 0.05$). Continuous TAP block group showed, at rest and in motion, significantly lower pain scores at 2, 6, 12, 24 hours after surgery and thereafter. At rest, VAS scores in the study compared to control group were: 2.17 *vs* 4.23 ($p = 0.03$), 1.25 *vs* 2.31 ($p = 0.02$), 0.83 *vs* 2.08 ($p=0.02$), 0.67 *vs* 3.38 ($p=0.001$). In motion: 2.58 *vs* 5.62 ($p=0.002$), 2.08 *vs* 3.85 ($p=0.02$), 0.83 *vs* 2.08 ($p=0.02$) and 1.83 *vs* 5.08 ($p=0.01$). Total morphine consumption at 96 hours was significantly lower in the study group (11 *vs* 21mg, $p = 0.001$). Moreover, patients in the continuous TAP group walked after the first post operative day (84 *vs* 15%, $p < 0.001$), whereas after the second day in the control group (100 *vs* 78%, $p=0.22$). Nausea and vomiting were similar. Catheters were placed easily without any complications or ropivacaine adverse effects.

Conclusion: Continuous TAP block following PB abdominoplasty increases postoperative analgesia, decreases opioid requirements and facilitates early mobilization.

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8AP1-8

Ultrasound in peribulbar block: efficacy of a single-injection with short needle

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Background and Goal of Study: Peribulbar block (PB) is the most common type of anaesthesia for cataract surgery (1,2). There are studies that advocate for a single puncture with short needle (1,2).

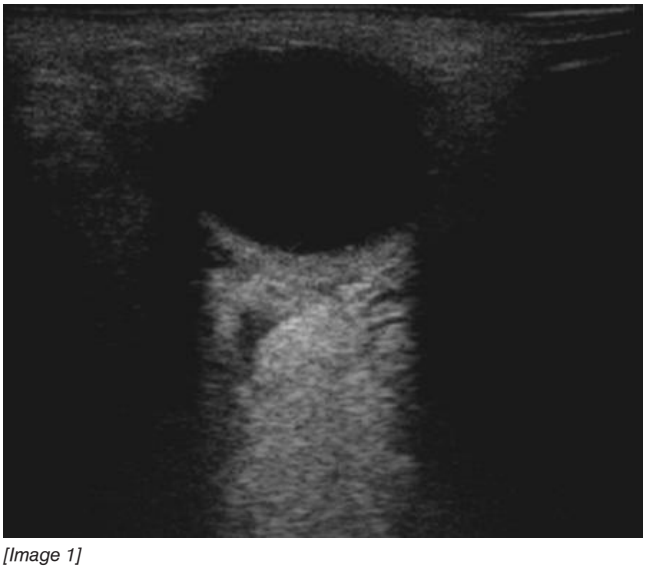
The objective of this study was to evaluate the intraconal spread of local anesthetic (LA) by ultrasound imaging (US) during PB (3) and to assess the efficacy of the lower temporal puncture with short needle.

Materials and Methods: In this prospective observational study, 18 patients were included. Lower temporal puncture was performed under sedation. Once the needle was in place, a linear US transducer was placed over the eyelid and the mixture of LA was administered.

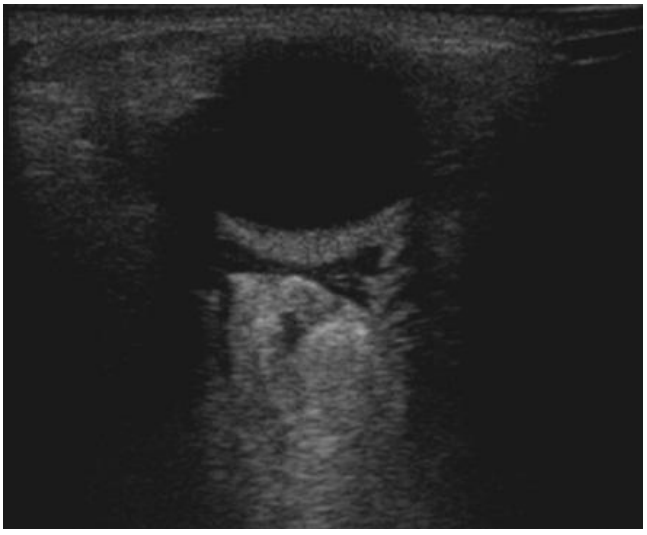
Demographic characteristics and axial length measurements were recorded. The spread of LA, akinesia, analgesia and complications also were noted.

Results and Discussion: The mean age was 73,44 years (SD 6,98) and BMI was 28,11 (SD 3,69). The axial lenght average calculated by US was 22,91 mm (SD 1,40). The mean volume administered was 7,25 mL (SD 1,01).

The full spread of LA through the back of the eyeball was observed in 12 patients, incomplete diffusion was observed in 5 patients and no diffusion was visualized in one. This patient required reinjection by incomplete blockade. LA diffusion observed in Images 1-3.



[Image 1]



[Image 3]

Chemosis occurred in 3 patients (16,7%). There was no vascular complication.

Conclusion: The use of ultrasound in the PB provides information on the spread of LA, helps predict the efficacy of the blockade and may decrease the dose.

Lower temporal puncture with short needle is a simple and effective option for peribulbar blockade, being better tolerated and safer for patients.

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8AP1-9

Regional analgesia in a patient with amyotrophic lateral sclerosis (ALS)

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Background: ALS is a progressive neuromuscular disease that determines muscle weakness, causing susceptibility to neuromuscular block, respiratory depression and raised risk of aspiration[1,2].The regional anesthesia is controversial due to fear of nervous lesion and symptoms exacerbation[3].

Case report: We present a 62y female patient, 80kg, proposed to urgent laparoscopic cholecystectomy. She had arterial hypertension, tetraparetic ALS with dysautonomia and nocturnal non-invasive ventilation support. After informed consent, the patient had ASA standard monitorization and Bispectral Index. Qualitative neuromuscular monitoring was used during the procedure. General anaesthesia was induced with 1mg midazolam, remifentanil perfusion (0,25 $mcg.Kg^{-1}.min^{-1}$), 100mg propofol and 20mg rocuronium. It was mantained with desflurane and remifentanil perfusion. 1,5h after induction, the procedure was converted to classic cholecystectomy and we administered 5mg rocuronium. 1h later it was finished and we performed an echo-guided paravertebral single-shot block with 20ml of 0,75% ropivacaine and administered 200mg sugammadex (TOF of orbicularis oculi muscle revealed 4 contractions with fade). The patient was quickly extubated without any respiratory or neurologic complications and period it wasn't necessary opioid analgesia in the post-operative period.

Discussion: This case presented some challenges: in spite of the susceptibility to the neuromuscular block, we used rocuronium to facilitate the pneumoperitoneum and the right sub-costal incision. In the end of the procedure, 1h after administering 5mg of rocuronium, the neuromuscular block was evident and the use of sugammadex allowed to reverse it completely. We decided to do a paravertebral block with high concentration ropivacaine to control post-operative pain, reducing the risk of decreased ventilation and avoiding opioids after the surgery. The benefits of this analgesia exceeded the concerns of nerve damage. The combined administration of sugammadex with paravertebral block allowed quickly extubation, avoiding the need for ventilator support after the surgery.

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Learning points: The combination of paravertebral block and the use of sugammadex permitted an early extubation of a patient with neurological disease, without any respiratory or nervous complications.

8AP1-10

A prospective, randomized comparison between double-perivascular (PV) and quadruple and perineural (PN)-injection ultrasound-guided (US) axillary brachial plexus block (AXB)

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Background and Goal of Study The study compared PV involving 2 separate skin punctures) and PN 4 separate punctures US (AXB) for upper extremity surgery, we compared the effectiveness and time efficiency of perioperative axillary blocks. The hypothesis tested was that the performance and onset time would be different(sample size 20pts per group t test)
Materials and Methods: 40 pts were randomly allocated to receive a PV (n = 20) or PN (n = 20) US AXB. The local anesthetic agent (34ml ropivacaine 5 mg/mL) was identical in all subjects. For both groups, the musculocutaneous nerve was first located and then anesthetized using 7 mL ropivacaine 5 mg/mL. Subsequently, in the PV group, 27 mL was injected posterior to the axillary artery (redirection, to achieve circumferential spread). In contrast, for the PN group, the median, ulnar, and radial nerves were individually anesthetized with volumes of 9 mL .The performance time, number of needle passes, and complications (vascular puncture, paresthesia) were recorded. The primary outcome was the success rate of the block, defined as anesthesia adequate for surgery. Secondary outcomes were the time to administer the block, time to the onset of surgical anesthesia, and incidence of adverse events. A blinded observer assessed the set parameteres in the theatre.
Results and Discussion: No differences were observed between the 2 groups in terms of success rate (95%-95%), total anesthesia-related time (27.5-29.5 min), and block-related pain scores and onset time {18.5 (SD 6.0) vs 18.9(SD 5.0)} min. The 2-injection technique was faster to administer (7.7(2.4) vs 14.2(2.8) minutes, $P = 0.000$). However, the PV technique required fewer needle passes (4 SD, 1.5] vs 6.5 [SD, 2.7]; $P < 0.001$) as well as a shorter performance time {8.2 (SD, 2.3) vs 15.7 (SD, 3.2) min; $P = 0.000$}. No vascular puncture was recorded. Pearson x2 and wilcoxon test was used.
Conclusion(s): PV and PN ultrasound-guided AXBs result in comparable success rates and total anesthesia-related times. An ultrasound guided 2 injection may be as effective as, and more time efficient than ,a 4 injection technique.Because of fewer needle passes and a shorter performance time, the PV technique provides a simple alternative for ultrasound-guided AXB
References:
Anesth Analg. 2010 Apr 1;110(4):1222-6

8AP2-1

Evaluation of ultrasound guided interscalene brachial plexus block versus general anesthesia versus combination of both techniques in shoulder arthroscopy. A randomized clinical trial

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Background and Goal of Study: This randomized clinical trial evaluates interscalene brachial plexus block (ISB), general anaesthesia (GA) and the combination of both anaesthetic methods (GA + ISB) in patients undergoing shoulder surgery.
Materials and Methods: Suitable patients aged 20 - 80 years (American Society of Anaesthesiologists grade I - III) scheduled to undergo shoulder surgery were randomized to ultrasound guided ISB (10 ml mepivacaine 1% and 20 ml ropivacaine 0.375%), GA (propofol, sunfentanil, desflurane) or GA + ISB. Practicability, analgesics consumption, postoperative recovery and satisfaction were evaluated.
Results and Discussion: A total of 120 patients were randomized. ISB led to significantly shorter times for emerge [GA: 20 (9 - 49) min, GA + ISB: 18.5 (3 - 44) min and ISB: 15.5 (0 - 28) min, p = 0.0008] and until first ambulation [GA: 272 (60 - 1231) min, GA + ISB: 195 (85 - 500) min, ISB: 85 (3 1156) min, p < 0.0001]. 9 / 40 patients (GA) and 5 / 40 patients (GA + ISB) received a tracheal intubation due to insufficient laryngeal mask ventilation. 1 / 40 patients with an ISB had an insufficient block and received a GA. 13 / 40 patients with an ISB, compared with each 40 patients with GA and GA + ISB were in need of a recovery room (p < 0.0001). ISB led to a significant reduction of analgesics at the day of surgery (p < 0.05). Patients with ISB were more likely to describe the anaesthesia "better as expected" (p = 0.0031).
Conclusion(s): ISB is superior to GA and GA + ISB in patients undergoing shoulder surgery in terms of analgesics consumption, faster recovery and patient satisfaction.

8AP2-2

Ultrasound-guided intermediate cervical block versus superficial cervical block for carotid endarterectomy: a randomised controlled trial

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Background and Goal of Study: The value of ultrasound guidance in intermediate cervical block is poorly discribed. The aim of this prospective, randomised, controlled study was to compare the efficiency of ultrasound-guided intermediate cervical block (USICB) to landmark-based superficial cervical block (SCB) for carotid artery endarterectomy.
Materials and Methods: The study was conducted according to the French bioethic law (n° 2004-806) and approved by our University hospital Institutional review Board. Patients scheduled for carotid artery endarterectomy under regional anesthesia (ropivacaine (ROP) 4.75 mg / ml) were randomised into 2 groups according to the technique of anesthesia performed, SCB (Control group) or USICB (Echo group). In Echo group the probe was placed perpendicular to the skin, in the horizontal plane at the C3-C4 level; the needle was inserted in-plane, between the inferior border of scapula elevator muscle and the posterior border of SCM muscle (under the investing layer of the cervical fascia). Midway between the internal jugular vein and posterior border of SCM 10 ml of ROP were injected, 5 ml were injected while the needle was withdrawn, then 5 ml were injected in the subcutaneous plane along the posterior border of SCM in a cranial direction. In Control group, 20 to 30 ml of ROP were injected at the C2-C3 level, fan-like, in a front side direction, in the subcutaneous plane.
Main outcom was cervical block success, defined by surgery performed under regional anesthesia without supplemental topical lidocaine (LID). Secondary outcomes were rate of conversion to general anesthesia (GA), total dose of supplemental topical LID and block-related complications. Statistical analysis was performed using exact Fischer or Student t-tests. P < 0.05 is significant.
Results and Discussion: Demographic data of the 86 patients included (age, ASA status) did not differ between groups. Conversion to GA for inadequate analgesia was needed in 0 and 2 patients of Echo and Control group respectively. Success rate of cervical block was not statistically different between the groups (Echo group 23%, Control group 7%, P=0,068). Mean dose of topical LID was not different between groups. No complication directly related to cervical block was observed.
Conclusions: This trial demonstrates that ultrasound-guided intermediate cervical block could be performed safely and compared favourably to superficial cervical block to perform carotid artery surgery.

8AP2-3

Can internal jugular vein cannulation injure brachial plexus? Sonoanatomy of the internal jugular vein and the brachial plexus

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Background: Brachial plexus (BP) injury is one of the complications of internal jugular vein (IJV) cannulation. Direct needle trauma may result in the BP injury. However, there is no article investigated the anatomical relationship of the IJV and the BP. The aim of this study was to investigate the relation of the IJV and the BP by ultrasonography.
Patients and methods: One hundred patients scheduled for elective orthopedic surgery who underwent peripheral nerve blocks other than interscalene or supraclavicular BP block were studied.
Patients received propofol sedation with spontaneously breathing after peripheral nerve blocks for the surgery.
Patients were placed in the supine position, with the head facing away from the neck side to be observed. Then, the BP was studied from the level of the C5 vertebra to the supraclavicular fossa by ultrasonography.
The primary outcomes included the following:
1. Minimum distance from the IJV to the C5-8 nerve roots, respectively.
2. Frequencies of the C5-8 nerve roots that ran behind the IJV.

Results: The minimum distance from the IJV to the C5-8 nerve roots, respectively, are summarized in Table 1.

Cervical nerve root	Right (cm)	Left (cm)	P
C5	0.45±0.19	0.60±0.31	<0.05
C6	0.73±0.22	0.89±0.37	<0.05
C7	1.27±0.35	1.45±0.40	<0.05
C8	1.81±0.43	2.08±0.45	<0.05

[The minimum distance from IJV to C5-8 nerve roots]

The C5 nerve root was closest to the IJV (0.45±0.19 cm [right] and 0.60±0.31 cm [left]). The C8 nerve root was most distant from the IJV (1.84±0.43 cm [right] and 2.08±0.45 cm [left]). The distances from the IJV to the nerve roots on the right side were significantly shorter than those on the left side (P< 0.05).
The frequencies of the C5-8 nerve roots that ran behind the IJV are summarized in Table 2.

Cervical nerve root	Right (%)	Left (%)
C5	83	40
C6	77	36
C7	59	6
C8	24	0

[The frequencies of C5-8 nerve roots ran behind IJV]

The right C5 nerve root ran most frequently behind the IJV (83%). On the other hand, no left C8 nerve root ran behind the IJV.
Conclusion: All nerve roots from the C5-8 other than the left C8 root ran dorsally to the IJV. The mean distances from the IJV to the C5 and C6 nerve roots were less than 1.0 cm. We conclude that IJV cannulation can accidentally traumatize the BP if the needle passes through the posterior wall of the right IJV.

8AP2-4

Three-dimensional reconstruction of the spatial distribution of anaesthetic during locoregional anaesthesia

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Background: Ultrasound guided anaesthesia is nowadays a standard for performing locoregional anaesthesia. In the clinical pratice, 2D ultrasound is commonly used,while only a few experiences describe the use of multiplanar imaging obtained with 3D devices [1]. Multiplanar imaging can ensure the correct positioning of the needle with respect to major vessel and nerves, thus reducing the incidence of errors, in particular of intrafascicular, intravascular and pleural injections.In this case report, the visualization of a volumetric reconstruction of the position of the needle and the distribution of the anaesthetic with respect to the target nerve, using a three-dimensional rendering of the acquired volume is described.
Case report: The present experience concerns a 21 years, male ASA I patient who underwent axillary block that was performed for a scheduled upper arm surgery, after giving his informed consent. The block was performed with a combined of electrical stimulation and ultrasound guidance technique. After elicitation of the motor nerve response, we administered 5 ml of local anesthetic at a rate of 600 ml per hour. After the execution of the block, a 30 MyLab Gold (Esaote) with the LA523 linear transducer (7.5 MHz frequency) was used to record a movie, while the probe was slid along the axillary artery in the cranio-caudal direction for 5 cm.
The film was elaborated to visualize the volumetric reconstruction of the distribution of the anesthetic with respect to the target nerve, using a tridimensional rendering of the acquired volume. In the present stage, the reconstruction of the volume occurs as an offline procedure. A semi-automated segmentation allows defining the regions corresponding to the nerve and the anaesthetic. The two regions are, at the moment, fed to a visualization program (MicroView, by GE Healthcare) which performs the actual rendering of the image.
Discussion: The 3D image allows an easy visualization of the spatial distribution of the drug around the nerve, as the length of nerve exposed to anaesthetic has large impact on the treatment outcome. It clearly shows the anatomic peculiarities (presence of septa, relative placement of vessels and nerves) which sometimes make the drug distribution unpredictable, with reduced efficacy of the block.

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Learning points: Using 3D imaging we expect a possible optimization of the dose of the anaesthetic to be administered.

8AP2-5

Ultrasound-guided interscalene brachial plexus block evaluated by infrared thermography and distal skin temperature

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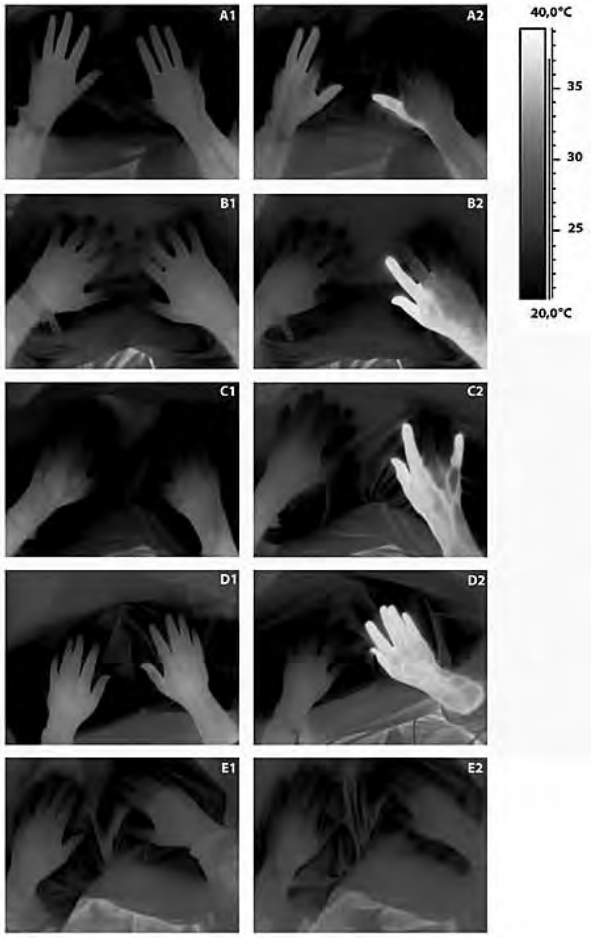
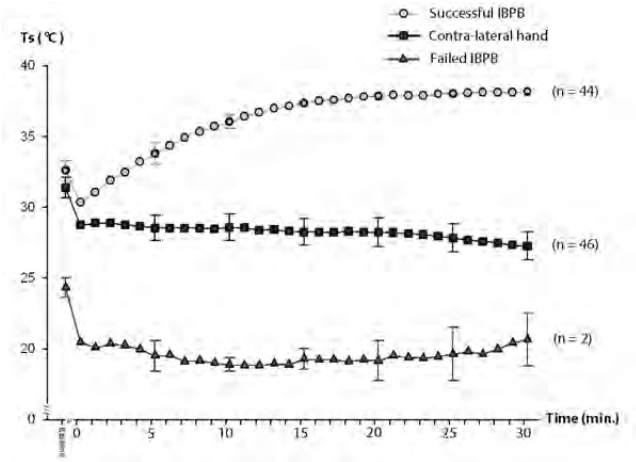
Background. Sympathetic block causes vasodilatation and increase in distal skin temperature (Ts)([123]). However, the detailed thermographic pattern after brachial plexus block is unknown. In the present study we investigated the thermographic response in the upper limb after an interscalene brachial plexus block (IBPB).
Methods. We performed an US-guided IBPB in 46 patients scheduled for shoulder surgery. Using the contra-lateral hand as control we obtained infrared thermographic images of both hands before blocking and during the following 30 minutes. We defined areas of interest on the hands and fingertips and analyzed mean Ts of each area.
Results. Forty-four blocks were successful and two were failures. We uncovered four distinct thermographic patterns of a successful IBPB. All successfully blocked hands demonstrated a rapid, substantial and highly significant increase in Ts of the 1st finger. In 4 patients the increase in Ts was restricted to the 1st finger; 11 patients demonstrated increased Ts of the 1st and 2nd finger; 5 patients had increased Ts of the 1st,2nd and 5th finger and in the remaining 24 patients Ts increased in all parts of the hand. In contrast, Ts decreased in all parts of the hand in the 2 failed blocks and in all contra-lateral measurements.



[Figure 1 Infrared thermographic images before and 30 min after intersealene brachial plexus block. 5 different patterns are illustrated. Image 1: before blocking. Image 2: 30 min. after blocking. Panel A: Skin temperature (Ts) increase confined to 1st finger. Panel B: Ts increase on 1st and 2nd finger. Panel C: Ts increase in 1st, 2nd and 5th finger. Panel D: Ts increase in all parts of the hand. Panel E: Ts decrease after block failure.]



[Figure 2: Mean skin temperature (Ts) measured at Spot1 (1st finger) after interscalene brachial plexus block (IBPB). Values are means. Error bars represent SEM.]

Conclusion. Successful IBPB resulted in four different thermographic patterns in the hand. Ts always increased in the 1st finger and distal Ts was statistically significant already after 2 min. These results should be used in future studies investigating distal Ts of the 1st finger in predicting IBPB success.

References.

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8AP2-6

use of ultrasound to identify the spinal space in back instrumented. Case Report

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Instrumented spines represent a challenge to perform spinal anesthesia. Fluoroscopy can help but it is expensive and not easily accessible. Normal lumbar spinal ultrasound anatomy has already been described, but little is known about the ultrasound anatomy of instrumented spines for conductive anesthesia.

Case report: Our 30 year old patient was programmed for C-section. She had a scoliosis surgery at the age of 17 years where Harrington rods were placed. After her first c-section with general anesthesia she had a poor post operatory pain management and she wishes to have early contact with her newborn. In the sitting position an ultrasound back evaluation was performed. The end of Harrington rods above L4, the medullar canal, disruption of complex ligamentum flavum-dura at L4-L5 and L5-S1 and its distance from the skin were noted. Disruption of ligamentum flavum-dura is not adequate for epidural puncture so L4-L5 were chosen for spinal anestesia with a pencil-point 27G needle. The ultrasound identified intervertebral space L4-L5 coincided with the images visualized in the fluoroscope screen.

The technique was made with a unique puncture; anesthesia level was adequate and without complications. During newborn extraction ketamine 25 mg bolus was administrated and after extraction Remifentanyl TCI Cp as analgesic complement. For post operatory pain control we did a bilateral eco guided TAP block with Bupivacaine + Adrenaline, 10 cc in each side. Post operatory evolution was excellent and patient referred a VAS of 1/10.

Conclusion: By being able to identify the best accessible intervertebral space improves the chances of applying anesthesia with a unique puncture, thanks to the identification of the anatomical changes caused by previous surgery and possible complications related to general anesthesia in the pregnant patient and fetus were avoided. Strengthening analgesia with intravenous medications and additional peripheral blocks gave the patient greater comfort and an early recovery.

References:

Anesthesiology Clin 2008;26:145-158, Br J Anaesth 2009; 103: 726-, Anesth Analg 2007;104:1188-1192.

Learning points: Ultrasound assisted evaluation of instrumented spines permits the identification of bony and ligamentous structures, the measurement of distances and the identification of irregularities in the ligamentum flavum. This allows us to make an evaluation, determine the accessibility and to implement neuraxial techniques.

8AP2-7

Ultrasound-guided obturator nerve block: effects and spread of distal interfascial injection

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Background and Goal of Study: This study assessed the effect of solely ultrasound (US)-guided obturator nerve block by an interfascial approach, in patients undergoing transurethral resection of bladder tumors (TUR-BT), and by anatomical dissection in fresh cadavers.

Materials and Methods: In the clinical study, ethical approval for the study was provided by our hospital and written informed consent was obtained from all patients. Obturator nerve block was performed by an US-guided distal interfascial approach between the adductor longus and brevis and brevis and magnus muscles.

Following nerve stimulation to confirm muscle twitch responses, 5 mL of 1.5% lidocaine with epinephrine was injected. In the cadaver study, approval of the ethics committee of our university was obtained with written informed consent prior to death. Obturator nerve block was performed by the same manner as in the clinical study, with injection of 5 ml of a blue dye, followed by anatomical dissection.

Results and Discussion: All 20 obturator nerve blocks in 18 patients were successfully performed. Motor functions of the adductor muscles were blocked within 10 minutes in all cases.

When positive responses at both branches were obtained by the nerve stimulation, shorter onset time (5.9 (4.8-6.9)) min, mean and 95% confidential interval) was observed comparing to patients without any positive responses (8.0 (4.6-11.4) min, $p = 0.0032$). Effect of motor blockade was lasting for 261 (232-290) min and it did not have relation between the duration time and presence of positive responses by nerve stimulation.

Pearson's correlation coefficient indicated a significant correlation between the number of branches with positive responses to nerve stimulation preblock and onset time ($r = 0.586$, $p = 0.007$).

There were no complications related to obturator nerve block, such as intravascular injection, local anesthetic toxicity, neural damage or paralysis of the adductor muscle. In 16 obturator nerve blocks in eight cadavers, all the anterior and posterior branches were surrounded by the blue dye for 3-5 cm in the interfascial planes of the adductor muscles. In only one block the blue dye spread to the pectineus muscle.

Conclusion(s): US-guided interfascial injections between the adductor muscles could provide clinically effective obturator nerve block for TUR-BT. Anatomical dissection supported the clinical results, demonstrating spread of the dye over the anterior and posterior branches.

8AP2-8

Analgesic efficacy of ultrasound-guided transverse-abdominal plain blockade in laparoscopic urological surgery

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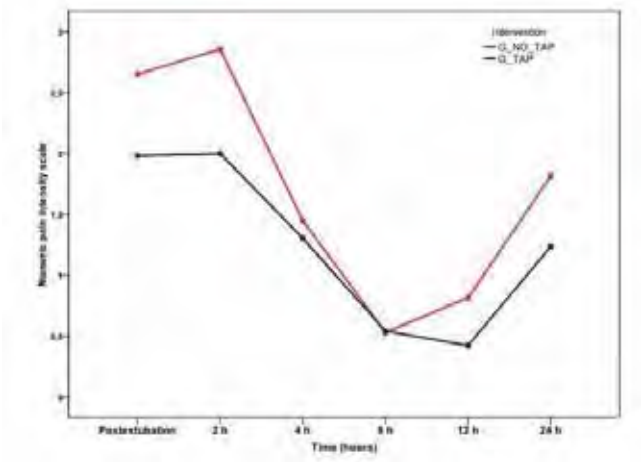
Goal of study: The purpose of this study was to compare pain level (according to numerical pain intensity scale) at 1 hour post-extubation, 2, 4, 8, 12 and 24 postoperative hours between patients who underwent transverse abdominal plain blockade (TAP) and patients with conventional analgesia. Also the opioid consumption was assessed.

Material and methods: After ethical approval, we performed a randomized clinical trial. Patients underwent laparoscopic nephrectomy or prostatectomy were randomized in an experimental group (TAP) with local anaesthetic: Bupivacaine chlorhydrate 0.25% adjusted by weight and type of surgery; and, control group (no TAP).

All patients received iv Metamizol 2 g at the end of surgery and later q 8h, Morphine and Hyoscine as a rescue analgesia. Inclusion criteria were >18 yrs., laparoscopic urologic surgery, physical status ASA <3, surgical procedure without complications, signed informed consent. Exclusion criteria were allergy to bupivacaine chlorhydrate, patients with chronic pain treatment, alcoholism, decompensated hepatic disease, coagulation disorders and BMI >35. Demographic data, postoperative pain, morphine consumption, length of stay and complications were measured.

Results: 120 patients were recruited, 75 prostatectomies and 45 nephrectomies. 61 patients were randomized to TAP interventional group and 59 patients to no-TAP group.

No demographic and clinical differences between groups were found. Figure 1 shows the numerical pain intensity scale along 24 postoperatively hours.



[Fig1]

Morphine consumption was lower in TAP group (3.8 vs 5.5 mg; P=0.034). When we analyzed different type of surgical intervention, morphine consumption was lower in TAP nephrectomies (4.5 vs. 7.4 mg; P=0.028). In prostatectomies no differences were found between groups (3.6 vs. 4.2 mg; P=0.521). No differences were found in NVPO, liquid and food tolerance, or early mobilization.

Conclusions: Morphine consumption was lower in patients who underwent transverse-abdominal plain blockade, especially in nephrectomies. No adverse effects were observed. Our data suggest that TAP blockade might be a good tool for multimodal analgesia in laparoscopic urological surgery.

8AP2-9

Motor sparing knee block - a new approach: audit of analgesic effects in 13 consecutive cases undergoing total knee arthroplasty

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Background: A new motor sparing block technique for knee surgery (MSK block) has been described. The analgesic effects are shown in this retrospective audit of 13 consecutive patients undergoing TKA.

Case report: Lateral and Intermediate Cutaneous Nerves of Thigh (LCNT, IMCNT), Infrapatellar (IPN) and Genicular Nerves (GN) were blocked using US with a total of 25 ml 0.75 % Chirocaine for postoperative analgesia. All patients received Paracetamol i.v. and Morphine as required. Further i.v. Morphine was prescribed for recovery. A rescue femoral block was used if clinically indicated. Postoperative oral Morphine and/or Tramadol was prescribed, NSAIDS used as tolerated. 24 hours pain scores and analgesic consumption data was collected. All blocks were performed by the first author.

Results: 7 male (age 53-71, weight 75-120 kg) and 6 female patients (age 56-86, weight 55-75 kg) underwent primary TKA. 1 patient had spinal, 12 general anaesthesia with Propofol / Fentanyl induction and Sevoflurane maintenance.

	Intraop. i.v. Morphine	Pain score recovery 0-3	Recovery Morphine i.v.	24 hour pain score 0-3	Oral Morphine / 24 hrs	Oral Tramadol / 24 hrs(n=6)
average	2.75 mg (excl spinal pt)	1 (excl spinal pt)	4.1 mg (excl spinal pt)	1	24.5 mg	333 mg
minimum range (No of patients)	0 (n=6)	0 (n=5)	0 (n=7)	0 (n=1)	0 (n=2)	200 mg (n=1)
maximum range (No of patients)	10 mg (n=1)	3 (n=1)	20 mg (n=1)	2 (n=2)	50 mg (n=1)	400 mg (n=3)

[Opioid use and pain scores in 24 hours]

2 patients required a femoral catheter and were excluded from further analysis. None of the remaining patients had motor block.

Discussion: MSK block sequence requires 6 separate injections, which could prolong overall anaesthetic time, however target identification is made easier by bony characteristics (GN) and perivascular placement (IPN). Patients show good pain scores after TKA, even though the posterior capsule is not blocked with this approach. Over 24 hours 9 of 11 patients had no or mild pain and using only small doses of oral Morphine (and 1 of 2 remaining patients with moderate pain did not take any analgesia). In the 2 femoral catheter patients one or more injections may not have been in the optimum position. Compared to intraoperative infiltration technique MSK block adds the cutaneous cover for TKA and, being placed prior to incision may reduce windup. A comparison with femoral nerve block and enhanced recovery protocol remains to be conducted.

Conclusion: MSK block may be a promising new technique for TKA with good analgesia and no motor block.

8AP3-1

Comparision of meperidine and nefopam for prevention of shivering during spinal anesthesia

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Background and Goal of Study: Shivering is a frequent event during spinal anesthesia and meperidine is a well-known effective drug for prevention and treatment of shivering. Nefopam is a non-opiate analgesic and also known to have an anti-shivering effect. We compared nefopam with meperidine for efficacy of prevention of shivering during spinal anesthesia.

Materials and Methods: Sixty five patients, ASA physical status I or II, aged 20-65 years, scheduled for elective orthopedic surgery under spinal anesthesia were investigated. Patients were randomly divided into two groups, meperidine (Group M, n=33) and nefopam (Group N, n=32) groups. Group M and N received meperidine 0.4mg/kg or nefopam 0.15mg/kg, respectively, in 100mL of isotonic saline intravenously. All drugs were infused for 15 minutes by a blinded investigator before spinal anesthesia. Blood pressures, heart rates, body temperatures and side effects were checked before and at 15, 30, and 60 minutes after spinal anesthesia.

Results and Discussion: The incidences and scores of shivering were similar between the two groups. The mean arterial pressures in Group N were maintained higher than in Group M at 15, 30, and 60 minutes after spinal anesthesia. The injection pain was checked in Group N only and its incidence was 15.6%.

Conclusion(s): We conclude that nefopam can be a good substitute for meperidine for prevention of shivering during spinal anesthesia with more stable hemodynamics, if injection pain is effectively controlled.

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Acknowledgements: We deeply appreciate to Dr Yeon A Kim for collecting and analyzing the data of this study.

8AP3-3

Transversus abdominis plane block: effect of the local anesthetic volume on analgesia after laparoscopic cholecystectomy

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Background and Goal of Study: The TAP block interest for analgesia after laparoscopic cholecystectomy has been well established. Despite the extensive literature on this subject, there is currently no agreement on the optimal volume of the local anesthetic to administrate. The aim of our study is to evaluate the effect of the local anesthetic volume on the quality of analgesia obtained, following a TAP block performed during laparoscopic cholecystectomy.

Materials and Methods: After the approval of the ethics committee, we performed a prospective randomized double-blind uncontrolled trial, including 60 patients of ASA I & II, aged between 20-65 years, who were proposed for laparoscopic cholecystectomy for cholelithiasis.

All patients had a bilateral blind TAP block with the same dose of local anesthetic (100 mg of bupivacaïne), delivered in three different volumes. Patients were randomised into three groups according to whether they received 20 ml of bupivacaine 0.5% (group G1), 30 ml of bupivacaine 0.33% (group G2), or 40 ml of bupivacaine 0.25% (group G3). Parametric data were analyzed using one-way analysis of variance. Non parametric data were analyzed using chi-

square test. A value of $p < 0.05$ was considered significant.
Results and Discussion: Patients' demographic characteristics were statistically similar between the three groups regarding age ($p = 0,836$), sex ($p = 0,851$), weight ($p = 0,973$) and height ($p = 0,655$). The comparison of intraoperative remifentanil consumption per minute (Table 1) and Visual Analog Pain Sale scores (Figure 1), showed statistically significant results. The use of postoperative analgesics was significantly lower in group G3 (Table 2).

	Groupe G1 (N = 20)	Groupe G2 (N = 20)	Groupe G3 (N = 20)	ANOVA (p)	Post hoc (G1-G2)	Post hoc (G1-G3)	Post hoc (G2-G3)
Remifentanil consumption per minute (µg/min)	13,01 +/- 2,85	10,71 +/- 3,33	8,95 +/- 2,02	**< 0,001**	**0,041**	**< 0,001**	0,148

[Table 1. Remifentanil consumption per minute.]

	ANOVA (p)	Post hoc (G1-G2)	Post hoc (G1-G3)	Post hoc (G2-G3)
Morphine	0,003	0,679	**0,005**	**0,047**
Paracetamol	< 0,001	0,076	**< 0,001**	**0,026**
Nefopam	< 0,001	0,101	**< 0,001**	**0,025**

[Table 2. Postoperative analgesics consumption]

[Figure 1. Visual Analog Pain Scale Scores]

Conclusion(s): The increased volume of local anesthetic improves the quality of analgesia obtained following a TAP block performed during laparoscopic cholecystectomy.

8AP3-4

The effects of thoracic epidurally administered drugs on urethral sphincter function: a pooled analysis

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Background & Goal of the study: Thoracic epidural analgesia (TEA) has been shown to inhibit detrusor activity in patients undergoing open renal surgery, resulting in relevant postvoid residuals. However, the impact of different epidural drug mixtures on urethral sphincter function is unknown.
Material and methods: The present study is a pooled analysis of an open observational study[1] and a double-blind randomized trial[2]. Twenty-eight women without lower urinary tract symptoms, who underwent open renal surgery with TEA, were pooled and categorized into three groups with different epidural regimens (7 with bupivacaine 0.125%, 8 with bupivacaine 0.125% and fentanyl 2 µg/ml and 13 with bupivacaine 0.1% plus fentanyl 2 µg/ml and epinephrine 2 µg/ml). All women underwent urethral pressure measurements before TEA and during TEA 2-3 days postoperatively. All patients received a TEA placed at the insertion site interspace T 8-9.
Results and discussion: Maximum urethral closure pressure (MUCP) at rest decreased significantly during TEA with bupivacaine alone (mean 70 cmH2O [95% CI: 64-77] to 45 [29-61], P=0.0005) and with bupivacaine/fentanyl/epinephrine (72 [58-86] to 61 [47-75], P=0.016), whereas with bupivacaine/fentanyl no significant change could be detected (70 [58-81] vs 63 [50-75], P=0.391). In all groups functional profile length at rest was not influenced during TEA.
Bupivacaine decreased MUCP at rest. This effect was counteracted by the addition of fentanyl, most likely a systemic effect. The addition of epinephrine, which decreases the fentanyl plasma level by half again lead to a reduced MUCP. Systemic opioids may not only impact detrusor function but also urethral pressure further inducing voiding problems.
Conclusion: TEA with bupivacaine and the addition of fentanyl and epinephrine appears to decrease maximum urethral closure pressure at rest in women. The addition of fentanyl alone to bupivacaine may reduce this effect. Thus, the TEA effect on urethral sphincter function seems to depend on the drug mixture administered.
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8AP3-6

The blockade of the sciatic nerve with different doses and volumes of lidocaine using ultrasound guidance

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Background and Goal of Study: To determine minimal volume and amount of lidocaine required to provide an effective sciatic nerve blockade. No minimum effective amount of lidocaine to block the sciatic nerve.
Materials and Methods: 193 sciatic nerve blocks have been performed for 193 patients. The procedure was given using both ultrasonic guidance and peripheral nerve stimulation techniques. The blocks were performed with 20 and 15 ml of 0,75% lidocaine solution; 40, 30, 25, 20, 15, 12,5, 10ml of 1% lidocaine;10 and 7,5ml of 1,5% lidocaine; 10, 7,5 and 6,5ml of 2% lidocaine; 6,5 5, 4,5ml of 3% lidocaine; 5 and 4,5ml of 4% of lidocaine. The cross section area of the local anesthetic and spread length along the course of the nerve were determined. Ethical approval for this study was provided by the Ethical Committee of the Mogilev Regional Hospital, Belarus (President Dr.Alexandr R.Stolin), Protocol No.3/C on 2 August 2010.
Results and Discussion: Minimal volume of 0,75% solution to obtain a complete sciatic nerve block was 20ml; 1% - 12,5ml; 1,5% - 10ml; 2% - 6,5ml; 3% - 5ml; 4% - 5ml. The minimal amount of anesthetic with 3% and 4% lidocaine solution necessary for an adequate block was 150 and 200mg, respectively. It is obvious that the amount of lidocaine of 135 mg (3% solution, 4,5 ml) and 180 mg (4% solution, 4,5 ml) is sufficient to provide a successful sciatic nerve block. But a reduction in the volume of the local anesthetic to 4,5 ml did not ensure complete wrapping of the sciatic nerve and as a result an adequate block could not be achieved.
Conclusion(s): Minimal volume of local anesthetic to obtain an effective sciatic nerve block was 5ml, minimal quantity of lidocaine was 125mg. The use of ultrasonic visualization for the performance of the effective regional sciatic nerve blockade made it possible to reduce the amount of lidocaine from 300-400 mg to 125 mg. The use of 4.5 ml of 4% lidocaine did not lead to complete anasthesia and motor block in the zone of innervation of the sciatic nerve. No complete wrapping of the sciatic nerve was noted.

8AP3-7

Effectiveness of treatment options for post-dural puncture headache retrospective review at St. Luke's International Hospital in Tokyo between 2007-2011

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Objective: To investigate the incidence, options and duration of treatment for post dural-puncture headache (PDPH), as well as the number of additional in-hospital days spent due to PDPH.
Methods: After obtaining IRB approval, we conducted a retrospective review of medical records at our Hospital between 2007-2011.
Results: There were approximately 6,000 cases of neuraxial anesthesia at our hospital between 2007-2011. Cases included epidural anesthesia (Epi, 18G Tuohy needle), spinal anesthesia (Sp, 25G Quincke needle), and combined spinal-epidural anesthesia (CSEA, needle-through-needle with 18G Tuohy needle and 27G Whitacre needle,). We identified 35 patients diagnosed with PDPH (24 with Epi, 11 with CSEA, none with Sp). In Epi, all patients with PDPH had documented accidental dural punctures and were positive for aspiration of cerebrospinal fluid (CSF) from the epidural catheter. In CSEA, 10 patients had accidental dural punctures by the 18G epidural needle with aspiration of CSF. One patient's dura was reportedly only pierced with the 27G needle.

Out of all patients, 34 were administered caffeine (300mg/day), while the remaining were given NSAIDs. Timing of caffeine administration varied between zero and 9 post-operative days (POD). Symptoms resolved in 30 of 34 patients given caffeine or NSAIDs, but blood patch therapy (BP) was additionally performed in 4 patients whose symptoms did not resolve with caffeine and observation. BP was performed at 2, 5, 6, and 10 POD. PDPH resolved within 1 to 8 days of BP. The length of hospital stay was extended due to PDPH in 3 patients, who spent additional 5, 6 and 10 days beyond their scheduled length of stay. No patients received multiple BPs.
Discussion: PDPH is an occasional complication of neuraxial anesthesia. Normally headache resolves spontaneously within 7 days, but may be sustained. Caffeine and BP are treatments options for PDPH. In this study series, 7 patients received BP for caffeine-resistant PDPH. It has been reported that BP within 24 hours of dural puncture is not effective, but there is no conclusive evidence regarding the optimal timing of BP for PDPH. We suspect that early BP (within 7 days) may alleviate PDPH faster than caffeine therapy, with the possibility of reducing additional in-hospital days.
Conclusion: We treated 35 PDPH patients with caffeine and BP. Early BP may be more effective against severe PDPH than caffeine administration, and may help reduce additional in-hospital days.

8AP3-8

In vitro exposure to local anesthetics impairs human osteoblasts cell growth

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Background and Goal of Study: Local anaesthetics inhibit neuronal signal transmission through blockade of the sodium channel and are widely used to induce anaesthesia or analgesia. In various settings, e.g. after arthroscopic surgery, they can be continuously infused into the joint providing postoperative pain relief. Chondrotoxicity of some of these agents after intra-articular application has been previously shown.
We investigated the effect of common local anaesthetics on growing osteoblasts in an *in vitro* model focusing on cell count, cell viability, proliferation rate, apoptosis and wound healing.
Materials and Methods: Growing foetal human osteoblasts were exposed to lidocaine, bupivacaine or ropivacaine solutions at 0.3125 mg/ml (low) or 1.25 mg/ml (high) under different settings.For the wound healing essay cells were grown to confluence leaving a standardized 500 mm gap open. Plates were then incubated for 15 hrs with the local anaesthetics at low or high concentration and gap area closure was then determined.For the cell count, viability, proliferation and apoptosis essays: *Group 1*: continuous exposure; *Group 2*: exposure limited to 48 hrs, followed by incubation in neutral medium. Cells were harvested and analysed after 3, 6, 9 days.Cell counts, viability and proliferation were assessed by fluorescence DNA quantitation, tetrazolium bromide (MTT) and by colorimetric bromodeoxyuridine (BrdU) assay respectively; apoptosis using the fluorogenic caspase-3 cleaved reporter assay.
Results: Wound healing was significantly impaired with high concentrations of all local anaesthetics ($p < 0.001$) with bupivacaine showing the largest negative effect when compared to others ($p< 0.05$). In Group 1, exposure to local anaesthetics resulted in a significant dose and time dependent decrease in cell number, viability, proliferation and apoptosis rates for all three local anaesthetics when compared to control ($p < 0.001$). In Group 2 lidocaine and ropivacaine showed significantly less decrease in cell number and proliferation when compared to Group 1 ($p < 0.05$). With bupivacaine this effect could only be shown at low concentrations.
Conclusion(s): These data suggest that intra-articular application of local anaesthetics may negatively affect osteoblast's growth, viability and proliferation, possibly impairing bone healing in this in vitro model. Limiting exposure to shorter periods of times and lower concentrations could weaken this deleterious side effect.

8AP3-9

Effect of intravenous methylprednisolone in the treatment of post-dural puncture headache: a double blind controlled clinical study

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Background and Goal of Study: Post-dural puncture headache(PDPH) is the most frequent complication after spinal anesthesia or accidental dural perforation during attempted epidural block. There is no definite profilactic treatment to prevent PDPH.In this study we evaluated the efficacy of intravenous methylprednisolone in the treatment of headache after spinal anesthesia.
Materials and Methods: After hospital ethical committee approved the study and written informed consent was obtained, fifty patients (American Society of Anesthesiologists physical status I-III) with headache after spinal anesthesia were included in this double blind controlled clinical study conducted between 1 January and 30 September 2012, in Constanta County Emergency Hospital. Patients were randomly assigned in two groups: 25 patients received only conventional therapy (complete bed rest, hydration, acetaminophen and pethidine), other 25 patients received conventional therapy plus intravenous methylprednisolone (one dose of 500 mg iv). Mean (+/- SD) of headache intensity at 0, 6, 24, and 48 hours after beginning of treatment was measured using visual analog scale.There were no differences in the demographic variables between groups.
Results and Discussion: There was no significant difference in headache intensity between two groups before beginning of treatment. After 6 hours, the mean of headache intensity in 25 patients treated conventionally was 5.83 (+/- 1.27) while it was 2.37 (+/- 1.06) in other patients received intravenous methylprednisolone too ($p < 0.001$). After 24 hours, mean headache intensity was 3.82 (+/- 1.64) in conventionally treated group versus 0.84 (+/- 0.62) in methylprednisolone group ($p < 0.001$). After 48 hours, mean headache intensity was 1.72 (+/- 0.73) in conventionally treated group versus 0.53 (+/- 0.21) in methylprednisolone group ($p = 0.001$).
Conclusion(s): Some authors have used steroids with certain degree of success as a part of the treatment of PDPH. The steroid that has been used is Hydrocortisone of up to 800 mg over 24 hrs. In this study we have shown the therapeutic effects of intravenous methylprednisolone in reducing headache after spinal anesthesia. Its mechanism of action is yet to be determined. However, we believe it is useful to perform a prospective evaluation of this drug against the traditional conservative treatment and hydrocortisone.

8AP3-10

Development of an experimental porcine model of bupivacaine intoxication: correlation of plasma levels of bupivacaine and electrocardiographic parameters

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Background and Goal of Study: Reports of serious cardiac bupivacaine intoxication are fortunately unusual, however in order to improve our knowledge and prevention of local anaesthetic toxicity the development of animal models is needed. The adverse event comes along with important electrocardiographic alterations, especially those related to ventricular conduction such as the QRS interval widening.
Detecting a severe intoxication with local anaesthetic before a cardiovascular collapse takes place involves important clinical considerations. We aimed to develop a non-letal steady model of bupivacaine intoxication and correlate bupivacaine plasma levels with the QRS complex duration as an instantaneous marker of severe local anaesthetic intoxication.
Material and methods: Fourteen mini-pigs were premedication with ketamine and anesthetized with intravenous sodium thiopental 5mg-kg . The anesthetic maintenance was performed with sevoflurane 1 CAM (2.6%).
Femoral artery and vein were canalized for invasive monitoring, analytical blood gas samples and bupivacaine levels determinations. After instrumentation and motorization, a bupivacaine bolus of 4 $mg.kg^{-1}$ was administered. Electrocardiographic parameters were recorded and blood samples were taken before and 1, 2, 3, 4, 5 and 10 min after the drug administration. We correlated venous plasma concentration with the QRS widening observed. A P-value < 0.05 was considered statistically significant.
Results and discussions: No animal died as a result of the experience and hemodynamic data and blood gas analysis were maintained at physiological

range. The mean of maximum QRS interval prolongation was 159% of the control value and was observed in 80% of the animals, whereas the rest developed sustained and non-sustained ventricular tachycardia.
There was a statistically significant positive correlation between the **Δ** in QRS interval and bupivacaine plasmatic levels. (Correlation coefficient of 0.46; P=0.017).
Conclusions: This porcine model of bupivacaine intoxication has been steady, obtaining important electrocardiographic modifications and keeping alive all animals. The relevant QRS interval widening was positively correlated with bupivacaine plasmatic levels. The instantaneous modification of this electrocardiographic parameter could be a useful clinical marker of serious bupivacaine intoxication in a daily basis.

8AP3-11

Ropivacaine less pronounced inhibits sympathetic activity than bupivacaine

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Background and Goal of Study: Local anesthetics cause sympathectomy and therefore hemodynamic disorders. The purpose of the study was investigation of the effect of local anesthetics on vegetative balance.
Materials and Methods: We have examined 37 males who had surgery on inguinal hernias under epidural anesthesia. 19 patients had epidural anesthesia with a 0.5% solution of bupivacaine, 18 patients - with a 0.75% solution of ropivakayine. In the perioperative period all patients underwent daily ECG monitoring by Holter with determination of heart rate variability (HRV). Normal values of HRV were determined on the basis of monitoring of healthy control individuals (12 males).
Results and Discussion: Compared with the control group in the examined patients in active period of monitoring LF/HF was significantly higher (1.83 and 4.48, respectively). In passive period LF/HF increased by 16.07%, $p < 0.05$ (to a value of 5.2). Compared with the control group in the examined patients pNN50% in active period of monitoring was lower (6.3 and 4.42, respectively). In passive period pNN50% nonsignificantly increased by 1.58% (to 4.49). In active period LF/HF was on 22.08% higher in group of ropivacaine as compare with bupivacaine. The values significantly increased in both groups in passive period ($p < 0.05$). However in group of ropivacaine LF/HF decreased only by 12.60%, in group of bupivacaine by 20.60%. The difference between groups decreased to 13.99%. In active period pNN50% was higher on 7.51% in group of ropivacaine. In passive period the values nonsignificantly increased in both groups. The difference between groups decreased to 6.73%.
Conclusion(s): Ropivacaine characterized by less pronounced inhibition of sympathetic activity. In our opinion due to this is less pronounced disorders of baroreflective regulation of the heart under the influence of ropivacaine and, thereafter, less pronounced clinical manifestations of sympathectomy (decreasing of blood pressure and bradycardia).
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8AP4-1

Sheared epidural catheter: what now?

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Background: Breakage of an epidural catheter is a rare yet well-known complication. Due to the small number of cases found in the literature, the decision to leave or remove indwelling catheter sections remains controversial. This report aims to make a review of the dos and dont's in this setting.
Case report: The patient, a 56 y.o. man, ASA II, scheduled for Hip Resurfacing, received an epidural catheter using the loss-of-resistance technique (B. Braun Perifix® G18). In left lateral position, a Tuohy needle was placed into L3-L4, and the catheter was advanced 10cm. Resistance was encountered while introducing the catheter, therefore it was decided to remove it through the needle, and it sheared off at 2.5cm. After informing the surgeon and patient, a CT scan was done and the patient was discharged to the post-anesthetic unit. CT showed that the catheter tip was retained in the posterior paravertebral tissues in L3-L4. Considering that the patient remained asymptomatic, it was decided to leave the fragment *in situ* and periodically follow-up the patient, who was advised to report any adverse symptoms.
Discussion: Possible causes for catheter fragmentation include: shearing of the catheter by a Tuohy needle when attempts are made to withdraw the catheter through the needle; kinking/curling/knotting and manufacturing defect. Due to the rare complications that might develop from the presence of a retained fragment, the patient should be informed and monitored periodically. Imaging exams should be done in all cases to determine the exact location of the fragment, to orient laminectomy, and for follow-up. Current literature suggests that retained fragments are sterile, inert and unlikely to cause neurological sequelae.
Therefore, it is believed that fragments are generally safe to leave in place as long as there are no neurological symptoms or signs. Exploratory laminectomy should be done if either the patient develops neurologic changes, the catheter is in the subarachnoid space, or the tip is emerging out of the skin [1].
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Learning points: The usual guidelines for insertion/removal of catheters should be strictly followed to prevent shearing. The presence of a fragment should be documented and communicated to the patient and surgeon, since symptoms may develop months or years later. Therefore, the patient should be reviewed periodically and, if symptoms develop, spine imaging and surgery are advocated.

8AP4-2

Can the patient position during lumbar epidural catheter removal affect its withdrawal forces in total knee replacement arthroplasty patients?

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Background and Goal of Study: The breakage or shearing of a lumbar epidural catheter from excessive tension during removal is not common, but if it does occur it can result in serious complications. Previous studies in pregnant women have indicated that the force at extraction of the lumbar epidural catheters was significantly greater with patients sitting compared with the lateral position.
On the other hand, patients in their middle ages or above with degenerative knee diseases may accompany degenerative spine conditions. Since there has been no investigation on lumbar epidural catheter withdrawal forces in these patient population, we investigated in this study, the lumbar epidural withdrawal forces and possible associated risk factors in total knee replacement arthroplasty (TKRA) patients.
Materials and Methods: Seventy eight patients undergoing TKRA and combined spinal epidural (CSE) anesthesia were enrolled. Lumbar epidural catheterization was performed at lateral position before surgery and the patients were randomly allocated to one of three position groups for removal: lateral (L), prone (P), and sitting (S). On the third postoperative day, all lumbar epidural catheters were removed by one investigator who measured the peak tension during withdrawal in the assigned position.
Results and Discussion: The forces (mean [range]) required to remove the catheters were considerably greater in the sitting and prone than in the lateral position: group P (3.88 N [0.28-10.36]), group S (4.14 N [0.04-11.57]), and group L (1.32 N [0.07-3.65]) ($P < 0.001$). And there were positive correlation between length of catheter in epidural space and peak tension. ($P = 0.0026$,

ß coefficient = 0.223) Patient factors such as sex, age, height, BMI, level of insertion, the depth from the skin to the epidural space, duration of catheter in epidural space, the history of spine surgery and listhesis in X -rays did not influence the withdrawal forces.
Conclusion(s): For ease of removal of catheters from the lumbar epidural space, the lateral decubitus position is recommended in TKRA patients. Thus, in placing the epidural catheter, the physician should pay attention not to insert a catheter too deep.

8AP4-3

The incidence of motor block following continuous epidural infusion analgesia (EIA) in children at a UK tertiary paediatric hospital

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Background and Goal of Study: Complications of continuous epidural infusion analgesia (EIA) in children are rare. The UK National Paediatric Epidural Audit(1) identified the risk of grade 1(serious) incidents to be 1:2000. This retrospective service review describes the incidence of motor blockade following EIA at a tertiary paediatric centre in the United Kingdom (UK). The results are compared with current national data.(1)
Materials and Methods: We performed a retrospective analysis of anaesthetic charts and EIA monitoring sheets in children receiving EIA between 2010 and 2011. Motor block was deemed significant/high if ≥2 on Bromage scale (can wiggle toes but not bend knees). Management and outcomes of significant motor block were identified from the medical and nursing notes.
Results: Over the 2-year period 58 patients with EIA were identified. Motor block ≥ 2 occurred in 24% (14/58) of children receiving EIA. Motor block was never recorded for 3(5%) of epidurals and was deemed difficult to assess in one case. The drugs used for the EIA were 0.125% levo-bupivacaine and 0.1% levo-bupivacaine with fentanyl 2mcg/ml. The occurrence of motor block was similar for both drugs 43% without additives and 57% with. The mean duration of motor block was 9.88 hrs.
Discussion: In our retrospective analysis, motor block appears to be a frequent occurrence in children receiving EIA.Half of all documented motor blocks resolved without intervention. The immobility that results from motor block of the extremity or the trunk can result in the development of pressure sores as well as compression injury of peripheral nerves. The UK national epidural audit identified 33 cases of this nature. There was one case of a pressure sore identified in our centre and similarly to the cases reported in the UK national epidural audit this resolved without further complications.
Conclusion(s): Despite the use of low concentration of local anaesthetic in EIA, we observed a significant incidence of motor block. Following these results, we have redesigned the guidance for management of motor block in patients receiving EIA. Also, assessment of skin integrity, and the importance of skin care on the ward was highlighted and further training had been provided . Further prospective audit of complications related to EIA will be required.
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8AP4-4

Combined spinal epidural anesthesia for open radical retropubic prostatectomy: a comparison between two anesthesia methods

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Background: Standard Operating Procedures (SOP's) lead to a standardization of processes in the operating room and provide high quality patient care and high patient safety. The combined spinal epidural anesthesia (CSE) is an alternative method as anesthesia for open radical retropubic prostatectomy (RPE). In a recently published study by Nakano et al. was shown in a small group of patients that the CSE has an advantageous effect on the intraoperative blood loss and blood pressure in patients with RPE. So far there is no study that has investigated in a large patient population, the advantages and disadvantages of the CSE. The aim of this high-volume single-center analysis was to compare the CSE with the combined general anesthesia plus epidural anesthesia (ITN/PDA) in terms of patient safety and process optimization retrospectively.
Materials and Methods: From the database of an online documentation software (Narkodata, IMESO GmbH) were analyzed anesthesia records of 1207 patients who underwent RPE in the period from 01/2008 to 08/2011 and met the study criteria. Parameters for patient safety, costs and time development were analyzed.
Results: A total of 698 (57.8%) patients received CSE and 509 (42.2%) patients ITN / PDA. The CSE group compared to the ITN / PDA had significantly reduced blood loss ($p < 0.0001$), a significantly reduced need of volume from the start of anesthesia to the end of the anesthetic recovery room ($p < 0.0001$) and a significantly lower need of catecholamines ($p < 0.0001$). Meanwhile, the need of Atropin in the CSE group was significantly increased (23.4 vs. 36.4%; $p < 0.0001$). The CSE caused relevant shorter processing times compared to the ITN / PDA with respect to anesthesia time, less surgical time (47.2 ± 18.9 vs. 77.7 ± 26.1 min; $p < 0.0001$), length of stay in the recovery room (160 ± 71.2 vs. 182 ± 88.5 min;. $p < 0.0001$) and the total hospital stay (9.9 vs. 11 days;. $p < 0.0001$).
Conclusion: This retrospective study with a large patient population for the first time shows that the method of CSE for patients undergoing radical prostatectomy is safe to use and therefore a possible alternative to the combined method ITN/PDA. In addition, our study showed significantly shorter anesthesia time, shorter stay in the recovery room and a shorter hospital stay. This seems to be in addition to a high level of patient safety and high quality patient care very relevant in the context of the perioperative process optimization.

8AP4-5

Neurogenic complications of caudal epidural anesthesia

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Background: Neuraxial anesthesia is a common procedure, allowing the physician to provide patients with cost-effective but also pain-effective anaesthesia. It can be performed easily and safely even at an outpatient clinic. However, unintentional side effects including local anesthetic toxicity, spinal epidural hematoma, infection, and neurogenic complications may occur, causing permanent neurologic deficits.
Case report: A 60 year old man presented with severe back pain and motor dysfunction. Past medical history included hypertension, diabetes, and unstable angina. Prior to admission, he underwent caudal epidural at a local clinic. Upon injection, he experienced an electrifying sensation shoting down both legs. Symptoms included continuous muscle spasms, allodynia, diaphoresis, fatigue, and urinary and rectal dysfunction. Both legs were edematous, pallor, and cold. Motor functions were difficult to evaluate. Lab findings showed elevations in CPK, CK-MB, CRP, and WBC count.
Initial MRI was vague, showing heterogenous contrast-enhancing lesions in the caudal epuina with subcutaneous hematoma. Unable to obtain a definite diagnostic image, treatment began by ruling out back infection along with anticonvusants and analgesics.
Over several weeks, he regained full sensory and motor functions. Follow up MRI showed bilateral heterogenous contrast-enhancement of the iliopsoas muscle.
Discussion: Despite efforts made to predict and prevent risk factors contributing to unsuccessful neuxraxial anesthesia, no absolute factors have been found. The level of experience of the anesthesiologist or provider, as well as anatomical anomalies of the patient and particles of steroids mixed to local anesthetics may affect its success. It is still controversial whether or not performing neuraxial anesthesia in those taking prophylactic anticoagulants is safe.
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Learning points: It is essential for the anesthesiologist to be fully aware of the anatomical and technical aspects of performing a successful block, along with specific pharmacological interactions and potential side effects in order to minimize such devastating outcomes. Negligence may lead to serious complications.

8AP4-6

Initial experience with a multidisciplinary enhanced recovery after surgery programme (ERAS) in patients undergoing colorectal metastatic liver resection

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Background: Actually, there is enough experience in retrospective and prospective trials to consider liver resection as the treatment of choice for some patients with liver metastases from colorectal cancer. The combined anesthetic technique (general anesthesia associated with epidural analgesia) is an anesthetic and analgesic option accepted and frequently used for perioperative management of major abdominal surgery, thoracic and cardiac ones, but there is controversy for use in liver resection surgery due to the coagulopathy and complications such as spinal hematoma making the anesthesiologist assess the advantages of the epidural catheter placement against these potential comlications.
This study evaluated the benefit of an ERAS programme for patients undergoing liver resection.
Materials and Methods: Prospective observational study including 61 patients undergoing colorectal metastasic liver surgery from January 2011 to June 2012. As variables selected: demographic data, ASA, past medical history, previous treatment, preoperative hemostasia, size of liver resection, anesthesia (general or combined), CVP, estimated blood loss, surgical specimen weight, hemostatic values at the end of surgery, at 24, 48, 72, 96 and 120 hours , postoperative pulmonary complications, postoperative oral intake, length of ICU and hospital stay.
Endpoints were estimated of blood loss, analysis of hemostatic profile after surgery, postoperative pulmonary complications, length of ICU & hospital stay, resumption of oral intake, morbidity and mortality.
Results: We studied 61 patients from January 2011 to June 2012, 31 were treated with epidural analgesia and 30 with intravenous analgesia. Both groups showed uniformity for comparison. 59% were men, most patients ASA II, 83%, with a mean age of 61.7 years. All patients had normal preoperative hemostasis. Less intraoperative bleeding was observed in patients managed with epidural analgesia ($p < 0.01$), less likely to develop pulmonary complications ($p < 0.01$) and an earlier oral intake ($p < 0.01$).ICU and hospital stay wasn't statistically significant.
Conclusion: The ERAS fast-track protocol is safe and effective for patients undergoing colorectal metastatic liver resection. It allows reducing intraoperative blood loss, early oral intake and less pulmonary complications.

8AP4-7

Epidural drug administration combined with epidural blood patch, executed immediately after dural puncture: a case report

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Background: A patient that was already under treatment for lumbalgia sciatica, attended the pain therapy department of the General Hospital of Rhodes for the third and last session of her epidural drug injection scheme.
The purpose of this study is to report an immediate epidural blood patch, combined with epidural drug administration that followed an unfortunate dural puncture during the epidural counter pain session. After searching in the online article search engines (eg Pubmed) no articles describing similar cases were found.
Case report: A 72 years old female patient attended the pain therapy department of the General Hospital of Rhodes for the 3rd and last session of her epidural drug injection scheme. The patient was well informed about the procedure including all advantages, possible complications and their possible solutions (eg blood patch), and firmed the consensus.
The patient was in visibly better condition in comparison to the first session and was eager to finish them as she claimed that after each previous session her situation constantly improved.
The patient was put under constant monitoring. All common protocols were followed for the execution of the epidural puncture (eg sterilization) that unfortunately brought to Dural Puncture. The patient immediately manifested severe headache, nausea and vomit and was informed about the situation.
The patient claimed that she could not bear the headache and graded it from a scale ranging from 1 to 10 as '10'.
The patient then underwent a second epidural puncture in a higher intervertebral space, that was followed by drug administration and then the injection of 20ml of autologous blood.
Discussion: The patient reported a gradual improvement of her situation and the headache was completely vanished after 35 minutes. Moreover the patient reported a further improvement of her lumbalgia sciatica.
References:
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2. D. Turnbull, D. Shepherd. "*Post-dural puncture headache: pathogenesis, prevention and treatment*" British Journal of Anaesthesia 91 (5): 718±29 (2003).
Learning points: This case represents a good example where epidural drug administration followed by an epidural blood patch, executed immediately after dural puncture, didn't compromise each other's respective beneficial results.

8AP4-8

The impact of the combination of continuous femoral and sciatic nerve block versus epidural analgesia for the postoperativ analgesia, functional recovery and outcome after total knee arthroplasty

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Background and Goal of Study: Total knee arthroplastyTKA is associated with severe postoperative pain. Although femoral nerve blockFEM is a well-established procedure to improve analgesia afterTKA, many surgeons remain critical in regard to prolonged quadriceps weakness and consequtive falls. Another issue is the pain at the popliteal region that might require a sciatic nerveSCI block. The aim of this prospective randomized controlled study is to compare the analgesia and short-term functional outcome with a FEM/SCI blocks versus epidural analgesia after TKA.
Materials and Methods: After ethical board approval, 100 patients who receive TKA under spinal anesthesia were randomized to the control group with epidural catheter analgesia (48 patients) or to the study group with a continuous combined FEM/SCI block (52 patients). Exclusion criteria were: age under18 years old, infection near insertion site, preexisting neurologic disorders, pregnancy or lactation, coagulation disorders, ASA IV, inability to understanding PCA pump. Perineural catheters in the study group were placed under ultrasound guidance. After anesthesia remission, the patients received primary PCA through the perineural or the epidural catheters. All patients could ask for supplementary piritramid if needed. The visual analogue scala VAS was recorded every hour from first postoperative pain until 8 h later, on day 1, 2 and 7 VAS was taken twice a day. Side effects of piritramid, quadriceps weakness, paresthesia on the sciatic territory, other paresthesia related to the epidural analgesia, maximal bending of the knee, walking distance were recorded for the first 7days.
Results and Discussion: Both groups were similar in respect to the demographic data. Postoperative opioid consumption was comparable for the first 48 hours, mean18,67mg ($p>0,05$). The only difference was at 8 hours postoperative, when the study group required more piritramid (17,86 mg±10,972,mean±SD) than the control group (12,42 mg±9,658) ($p=0,01$,Student T-test). 20,83%patients from the study group versus 34,61% from the control group experiences popliteal pain. The patients satisfaction was similar for both groups.
Conclusion(s): Our results are similar to other studies, the FEM/SCI combination being similar to epidural analgesia afterTKA. The limitation on the operated leg and the distance from the neuraxis might favour the combined FEM/SCI block. Short term functional outcome was similar with either analgesia procedure.

8AP4-9

The comparison of analgesic effects of epidural analgesia, continuous femoral block and intravenous patient controlled analgesia

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Background and Goal of Study: Total knee arthroplasty (TKA) is associated with severe pain. Inadequately treated, it intensifies reflex responses, which can cause serious complications, such as cardiopulmonary or urinary problems and thromboembolism. After TKA, postoperative pain relief can be achieved by a variety of techniques, such as IV patient-controlled analgesia (PCA), epidural analgesia, and continuous femoral nerve block. The aim of our study was to compare this three techniques in terms of their analgesic efficacy, their effects on hemodynamic parameters and patients' satisfaction.
Materials and Methods: Sixty patients, ASA I-III, undergoing TKA were randomized into three groups. After standart general anesthesia, first group (group GA) received IV PCA. The second group (group EA) received epidural anesthesia followed by an epidural PCA. In the third group (group KFB) a femoral nerve catheter was advanced before the induction of general anesthesia and after the operation they get a femoral PCA. Visual analog scale (VAS) scores were evaluated in recovery room, 1,6,24,48 and 72 hours after the operation and in 24,48,72 hours during exercise. Possible side effects, blood loss and patients' satisfaction were recorded.
Results and Discussion: In our study, we determined that, after TKA epidural analgesia and continuous femoral block provide better pain relief than IV patient controlled analgesia, continuous femoral block is as efficient as epidural analgesia and better during exercise.
Conclusion(s): Continuous femoral block is the technique of choice to provide postoperative analgesia after TKA, because the patients' satisfaction is better in femoral block group and it induces fewer side effects than epidural analgesia.

8AP4-10

Continuous thoracic epidural analgesia (CTEA) vs. intermittent bolus epidural analgesia (IBTEA) reduces hypotension risk and opiods use in major thoracic surgery

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Background and Goal of Study: Thoracic epidural anaesthesia (TEA) has been established as a cornerstone in the perioperative care in major thoracic surgery. The aim of this prospective, randomised clinical study was to compare the efficacy and safety of CTEA vs. IBTEA during major thoracic surgery.
Materials and Methods: Fifty-one patients, age between 50 and 85 years, II- IV ASA status, undergoing major thoracic surgery (pulmonary resection) under general anesthesia and TEA were allocated randomly to two groups according to type of local anesthetic administration via epidural catheter: group A (26 patients) with CTEA and group B (25 patients) with IBTEA. The thoracic epidural catheter was inserted before induction of general anesthesia, between the level T2 and T7. Anesthesia was induced using propofol, fentanyl, and rocuronium.
In group A we provide a continuous infusion of 4 ml/h ropivacaine 0.2% with 2-4 ml bolus as needed.
In group B we administrate repeated bolus of 4-6 ml of ropivacaine 0.5%. We recorded blood pressure (BP) before epidural anesthesia (baseline) and every 3-5 minutes, and we defined a decrease of 30% of BP, in relation with baseline value, as hypotension. Elevated BP has been first treated by increasing the epidural infusion rate or by bolus administration. If necessary the inspired concentration of sevoflurane was also increased. During the surgery intravenous ephedrine was used for arterial pressure control and the total dose used was recorded. The target for systolic BP during the operation was to avoid a decrease with more than 30% comparing to baseline value. We recorded also the quantity of opioid used during surgery (intravenous fentanyl).
Results and Discussion: Mean value of systolic BP before anesthesia in group A was 150±30 mmHg(CI95%- 13.2) and in group B 145±25 mmHg(CI95%-10). In group A we had 10 cases with hypotension (38.46%) requiring a mean ephedrine use of 8 mg/patient. In group B we had 22 episodes of hypotension (88%) and mean ephedrine use was 18 mg/patient (p=0.0003). The total use of opioid during surgery was significant higher in group B (0.7±0.25mg vs 0.3±0.2mg, p-0.005).
Conclusion(s): The total dose of fentanyl delivered can be significant reduced by using CTEA instead of IBTEA. In addition bolus of epidural ropivacaine 0.5% with the epidural catether placed in thoracic region is associated with unacceptable incidence of hypotension and higher use of vasopressor agent.

8AP4-11

MCP-1 following colorectal surgery depend on the type of anesthesia and surgery

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Background and Goal of Study: It is now clear that inflammation and cancer initiation are linked. Circulating levels of pro-inflammatory cytokines might be associated with short-term outcome in oncologic patients. MCP-1 was the main chemokine responsible for recruiting monocytes and promotes their adhesion by inducing them to upregulate MAC-1, the receptor for intracellular adhesion molecule-1 (ICAM-1) that is expressed in activated endothelium. It also enhances the secretion of IL-4 by T cells and there may be a direct role for MCP-1 in the development of Th_2 cells. Furthermore, MCP-1 expression in tumor cells is significantly correlated with the extent of tumor-associated-macrophage (TAM) infiltration, angiogenesis and poor survival.
MCP-1 is involved in the earliest steps of the inflammatory cascade, plays an important role in routine immune surveillance and immune modulation, and, more importantly, its rise is associated with an increase in postoperative mortality.
Different approaches have been proposed to lessen the inflammatory response following colorectal cancer surgery as laparoscopic technique and epidural anesthesia.
The aim of this study is to compare MCP-1 levels after open surgery with general anesthesia, open surgery with epidural anesthesia and laparoscopic colorectal surgery.
Materials and Methods: Sixty patients were included in this observational, prospective study, twenty in each group. Levels of MCP-1 were measured before surgical incision (TO) and on the first (T1), fourth (T4), twenty-fourth (T24) and forty-eight (T48) postoperative hours. Medical history, intraoperative data, postoperative progression, ICU and hospital length of stay, in-hospital and 1-year mortality of all patients were collected.
Results and Discussion: MCP-1 show great differences between groups. We have found a greater attenuation of MCP-1 release in laparoscopic group, moderate in epidural group and a great increase in control group.
MCP-1 levels are significantly lower in the laparoscopic group than in the epidural and control groups at all times postoperatively, T1, T4, T24 y T48 ($p < 0.01$).
Conclusion(s): It might be possible that following a scheduled surgery, low levels of MCP-1 means an attenuation of the postoperative response from the very early stages of the inflammation.
References:
Shibasaki H. The post-operative level of serum monocyte chemoattractant protein-1 and its correlation with the severity of surgical stress. *J Surg Res* 2006 Dec;136(2):314-9

8AP5-1

Intrathecal pethidine as an alternative to intrathecal lignocaine for perineal surgery: a randomised controlled study

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Aims: Perineal surgery can cause severe pain. Our aim was to evaluate pethidine as a sole intrathecal agent for providing anaesthesia and post-operative analgesia for short duration perineal surgery. This randomised control trial compared intrathecal pethidine with lignocaine, assessing intra-operative anaesthesia, analgesia, duration of post-operative analgesia, degree of motor block, and complications.
Methods: After ethical committee approval, we recruited 50 ASA Grade I and II patients undergoing elective perineal surgery in a tertiary referral hospital. The patients were randomised into two equal groups; Group A received 0.8ml of intrathecal plain lignocaine (heavy, 5%) and Group B received intrathecal preservative free pethidine 0.8mls (50mg/ml). Patients were assessed at 5 minutes for 15 minutes, then 30 minutes, 1,4,12 and 24 hours for: analgesic requirements; pain scores; motor block; complications.
Results: The group demographics were comparable. The mean surgery duration was 31 minutes. Surgical anaesthesia was achieved in all Group A patients at 5 minutes. In Group B, 24 patients had surgical anaesthesia within 10

minutes (mean 8.75mins, p< 0.1). One Group B patient required conversion to general anaesthetic.
All Group A patients developed motor blockade within 10 minutes (mean 5.4mins), while in Group B it took 15 minutes (mean 7.92mins, p< 0.01). The most common Bromage score in Group A was 3 (p< 0.001); in Group B it was 1 (p< 0.01). Only 2 Group B patients achieved a Bromage score of 3 (p< 0.005).
All patients in Group A required supplemental analgesia beyond 4 hours (p< 0.001). No Group B patients required analgesia until 12 hours (p< 0.002) and 9 were pain free at 24 hours (p< 0.002). There were no cardiovascular or respiratory side effects in either group. However, 10 Group B patients had urinary retention and 2 patients developed pruritus.
Discussion: Pethidine is useful for procedures with significant post-operative pain, demonstrating excellent analgesia for over 12 hours. Although pain relief onset is delayed by 5-10 minutes, the degree and duration of analgesia achieved is superior to lignocaine. It also produces minimal motor block, enabling early mobilisation. The main side effect noted is urinary retention, which could delay discharge in day surgery patients. However, this was managed with the single in and out urinary catheterisation. We feel a larger study to establish the incidence of such complications would be beneficial.

8AP5-2

Inadequate neuraxial anaesthesia in Marfan's syndrome

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Background: Marfan's syndrome is an autosomal dominant disorder of connective tissue, associated with an abnormal gene coding for fibrillin-1. It can affect several different organ systems, including the heart, eyes, skeletal system and lungs. It is a known to cause dural sac ectasia in 63-92% of affected adults[1]. Dural sac ectasia can lead to inadequacy of spinal anaesthesia[2] due to the increased volume of the caudal dural sac.
Case report: We analysed the anaesthetic records of 11 parturients with Marfan's syndrome who had undergone a total of 14 Caesarean sections under regional anaesthesia. We looked for evidence of an inadequate regional block which we defined as: requirement for a second spinal, conversion to a GA or additional perioperative analgesia required.
Of the 14 procedures (7 spinals and 7 combined spinal-epidurals(CSE)), 7 patients (50%) developed a block adequate for Caesarean section. 7 anaesthetics (50%) were deemed inadequate, requiring further anaesthesia or analgesia.
Of the inadequate blocks, the mean initial spinal dose of 0.5% hyperbaric bupivacaine was 2.8ml (ranging from 1.5-4ml). Six received intrathecal opiates. 5 of the 7 procedures were performed under CSE and 2 under spinal. 4 of the 5 patients that had a CSE received epidural local anaesthetic but despite this all four required additional measures (1 GA, 1 repeat spinal, 2 intravenous opiates).
Interestingly, one patient who received an inadequate spinal had had a recent MRI of her lumbar spine showing no evidence of dural ectasia.
Discussion: This case series suggests that patients with Marfan's syndrome have a higher incidence of inadequate block with subarachnoid anaesthesia. Attempts to compensate for the possibility of dural ectasia with a higher dose of local anaesthetic in the spinal, or by placing a CSE are not successful in all cases. Radiological appearances of the dural sac may not correlate with clinical response to neuraxial anaesthesia. The preoperative discussion should highlight the higher risk of inadequate block with increased need for supplemental analgesia.
References:
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2. Laccasie HJ, Millar S, Leithe LG, et al. Dural ectasia: a likely cause of inadequate spinal anaesthesia in two parturients with Marfan's syndrome. Br J Anaesth 2005;94:500-4.
Learning points: Patients with Marfan's syndrome have an unpredictable response to spinal anaesthesia.

8AP5-3

Spinal versus general anaesthesia for lumbar spine surgery: patient characteristics and economic aspects

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Background and Goal of Study: Most lumbar spine surgeries are performed under general anaesthesia (GA) although benefits of spinal anaesthesia (SA) are reported. The aim of this study was to prove our hypothesis that SA has a significant time-saving and therefore economical advantage compared to GA.
Materials and Methods: Electronically based anaesthesia data of 473 anaesthesias (368 SA, 105 GA) for lumbar interventions (decompressions, discectomies, transpedicular instrumentations) were analysed retrospectively. The following key-time points were exactly defined for both groups: 1) induction, 2) prone positioning, 3) preoperative preparation, 4) surgery time, 5) OR exit, 6) hand over to PACU. Kolmogorov-Smirnov-Test has been used to test normal distribution. Statistical analysis were tested using Chi-Square-Test for nominal variables and Mann-Whitney-U-Test for non-parametric data. A P-Value < 0.05 was considered siginificant.
Results: In 7 out of the 368 SA-Patients SA failed. Non-parametric statistical analysis demonstrated that SA required significantly less time for induction (3.9min), preoperative preparation (3.6min) and exit period (10.4min) compared to GA. Anaesthesia time with exclusion of the surgery time revealed a significant time reduction using SA of 20.2min (SA 56.8+/-12.3 vs 77.0min+/-17.7, p< 0.001).

Variables (minutes)	SA (mean +/-SEM)	GA (mean +/- SEM)	p-value
Induction	17.7 (+/-7.0)	21.6 (+/-7.2)	<0.001
prone position	19.4 (+/-9.4)	21.5 (+/-12.4)	0.243
preoperative prep	9.7 (+/-3.6)	13.3. (+/-5.4)	<0.001
surgery time	64.6 (+/-34.2)	122.2 (+/-62.6)	<0.001
exit	4.9 (+/-1.1)	15.3 (+/-5.7)	<0.001
hand over PACU	5.1 (+/-0.7)	5.3 (+/-1.6)	0.577
anaesthesia time without surgery time	56.8 (+/-12.3)	77.0 (+/-17.7)	<0.001
	SA = Spinal Anaesthesia	GA = General Anaesthesia	Mann-Whitney-U-Test

[Key-Time periods]

There were no significant differences of the ASA prevalence, BMI and sex. However SA patients were significantly older (median 61.7 +/-15.4 SEM) than GA patients (51.1+/-14.6, p=0.001). If surgery time is schedulded > 3h, GA anaesthesia was planned. Therefore surgery time for GA is significantly longer without any influence on anaesthesia time.
Conclusion(s): More than 20min can be saved using SA. In addition, the OR capacity can be increased from 4 to 5 cases a day in a 10 hour OR setting using SA in comparison with GA. Taking in account that the average anaesthesia costs 5 Euro per minute, SA reduces the OR costs by at least 100 Euro/case.

8AP5-4

IL-6 response in patients with diabetes mellitus type 2 after general and spinal anesthesia

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Background and Goal of Study: Surgery and anesthesia cause immunosuppression in operated patients. Anesthesia modulates immune response, diminishing stress reaction to the surgery, but it also has suppressive effects on a number of immune factors and processes. Due to their disturbed immunity and low-grade chronic inflammation present years before the first occurrence of simptoms of disease, patients with diabetes are a group at special risk of developing infections. Important question raises whether selection of anesthetics and anesthetic metod contributes to the immune system disorder in immunocompromised patients, including diabetics. Anesthesiologist must think about the immune actions and effects of anesthetics and choose drugs and anesthetic method after careful consideration of the immune status of the patient. Aim of this study was to determine whether there is a difference in preoperative concentrations of IL-6 in patients with diabetes type 2 compered to controls, whether there is different stress response in diabetics compered

to controls (postoperative values of IL-6) and whether there is difference in the cytokine response under spinal and general anesthesia.
Materials and Methods: 60 patients with diabetes mellitus type 2 (Group A) and 30 patients without diabetes as a control (Group B) were included in study. IL-6 was measured in 3 peripheral venous blood samples: 1) before induction of general and spinal anesthesia (A1), 2) at the end of surgery (A2), and 3) 24 hours after the first sampling (A3).
Results and Discussion: The results show that in both types of anesthesia (spinal and general) there was a significant increase in IL-6 (P< 0,001 in both groups). When comparing IL-6 values in patients according to type of anesthesia, there was no significant difference between Group A and B. Preoperative values of IL-6 did not differ significatly between Group A and B, as well as postoperative values (respons to surgical stress).
Conclusion(s): In all patients (with and without diabetes), regardless of the type of anesthesia, postoperative immunosuppression occurs. We did not confirm altered response to anesthesia and surgical stress in patients with diabetes mellitus type 2. Although it is believed that regional anesthesia diminish stress response, in this study we did not confirm that spinal anesthesia had effects on postoperative IL-6 concetration in terms of reducing operating stress, and consequently, immunosuppression.

8AP5-5

Can the dose of the local anaesthetic for intrathecal anaesthesia be reduced when an opioid is added? A meta-analysis of randomised trials

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Background and Goal of Study: Adverse effects of intrathecal local anaesthetics (LA) include arterial hypotension and motor blockade. These may jeopardise postoperative mobilisation of a patient undergoing day-case surgery. We aimed to test whether an opioid as an adjuvant allowed reducing the dose of the intrathecal LA, and whether this reduction would lead to a decrease in LA-related adverse effects without compromising the efficacy of the intrathecal anaesthesia.
Methods: We systematically searched (databases, bibliographies, to 11.2012) for full reports of randomised comparisons of an intrathecal LA alone (control group) compared with a reduced dose of the same LA with a concomitant opioid (experimental group). Relevant trials had to be performed in adults undergoing surgery with single-shot intrathecal anaesthesia without general anaesthesia.
Results: We included 28 trials (1,343 patients; most underwent day-case surgery). The most frequently used LA was bupivacaine (19 trials); others were lidocaine, ropivacaine, tetracaine, mepivacaine and levobupivacaine. The most frequently used opioid that was added to the LA was fentanyl (23 trials); others were sufentanil and pethidine. In experimental groups, the mean reduction of the LA dose compared with controls was 43%. In experimental groups, duration of motor blockade was reduced (weighted mean difference, -49.8 min [95%CI -61.8 to -37.8]). So was time to ambulation (-27.9 min [-63.7 to -18.3]), duration of PACU stay (-35.1 min [-50.4 to -19.9]), duration of hospital stay (-24.9 min [-35.5 to -14.2]), and time to urinate (-13.9 min [-25.3 to -2.50]). The risk of arterial hypotension (OR 0.28 [95%CI 0.14 to 0.57], NNT 7) and of shivering (OR 0.14 [0.06 to 0.33], NNT 6) was also reduced. The risk of block failure was not increased and the average duration of postoperative analgesia remained unchanged. However, the risk of pruritus was increased (OR 25.6 [95%CI 13.0 to 50.4], NNH 5). No case of respiratory depression was reported.
Conclusion: Through addition of an opioid, the dose of an intrathecally administered LA may be reduced by about 40%. As a consequence, the risk of LA-related adverse effects may significantly decrease without compromising the efficacy of the intrathecal anaesthesia.

8AP5-6

Propensity-score-matched comparison of postoperative outcomes between geriatric patients receiving general and regional anaesthesia for hip surgery: a population-based case-control study

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Background and Goal of Study: The effects of mode of anaesthesia on the major in-hospital adverse outcomes in geriatric patients undergoing hip surgery have never been verified by a large-scale nationwide and propensity score matched case control study.
Materials and Methods: We used 1997 - 2007 nationwide inpatient claim data from the Taiwan National Health Insurance Research Database to evaluated the effect of type of anaesthesia on postoperative in-hospital outcomes, including stroke, myocardial infarction, respiratory failure, renal failure and mortality of geriatric patients (over 65 y/o), who had hip fracture and underwent surgical repair. The Cox proportional hazard regression was used to estimate the HR between general and regional anaesthesia (GA and RA). Overall, 28451 (30.85%) patients had GA, and 63776 (69.15%) patients had RA. To adjust for potential baseline difference, age, gender and propensity comorbid score were matched. This resulted in 28451 (50%) GA matched to 28541 (50%) RA patients.
Results and Discussion: Patients receiving GA had significant higher rates of in-hospital mortality (2.07% vs 1.63%, for GA vs RA, P < 0.0001) and in-hospital stroke (1.30% vs 0.98, P = 0.0004), acute respiratory failure (1.38% vs 0.52%, for GA vs RA, P < 0.0001), compared to matched patients receiving RA. At the same time, patients receiving GA had longer ICU (0.63+/-3.62 vs 0.21+/-1.66 days, for GA vs RA, P< 0.0001) and total hospital stays (11.27+/-8.48 vs 10.64+/-10.57 days, for GA vs RA, P< 0.0001). Moreover, patients receiving GA need more mechanical ventilator support (9.01% vs 1.29%, for GA vs RA, P< 0.0001) postoperatively.
Conclusions: After adjustment for potential selection bias, for geriatric patients underwent surgical repair for hip fracture, regional anesthesia was associated with less postoperative outcomes, including in-hospital mortality, stroke rate, shorter ICU stay and total hospital stay and the need for mechanical ventilation support.

8AP5-7

Severe neurological complication after spinal block: transient cauda equina syndrome (CES)

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Background: Severe neurological deficits after spinal anesthesia are rather exceptional. Some local anesthetics are known to be toxic. But it is really uncommon with 0.5% hyperbaric bupivacaine, which is the case we are reporting.
Case report: A 43-yr-old, 60 kg, ASA physical status I patient with no history of previous neurological disorder, underwent elective removal of osteosynthesis material from right fibula. With the patient in the sitting position, spinal anesthesia was performed at the L4-L5 interspace with a 25G Whitacre needle. Clear cerebrospinal fluid with no signs of blood was obtained before injecting a single dose of 12mg 0.5% hyperbaric bupivacaine and 15mcg of fentanyl. There was no pain or paresthesia during the needle placement or drug injection. Minutes later, the sensory levels were bilateral, symmetric, and caudal to T10, so they proceeded to perform the surgery that was uneventful. Afterwards, she remained in the Post-Anesthesia Recovery Unit until the disappearance of the motor block. At discharge, the patient referred paresthesias in the proximal left lower limb.
A few hours later, she experienced an increase in the sensory disturbances and the onset of motor impairment associated with urinary incontinence.
The urgent MRI did not demonstrate abnormalities, discarding any cause of spinal cord compression.
Urgent Neurological consultation showed motor deficit in left lumbo-sacral roots, and sacral, gluteus, genital, plantar and lateral left foot sensory impairment aswell as bladder atony. Thus establishing the diagnosis of acute lumbosacral radiculopathy related to spinal anesthesia, compatible with CES.
The patient improved progressively, persisting only decreased left lower limb strength and being discharged 8 days after surgery.

Discussion: Most cases of CES after spinal anesthesia have been reported following administration of 5% lidocaine. There are a few reported cases with 0.5% hyperbaric bupivacaine, finding in some of them predisposing factors. There are many hypothesis as to why patients with no predisposing factors develop CES. It is believed that local anesthetic's toxicity may be favoured due to the sacral nerve roots are longer, they lack some coatings, and given their position in the thecal sac, they are the most exposed to anesthetic accumulation. To the date no clear association has been established between 0.5% hyperbaric bupivacaine and CES.

8AP5-8

Spinal cord injury after combined spinal-epidural anesthesia

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Background: Serious neurological complications related to spinal and epidural anesthesia and analgesia are only rarely reported. We describe the clinical and radiologic observations of a patient who developed neurologic deficits following combined spinal-epidural anesthesia.
Case report: 82-yr-old female proposed for femoral nailing revision. Classified as ASA III (hypertension, obesity, chronic obstructive pulmonary disease, degenerative osteoarticular disease) underwent combined spinal-epidural anesthesia. The level of puncture was determined based on Tuffier's line. A bolus dose of 10mg of 0,5% Levobupivacaine (2ml) and 2,5mcg of Sufentanil (0,5ml) was injected into the subarachnoid space, after free flow of cerebral spinal fluid. The patient did not report any warning signs of proximity of the needle to the cord. Twelve hours after the procedure the patient still had motor and sensitive block. Epidural hematoma was excluded by magnetic resonance imaging of the spine, which revealed an oval image with signal extended from T12 to L1. A possibility of spinal anesthesia-related traumatic spinal cord injury was considered. After one year, the patient was evaluated maintaining neurologic deficits.
Discussion: The influence of the mode of anesthesia on outcome of geriatric patients is a controversial issue. Spinal anesthesia is associated with significantly reduced early mortality and morbidity.[1] Complications of regional anaesthesia has been recognised from very long time, despite of being rare. [2] Spinal cord injury is related to accidental injection of local anesthetic at a higher intervertebral level, more cephalic than the conus medullaris. Tuffier's line is an unreliable method of identifying the lumbar interspaces, and anaesthetists commonly select a space that is one or more segments higher than they assume.[3]
References:
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2. Agarwal A. Complications And Controversies Of Regional Anaesthesia: A Review. Indian J Anaesth. 2009;53(5):543-553;
3. Reynolds F. Damage to the conus medullaris following spinal anaesthesia. Anaesthesia. 2001.56(3):238-47.
Learning points: Safe, effective practice of neuraxial anaesthesia requires a detailed knowledge of potential complications, their incidence and risk factors associated with their occurrence.

8AP5-9

Evaluation the femoral block effect for postoperative delirium in elderly patients undergoing femoral surgery in order to facilitate spinal anesthesia in a sitting position

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Background and Goal of Study: Geriatric patients requires special algorithm treatment according the complex medical status and special social needs with an overall goal-early mobilization. Strategies to protect the brain from postoperative delirium (POD) after hip fracture are needed. The aim of this study is to compare analgesic effect of femoral block vs. intravenous sufentanil and propofol to avoid POD in elderly patients undergoing surgery for femoral fracture, prior spinal anesthesia in sitting position.
Materials and Methods: We retrospectively analyzed the hospital records of elderly patients average age 80 undergoing femoral fractures surgery in the first six months of 2012. Group F patients n=58 had a femoral block 45 minutes before spinal anesthesia with 0.5 ropivacaine 30ml (ultrasound guided) and group S n=43 received a bolus iv dose of 10mcg sufentanyl and 10mg propofol two minutes before spinal block. Time to achieve spinal anesthesia, quality of patients tolerance to positioning, VAS scor and POD in the first 48 hours were recorded.
Results and Discussion: VAS scores during positioning (mean and range) were lower in group F than group S (2.5 (2-3) vs. 3.5 (3-5) p=0,003). Time to perform spinal anesthesia was shorter in group F 5.7 min. (SD 2.3) vs. 9.5 min in group S (SD 4.8), p=0.008). Patients tolerance was better in group F (49/9) than group S (29/14) p=0.021). Incidence of POD assessed by Mini Mental Satus Examination (MMSE) was lower in group F (7/51) compared with group S (11/32) p=0.003. For statistics SPSS 13.0 was used and $p < 0.05$ was considered significant.
Conclusion(s): There is no ideal anaesthetics for elderly patients, recent studies sugests that surgery improves quality of life rather than suvival .Femoral block is an easy method used to facilitate spinal anesthesia in a sitting position in elderly patients undergoing femoral fractures with less side effects than iv analgesia in terms of patient acceptance,time to achieve spinal anesthesia and developing POD.
References:
Sanders RD, Pandharipande PP, Davidson AJ:Anticipating and managing postoperative delirium and cognitive decline in adults. BMJ 2011, 343:d4331

8AP6-1

Safety of spinal anaesthesia in old patients with hip fracture

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Background and Goal of Study: Old patients with hip fracture are very fragile. The present study conducted following our clinical practice wants to show the safety of regional anaesthesia for surgical repair. In this way we observed the changes on cerebral oxygenation induced by hypotension after spinal block.
Materials and Methods: This prospective observational study included 30 patients aged ≥ 75 years old (yo) who underwent surgical repair of hip fracture. Institutional hospital approval and individual consents were obtained. Cognitive status was evaluated preoperatively and postoperatively by SPMSQ. Spinal anaesthesia was performed with bupivacaine (B) or levobupivacaine (L) plus fentanyl (15 μg). Local anaesthetic doses were 7 mg if height < 160 cm and 9 mg if height ≥ 160 cm. All patients received supplementary oxygen (36%). Hypotension, defined as systolic blood pressure (SBP) < 100 mmHg, was treated with 60 μg phenylephrine (PH) if heart rate (HR) ≥ 60 bpm or 5 mg ephedrine (EP) if HR < 60 bpm. Cerebral tissue oxygen saturation (L/R Ct O2 Sat) was measured by INVOS 5100 cerebral oximetry.
Results and Discussion: Values expressed as X±SD: Aged (y.o.): 83.4±5.8; Preoperative haemoglobin (g/L): 11.7 ±1.8; Mean (range) for pre/postoperative SPMSQ: 2 (0-7) / 1 (0-6). Twenty minutes after block, mean arterial pressure (MAP) decreased 28% in group B and 37% in group L (p=0,088 student T test) respect to basal values. Seven patients from each group needed PH (group B: 271.4±146.8; group L: 478.6±389.3). Cerebral oxygenation was not affected.
Conclusion(s): Hypotension induced by spinal block and treated with vasoconstrictors does not affect cerebral oxygenation.

8AP6-2

Effects of different kinds and different doses of 5-HT_3 receptor antagonists on prevention of hypotension after spinal anesthesia

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Background and Goal of Study: Hypotension after spinal anesthesia is a very common but serious complication. One cause of hypotension is Bezold Jarisch reflex.[1] In addition, further Bezold Jarisch reflex occurs through the 5-HT_3 receptor in intracardiac vagal nerve.[2] We aimed to evaluate the effects of different kinds and different doses of 5-HT_3 receptor antagonist on the hypotension after spinal anesthesia.
Materials and Methods: A prospective, randomized, double-blinded study was performed in 80 healthy parturients (ASA I or II) undergoing spinal anesthesia. Patients were randomly allocated into one of four groups. Each group received a dose of ramosetron 0.3mg (group 1, n=20), ondansetron 8mg (group 2, n=20), ondansetron 4mg (group 3, n=20) respectively and one group (group 4, n=20) received only placebo. 5 minute before spinal anesthesia, 5-HT_3 receptor antagonist or a placebo was injected intravenously. After spinal anesthesia, administration of crystalloid was restricted to less than

500 ml. Hemodynamic data, occurrence of nausea, vomiting, and shivering, amounts of vasopressor or atropine were recorded during 30 minutes. One-way ANOVA was performed to analyze hemodynamic data and chi-square tests were performed to analyze other data. A P value of < 0.05 was considered statistically significantly.

Results and Discussion: The difference between base mean arterial blood pressure and the lowest measured mean arterial blood pressure of group 1 was significantly lower than that of other groups ($P=0.029$). The use of phenylephrine was significantly increased with group 4 ($P < 0.05$).

Conclusion(s): Administration of 5-HT_3 receptor antagonist before spinal anesthesia is useful for the prevention of hypotension after spinal anesthesia. This study also found that ramosetron is more effective than ondansetron.

References:

1. Campagna JA, Carter C. Clinical relevance of the Bezold-Jarisch reflex. Anesthesiology 2003; 98: 1250-60.
2. Jordan D. Vagal control of the heart: central serotonergic (5-HT) mechanisms. Exp Physiol. 2005; 90: 175-81.

8AP6-3

Effect of prophylactic IM glycopyrrolate on spinal anaesthesia-induced hypotensive response in elderly patients

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Background and Goal of Study: Hypotension occurred after spinal anaesthesia would be a serious complication in elderly patients. Prophylactic glycopyrrolate, anticholinergics, is expected to attenuate haemodynamic changes following spinal anaesthesia. However, the effect of glycopyrrolate on spinal anaesthesia-induced haemodynamic changes in elderly patients is unclear. Thus, we evaluated the effectiveness of intramuscular (IM) glycopyrrolate on the incidence of spinal anaesthesia-induced hypotension in elderly patients.

Materials and Methods: A total of 50 patients older than 60 yr scheduled for elective surgery under spinal anaesthesia were included. Patients were randomly allocated to receive either 0.2 mg of glycopyrrolate (group G, $n=25$) or the same volume of normal saline (group C, $n=25$) intramuscularly. Hypotension was defined as systolic arterial pressure of < 90 mmHg or a decrease of mean arterial pressure decrease more than 20% from baseline. In patients who met either criterion, ephedrine 5-10 mg was given intravenously until arterial pressure increased above the threshold value. If bradycardia occurred (heart rate < 40 beats min^{-1}) without hypotension, IV atropine 0.5 mg was administered. The amount of IV fluid was left to the discretion of the individual anesthesiologist.

After spinal anaesthesia, the incidence of hypotension, ephedrine requirements, bradycardia, nausea and vomiting were evaluated. The changes (%) in MAP and HR were calculated from the difference between the baseline and the lowest recorded values ({[the baseline value-the lowest value]/the baseline value} $\times 100$).

Results and Discussion: Hypotension after spinal anaesthesia was significantly more frequent in the group C compared to that in group G (64.0% vs. 28.0%, respectively; $P=0.022$), and the group G required less amount of ephedrine than the group C (0 [0-5] mg vs. 5 [0-10] mg, median [IQR], respectively; $P=0.024$). Patients receiving glycopyrrolate had a smaller reduction of mean arterial pressure (-22.6% vs. -32.9%, respectively; $P=0.041$) and hear rate (-12.1% vs. -25.8%, respectively; $P=0.012$) than the group C. However, the incidence of bradycardia and the incidence of nausea and vomiting were similar between the two groups.

Conclusion(s): Prophylactic IM glycopyrrolate attenuated hypotensive response and reduced ephedrine requirements following spinal anaesthesia in elderly patients

8AP6-4

Continuous spinal anesthesia in a patient with severe pulmonary hypertension - a clinical case

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Background: Pulmonary arterial hypertension (PAH) is associated with a high peri-operative mortality rate[1]. Anesthetic management of patients with PAH is challenging and alternatives to general anesthesia (GA) are encouraged[1]. Continuous spinal anesthesia (CSA) has been shown to be effective as a sole anesthetic technique for abdominal surgery in patients with severe cardiopulmonary disease.

Case report: Woman, 77 years, ASA IV with chronic PAH (thromboembolic origin, systolic pulmonary artery pressure of 115 mmHg and pulmonary artery pressure of 72 mmHg), under oxygen therapy 24h/day, hypertension, atrial fibrilation, heart failure (HF) NYHA class IV, diagnosed with rectal adenocarcinoma, proposed for trans-anal rectal resection. To reduce the risk of right-sided HF and systemic hypotension we conducted a continuous subarachnoid block, L4-L5 level, in the sitting position, paramedian approach, with injection of hyperbaric bupivacaine (HB) 0.5% (5mg) plus sufentanil 2μg. The block was assessed every 15 minutes and 60 minutes later another 0,5 ml of 0.5% HB bolus was needed. The surgery lasted about 120 min and progressed uneventfully.

Discussion: CSA has been seldom used as first anesthetic method for colorectal cancer surgery and other major abdominal surgery in high-risk patients for whom GA would be associated with higher morbidity and morbility [2]. Two principles must be remembered in the management of right HF: right ventricle afterload must be reduced and systemic pressure must be maintained or increased. Both GA and single injection spinal anaesthesia may induce systemic hypotension. The split injection of successive doses of local anesthetic induces a progressive and predictable block, less hemodynamic instability and an effective anesthesia during the time required for the surgical procedure [1].

References:

1. L.Lonjaret et al. Ann Fr Anesth Reanim. 2012; 31(10):810-2;
2. Kumar et al. Sur Oncol. 2008; 17(2):73-9.

Learning points: CSA is an attractive technique for anesthesia for high risk patients, with PAH, proposed for trans-anal rectal resection. This technique, with a gradual titration of local anesthetic, respects the patient's hemodynamic with much less complications, avoiding ICU admission and postoperative mechanic ventilation.

8AP6-5

Epidural intracranial hematoma after spinal anesthesia: a case report

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Background: It is well- knowed the best anesthesic technique for cesarean section (C-section) is spinal anesthesia. We describe the occurrence of supratentorial epidural hematoma 4 days after spinal anesthesia for scheduled cesarean section.

Case report: A 21-year-old pregnant girl without pathological story underwent scheduled C-section. The patient had normal coagulation test. Spinal anesthesia was conducted by punturing the L3-L4 space with a 25-gauge needle and administered 9 mg of 0,5% isobaric bupivacaine and 10mcg of Fentanyl. The puncture was successful on the first attempt and the sensory level was T4. The C-section finished without incidents and the patient was discharged home 3 days later. After four days, the patient came to the Emergency Area because she presented oppressive frontal headache during 24hours, paresthesias in the left body and decreased level of consciousness without story of trauma or drugs ingestion.

A computed tomographic (CT) scan showed a left frontoparietal epidural hematoma of 3ml. She was admitted in intensive care unit, anitepileptic treatment was instaured and new CTs were performed 6 hours, 2 days and 5 days later and didn't show changes. She was discharged home 6 days later whitout incidents

Discussion: There has been reported in the literature two cases of epidural hematoma after spinal surgery under general anesthesia (1). Our case share the clinical presentation of the other two cases. A possible explanation for the mechanism of the pathogenesis of these hematomas was a Cerebrospinal fluid (CSF) loss(2). As we know, there isn't any other case in the literature of epidural hematoma after spinal anesthesia . Although, our case was not a surgery that should be associated with CSF loss, we speculate that it could have been produced due to a leak in the dura punture. The CSF hypovolemia displace the whole brain caudaly resulting in secondary intracranial hypotension or even negative pressure results with an epidural hematoma (1,2).

References:

1. Zhao-Jian L et al; Bilateral supratentorial epidural hematomas: a rare complication in adolescent spine surgery. Neurol Med Chir 52: 646-648,2012
2. Tetsuo H et al; Acute onset of intracranial subdural hemorrhage five days after spinal anesthesia for knee arthroscopic surgery: a case report. Jounal of Medical Case Reports 2012, 6:75.

Learning points: We can conclude that although it is a very rare case spinal anesthesia may be complicated with an epidural hematoma.

8AP6-6

Bezold-Jarish reflex and cardiac arrest under spinal anaesthesia

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Background: Cardiac arrests during spinal anaesthesia (SA) are described as "very rare", but are actually relatively common. 1 Hemodynamic instability is expected with the onset of the block, but delayed bradycardia or asystole may be more sinister. 2 The Bezold-Jarisch reflex (BJR) includes the triad of bradycardia, hypotension and peripheral vasodilation triggered by cardiac mechanoreceptor activation. 2 We report a successful intraoperative resuscitation during SA.
Case report: Male patient, 75 years old, 90Kg, ASA II, with hypertension (medicated with ACEI) and a sinus bradycardia of 57 bpm was admitted for suprapubic prostatectomy. No other medical or surgical history. A SA was performed using hyperbaric bupivacaine 8 mg plus sufentanil 2mcg. At the incision a T6 sensitive block level was documented and developed hypotension (MAP< 55mmHg) that was treated with ephedrine 10mg. He was otherwise stable until 40min after SA when the ECG showed severe bradycardia shortly followed by asystole. Atropine 0,5mg and adrenaline 1mg were immediately administered. Sinus rhythm and spontaneous circulation resumed after 1min of CPR. Noradrenaline was started to maintain MAP>60mmHg. Blood loss was minimal and until the time of cardiac arrest the patient had received 1L of ringer lactate solution. After surgery he was transferred to the ICU, heart disease was excluded and was discharged 1 week later after a iatrogenic pneumothorax.
Discussion: During SA the cardiac vagal tone is enhanced and the effect on venous return can be profound.[1] The BJR can be triggered by reduced venous return.[2] Strong resting vagal tone (bradycardia) and dermatomal block to T5/6 or higher, increases the risk of cardiac arrest during SA.[1,2] Volume loading is critical in maintaining adequate preload to decrease the risk of severe bradycardia and cardiac arrest. Inadequate volume loading was most probably the culprit. Early administration of a powerful alpha-adrenergic agonist to increase venous return and improve cardiac output, as recommended by Caplan et al[2] was performed.
References:
1. Anesth Analg 2001;92: 252-6;
2. Br J Anaesth. 2001;86(6): 859-68
Learning points: Although the resting bradycardia and sensitive block to T6 contributed to the sudden bradycardia followed by asystole, the activation of the BJR by the decrease in preload plays a key role in this case. Adrenaline must be used early in established cardiac arrest, especially after high SA.[2]

8AP6-7

Evaluation of patients' discomfort regarding regional anesthesia

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Background and Goal of Study: Regional anesthesia may cause physical and psychological discomfort. 50% of patients scheduled for urologic procedures undergo regional anesthesia, and their comfort represents a concern to the anesthesiologist. This study aims to:
1. identify factors related to patients' discomfort regarding regional anesthesia(position for anesthesia and surgery procedures, puncture site pain, room temperature, audio-visual perception, sensitive/motor blockade);
2. Evaluate patients' satisfaction with anesthesia.
Materials and Methods: After approval from the Hospital Ethics Committee all patients over 18years old, scheduled for urologic surgery, understanding Portuguese and anesthetized with spinal anesthesia were included. Patients in day case surgery or with incomplete medical records were excluded. We performed a questionnaire(with closed ended questions) in the first 24 hours after surgery and consulted anesthesia records. We asked yes or no questions, used a 1-10 scale to evaluate pain and a 1-4 scale to evaluate satisfaction.Because there isn't a valid questionnaire in the literature to evaluate what we aimed to, we created one based on multiple articles[1,2].
Results and Discussion: 50patients were included; mean age 65 years old (min.32, max.89); 78% males and 70% ASAII. 75%denied discomfort during positioning for back puncture and 58% referred cold during anesthesia or surgery. One person was uncomfortable in the surgical position and no one considered being awake uncomfortable; sensitive/motor blockade was uncomfortable for 22%. Spinal was more painful than the venous puncture for32%; for 50%venous puncture was more painful and for 18%pain was similar. Patients were satisfied or very satisfied with the anesthetic technique and would choose the same technique in the future in 98% of cases.
Conclusion: Although this questionnaire is not validated, it allowed us to understand that cold during anesthesia/surgery is a problem for most patients but this is easily solved. It also showed us that most patients are not uncomfortable with positioning during procedures, being awake and not feeling the legs.Interestingly only about one third of the patients thought that the back puncture was more painful than the venous puncture. In general we consider spinal anesthesia a good choice for these patients and we are satisfied that patients don't find it uncomfortable and are also satisfied.
References:
1. Anesthesia,2008, 63,pg 143-146
2. Korean J Anesthesiol 2010, 59,pg 260-264

8AP6-8

The role of the direction of the pencil point spinal needle hole on the mean local anaesthetic dose

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Background and Goal of Study: The role of the direction of the spinal needle hole on the Mean Local Anaesthetic Dose [MLAD] during intrathecal anaesthesia has not yet been evaluated. We measured the MLAD of intrathecal ropivacaine (Rc) 0.75% plus 15 μg fentanyl when given through a 26G Sprotte needle with either cephalic or caudal direction of the needle hole.
Materials and Methods: Following ethics committee approval 50 women aged 55-75 yrs and ASA I-II scheduled for elective vaginal hysterectomy (VH) had lumbar puncture performed between L2-3 interspace in the lateral decubitus position with Combined Spinal Epidural technique. The epidural space was identified with an 18 G Tuohy needle through which a 26 G Sprotte needle punctured the dura. The patients were randomly allocated such as if the Sprotte needle hole was directed caudally (group Ca) or cephalically (Group Ce). The dose of Rc 0.75% was given according to the Dixon and Massey up-and-down method [1], with a beginning dose of 3 ml (22.5 mg) respectively. In both groups fentanyl 15 μg was added to the solution. An ineffective dose defined as a Verbal Analog Pain Score of greater than 20/100 or no sensory block up to T8 dermatome directed an increase of 0.1 ml (0.75mg) to the next patient and vice versa. Two tailed t-test was performed for statistical analysis and P< 0.01 was considered significant.
Results and Discussion: In Group Ce the mean dose [SE] was 17.1 [3.73] mg and confident interval 95% 14,98-19,22 mg. In Group Ca the mean dose [SE] was 23.75 [1.55] mg and confident interval 95% 22,98-24,52 mg. The difference between the two groups is statistically significant with P< 0.001.
Conclusion(s): The orientation of the eye of a 26-gauge Sprotte needle during induction of intrathecal anaesthesia for VH influences the MLAD of 0.75% ropivacaine. When intrathecal anaesthesia is used for VH, the dose of local anaesthetic must be chosen according to the direction cephalic or caudal of the hole on the Sprotte needle and when different doses are compared, the direction of the needle hole must be known.
References:
1. Dixon WJ, Massey FJ. In: Introduction to statistical analysis. 1983:426-41.

8AP6-9

Effect of injection speed and colloid loading on hypotension associated with spinal anesthesia for orthopedic surgery in elderly patients

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Background and Goal of Study: In a previous study we found that low speed of injection reduces the incidence and severity of hypotension during spinal anesthesia. We kept the same study method but we use also colloid loading in periprocedural time.
Materials and Methods: Eighty-four patients, aged ^{3}65 years, II- III ASA status, undergoing orthopedic surgery under spinal anesthesia were allocated randomly to two groups according to speed of intrathecal injection: group A (forty-two patients) - 150 ml/hour speed and 500 ml of colloid intravenous and control group (forty-two patients) - usual spinal anesthesia technique and crystalloid loading. In first group we use a syringe pumps for injection, using bolus function, adapted to the spinal needle and we administrate 500 ml of Voluven® before and during the procedure. In control group we injected

manually and we administrate 500 ml of Ringer's solution. Time of injection in the A group was between 72 and 96 seconds, in control group was around 40 seconds. We use isobaric bupivacaine 0.5% with sufentanyl, in usual doses. We recorded blood pressure (BP) before spinal anesthesia (baseline, after premedication) and 60 minutes after, every 3-5 minutes, and we defined a decrease of 30% of BP, in relation with baseline value, as hypotension; we excluded patients with previous hypotension.
Results and Discussion: Mean value of systolic BP before spinal anesthesia in group A was 140±27 mmHg (CI95% - 12) and in control group 145.8±18 mmHg (CI95% - 8). Mean value of systolic BP after spinal anesthesia and 500 ml of colloid administration was 120.5±21.5 mmHg (CI95% -10) and we had 14 episodes of hypotension (33.3%). In control group mean value of systolic BP after spinal anesthesia and 500 ml of crystalloid administration was 100.5±16.5 mmHg (CI95% - 9.85) and we had 24 episodes of hypotension (57.14%). Mean ephedrine use was 5 mg/patient in A group. In control group all patients required ephedrine between 10 to 30 mg (16.5 mg ephedrine/patient; p value - 0.00035).
Conclusion(s): Low speed of injection and using colloid instead of crystalloid for loading reduce the incidence and severity of hypotension and the need of vasopressor agent use in elderly patients under spinal anesthesia. The use of syringe pumps for injection in this setting can be complicated and time consuming in usual practice, but allows a constant rate and a low speed of injection with significant improvement of hemodynamic parameters.

8AP7-1

Sciatic nerve block provide superior analgesia for popliteal pain after total knee arthroplasty

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Background and Goal of Study: Although continuous femoral nerve block (CFNB) is commonly used for analgesia after total knee arthroplasty (TKA), some patients complain of popliteal pain post-operatively.Therefore, we combined CFNB with sciatic nerve block (SNB), or infiltration of the posterior capsule (IPC) with a local anesthetic agent, to prevent popliteal pain. Thus, the goal of our study was to determine the analgesic efficacy of SNB compared to IPC for popliteal pain and to determine functional recovery after TKA.
Materials and Methods: This is a retrospective study of 51 patients who underwent TKA from January 2011 to December 2011. Of these, 28 patients received CFNB and SNB (SNB group) and 23 patients received CFNB and IPC (IPC group). Before induction of general anesthesia, all patients underwent ultrasound-guided femoral nerve catheter placement, and 20 ml of 0.375% ropivacaine was injected through the catheter. After surgery, CFNB was accomplished using 0.15% ropivacaneat a rate of 6 ml/h until postoperative day (POD) 4. Patients in the SNB group received a single dose of 20 ml of 0.375% ropivacaine under ultrasound-guidance, whereas patients in the IPC group received 20 ml of 0.375% ropivacaine into the posterior capsule of the knee during surgery by the orthopedic surgeon. We evaluated popliteal pain using the visual analog scale (VAS; score range: 0-100) on POD 0, 1, 4 and 7 and assessed functional recovery of the knee as measured by knee flexion angles on POD 1, 4, 7 and 21. VAS score of popliteal pain was presented as medians and knee flexion angles were presented as mean values. For all analysis, $P < 0.05$ determined significance.
Results and Discussion: Median VAS scores of popliteal pain were 0, 44, 2 and 6 for SNB and 35, 50, 38 and 27 for IPC on POD 0, 1, 4 and 7, respectively. In the SNB group, VAS scores were significantly lower than the IPC group on POD 0, 1, 4, and 7. ($P < 0.0001$, 0.01, 0.01 and 0.05, respectively) Mean knee flexion angle was 89, 104, 111 and 123 degrees for SNB and 85, 97, 102 and 116 degrees for IPC on POD 1, 4, 7 and 21, respectively. Knee flexion angles were significantly higher on POD 4 and 7 in the SNB group than in the IPC group ($P < 0.05$ and 0.003, respectively), but there was no statistically significant difference between the two groups on POD 21($P = 0.12$).
Conclusion(s): SNB offered better analgesia than IPC for popliteal pain and may have an effect on early functional recovery.

8AP7-3

Raised injection pressures during regional anaesthesia: needle or nerve?

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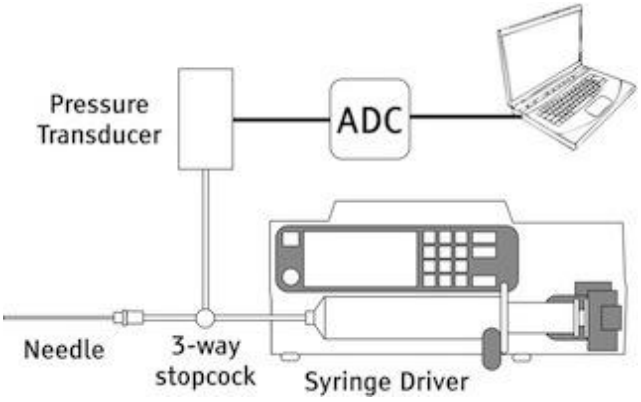
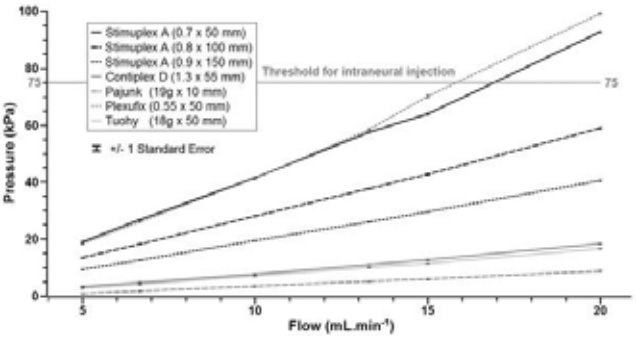
Background and Goal of Study: Intraneural injection of local anaesthetic during regional anaesthesia (RA) is a potentially serious complication associated with permanent neurological deficits. Injection pressures < 28 kPa and >75 kPa may indicate extra and intraneural injection respectively[1]; but do not account for flow, needle length and internal diameter (ID). Our study therefore explores these effects.
Materials and Methods: A syringe pump (Alaris GH Plus, Carefusion, US) and 50mL saline-filled syringe produced constant flows of 5, 6.67, 10, 13.3, 15 and 20 mL.min^{-1} in turn through 7 commonly used RA needles, with needle tips open to atmosphere. A calibrated pressure transducer (TP3-2.5B, TechniMeasure, UK) was connected between the syringe and needle via a 3-way stopcock (Fig 1). Pressure waveforms were captured via a 10 bit 240Hz analogue-digital converter and software (DI-148U, Dataq, UK), and exported to a spreadsheet (Excel, Microsoft, WA) for analysis. Plateau pressures for each needle and flow rate were measured 5 times, and the mean and standard error calculated.



[figure 1]



[Figure 2]

Conclusion(s): Perceived injection pressures vary considerably with flow rate and needle type. With small ID needles and fast injection rates, the clinician may be unable to differentiate whether this is due to the intrinsic resistance of the system, or intraneural injection.
Reference:
1. Hadzic A, et al. Reg Anesth Pain Med. 2004;29(5): 417-423.

8AP7-4

Upper limb tissue oxygenation increases after brachial plexus block

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Background and Goal of the Study: Brachial plexus block (BPB) induces hyperemia in the ipsilateral upper limb resulting in increased skin temperatures. However, there are no data available of changes in deep tissue oxygenation (StO2) after BPB. Near infrared spectroscopy (NIRS) technology now allows for measurements of muscle oxygenation at the thenar of the hand. Changes in StO2 after BPB are not investigated yet, and possibly serve as a marker of successful BPB.
Material and methods: Seventeen patients were enrolled. Ultra-sound guided BPB was performed at the interscalenic level (n=14) or at the supraclavicular level (n=3). StO2 was measured using NIRS-technology (Inspectra Spotcheck®, Hutchinson Technology) at the thenar of the hands. Baseline StO2 (BS) was recorded before performing BPB and repeated after 5 and 20 minutes. ANOVA was used to compare StO2 at the different time points.
Results and Discussion: The BPB's were successful in all of the patients. Baseline St02 was 80.6% and 79,9% in the blocked BPB-arm and contra-lateral arm respectively. StO2 in the blocked BPB-arm rose to 85.6% ($p< 0.05$ compared to BS) and 86.1% ($p< 0.01$ compared to BS) after 5 and 20 minutes respectively. There were no significant differences between StO2 at 5 and 20 minutes in the BPB-arm. In the contra-lateral arm StO2 was 82.6% (p=NS compared to BS) and 77.9% (p=NS compared to BS) after 5 and 20 minutes respectively.
In the blocked arm StO2 rose significantly 5 ($p< 0.05$) and 20 minutes ($p< 0.01$) after BPB compared to BS. There were no significant differences between StO2 at 5 and 20 minutes. Nor were there any significant changes in StO2 in the contra-lateral arm.
Conclusion: Tissue oxygenation measurements at the thenar of the ipsilateral hand can be an early indicator (within 5 minutes) of succesfull BPB. BPB not only increases skin bloodflow but also bloodflow to deeper (muscle) tissue and therefore can be indicated in critical upper limb ischemia.

8AP7-5

Neuropathy following axillary brachial plexus block

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Background: Neuropathic pain following nerve block is rare but a very troubling symptome that disturbs the quality of life and resist to treatments
Case report: We report a case of a 62-year old woman referred to our pain clinic for the upper extremity pain, which was developed following carpal tunnel operation under axillary brachial plexus block. Her medical history showed that she had right median neuropathy by neve conduction test, but she had not any abnormal laboratory tests.An axillary brachial plexus block under ultrasonographic guidance was planned for the carpal tunnel operation. 40 ml of lidocaine 1.5% mixed with 0.4 mg of epinephrine was slowly injected into radial, median, ulnar nerve area and musculocutaneous nerve. The tourniquet applied time was 90 minutes. No speciific events occurred during the operation. She started complaining of the dysesthesia and hypothesia in ulnar area from the postoperative 10th day. The pain was aching with intermmitant pinning sensation. The VAS was 6-8/10. The pinning sensation developed 3 or 4 times a day with 2-3 seconds in duration. Physical exam showed sensory defect in that area with cold sensation 1/10, touch 1/10 and pinprick 0/10 respectively. We started stellate ganglion block 3 times a week with pharmacological treatment(pregabalin, tramadol, milnacipran). The nerve conduction study performed 4 weeks following the operation showed medial antebrachial cutaneous nerve injury in painful arm. Currently she is complaining the continuous pain and allodynia with the intensity of 4-6/10 in VAS .
Discussion: There is a lot of controversy relating the cause of neuropathy following nerve block. The ischemic effect on the nerve by touniquet appears to be a contributing factor on the neuropathy. Because a large dose of lidocaine was injected in this case, the toxicity of lidocaine cannot be ruled out.
References:
Ben-David B, Barak M, Katz.K. Stahl S: A retrospective study of the incidence of Neurological injury after axillary brachial plexus block. pain practice 6:119-123,2006
Learning points: We are not sure that the neuropathy was caused by the tourniquet effect or the local anesthetic induced tissue toxicity, but there is a possibility of neuropathy when a large dose of lidocaine is injected to nervous tissue.

8AP7-6

A comparison of posterior and medial cord stimulation in neurostimulation-guided vertical infraclavicular block: a randomized non-inferiority clinical trial

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Background and Goal of Study: The type of distal motor response elicited with cord stimulation influences the overall success rate of infraclavicular block(ICB) using neurostimulation. We hypothesized that the medial cord stimulation might be as effective as the posterior cord stimulation in terms of block success during neurostimulation-guided ICB. The primary endpoint was success rate of complete sensory block. The secondary endpoints included onset time, efficacy of sensory and motor blocks, and adverse events.
Materials and Methods: Ninety-six patients scheduled for elbow, forearm and hand surgery were randomly received a single injection ICB after stimulation of the posterior (group P) or medial cord (group M).
The vertical ICB was performed half way between the jugular notch and the ventral process of the acromion using a nerve stimulator. At a stimulating current ≤ 0.5 mA,flexion of fingers and/or wrist was considered as the medial cord stimulation and extension of fingers and/or wrist as the posterior cord stimulation. All blocks were performed with 40 mL of ropivacaine 0.5%.
Sensory and motor block were assessed in the distribution of radial, median, ulnar, musculocutaneous, and medial antebrachial cutaneous nerve by a cold test and movement, respectively every 5 min until 50 min. A successful block was defined as complete sensory block of all five nerves below the elbow within 50 min after injection. The surgical procedures, duration of surgery, tourniquet time, and tourniquet pain and adverse events were noted. Analysis of the primary endpoint was performed according to a non-inferiority approach. P value < 0.05 was considered statistically significant.
Results and Discussion: The successful block rate of Group M was similar to that of Group P during ICB (95.7% vs 91.7%, 95% CI of difference -0.07 to 0.16, $P = 0.359$). The number of patients with block sufficient for surgery and supplementation were comparable between the groups. Onset time (median difference -1 min, 95% CI -3 to 1, $P = 0.239$), efficacies of the sensory and motor block, and adverse events were comparable in both groups.
Conclusion(s): This study demonstrated that the medial cord stimulation is non-inferior to the posterior cord stimulation in terms of block success rate in neurostimulation-guided ICB.
References:
Moayeri N. Vertical infraclavicular brachial plexus block: Needle redirection after elicitation of elbow flexion. Reg Anesth Pain Med 2009;34:236-41.

8AP7-7

Predictors of hospital admission after rotator cuff repair: the role of peripheral nerve blockade

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Background and Goal of Study: Addition of a peripheral nerve block for ambulatory rotator cuff repair surgery is reportedly associated with improved pain control, higher patient satisfaction and earlier discharge [1]. However, little conclusive evidence is available on the impact of regional anesthesia on the incidence of hospital admission after this procedure.
Materials and Methods: Data collected by Premier Inc. from approximately 400 hospitals between 2006 and 2010 was accessed. Patients for elective surgical rotator cuff repair were identified and included in our analysis. Subsequently, they were stratified by the type of anesthesia they received (general anesthesia (G) or general anesthesia plus upper extremity nerve block (GN)). Patient- and health care system related demographics, incidence of inpatient admission, incidence of major perioperative complications and differential resource utilization were compared.
Results and Discussion: We identified 27,201 entries for patients who underwent surgical rotator cuff repair; 10.9% (2,961) of those were admitted to the hospital. Compared to patients that were discharged to home, those admitted to the hospital were on average older (65.7 years vs. 57.3 years, $p< 0.0001$), had a higher average comorbidity burden (Deyo Index 1.06 vs 0.70, $p< 0.0001$), were more frequently female (58.5% vs. 42.0%, $p< 0.0001$), and had a lower rate of addition of a peripheral nerve block to general anesthesia (12.9% vs 15.7%, p=0.0003). However, age, comorbidity index and prevalence of individual comorbidities were similar between patient receiving G or

GN (58.2 years vs 58.4 years, p=0.2063; 0.73 vs 0.78, p=0.0621). Rates of major postoperative complications were significantly higher in the inpatient group. The cost of hospitalization was more than twice as high in patients admitted to the hospital (USD 12,686 vs 5,733, p< 0.0001).
Conclusion: This preliminary analysis of data suggests the presence of a higher comorbidity burden and average age among patients admitted to the hospital after ambulatory rotator cuff repair. However, patients in this group also had lower rates of addition of a peripheral nerve block to general anesthesia. As a next step, we will fit a multivariate regression model in order to determine whether type of anesthesia was independently associated with hospital admission and risk of major perioperative complications in this patient cohort.
References:
1. Hadzic et al. Anesthesiology 2005

8AP7-9

Local infiltration analgesia is as effective as continuous femoral block plus single-shot sciatic block after total knee arthroplasty

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Background and Goal of Study: Total knee arthrosplasty is considered a painful surgical procedure. Nowadays, continuous femoral block is the "gold standard" technique for postoperative pain relieve. Local infiltration analgesia (LIA), introduced in 2007, seems to be a good alternative technique in these patients. This study was done in the frame of the European multicenter PAIN OUT research project. The aim of this observational study was to compare pain scores and side-effects between the two techniques measured by the pain out assessment in the first 24 hours after surgery.
Materials and Methods: After IRB approval, 93 patients were enrolled in the study in the last two years. The patients received either regional anaesthesia (CFB) (n=50) (popliteal block and continuous femoral block); or local infiltration anaesthesia (LIA) (n=43) with 150mL of 0,2% ropivacaine. The postoperative pain out assessment includes different question of intensity of pain (VAS), side effects and patient satisfaction measured with a numerical rating scale.
Results and Discussion: The comparison in demographic, anthropometric and previous pain did not show any statistical different. The worst VAS in LIA group was 5,38±2,78 and in the CFB was 6,49±2,91 (p=0,17). The frequency of severe pain (VAS 6-10) was 41± 24,8% in CFB and 38,3±25,2% in LIA. Satisfaction with pain treatment was considered adequate in 81±24% of patients in LIA and 78±22% in CFB. Side effects were similar between groups except for the nauseas that were less intense in the LIA group (1,53±2,88 vs 2,14±2,85; p=0,012).
Conclusion(s): Our study suggests that LIA is as effective as peripheral blocks in postoperative pain management after total knee arthroplasty.

8AP8-1

The comparative estimation of the efficiency of the intrapleural and thoracic paravertebral analgesia at the thoracoscopic surgeries

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Background and Goal of Study: The comparative estimation of the efficiency of the intrapleural (IPA) and thoracic paravertebral analgesia (TPVA) at the thoracoscopic surgeries in patients with thorax traumas.
Materials and Methods: 55 patients in 2 groups were examined: the main group (25 patients) and control one (30 patients). In the main group the general anaesthesia was combined with TPVA through the paravertebral catheter in central segment (Th3 -Th6) and it was done bolus dosing of bupivacaine 100mg. In the control group it was combined with IPA through intrapleural catheter and it was done bolus dosing of bupivacaine 100mg. In the post -operative period with the aim of anesthesia in both groups it was done bolus dosing of bupivacaine 100mg through the catheter. Hemodynamics indexes, acid-base condition (ABC) and blood gases, the function of external respiration and the estimation of the pain sensation by visual-analogous scale (VAS) were investigated.
Results and Discussion: The patients of the main group had more stable hemodynamics indexes at all levels of surgery. 4 (16%) patients had moderate hypotension : average blood pressure decreased to 56,6±2 mm Hg. without substantial changes of the vital organs functions. 18 (60%) patients of the control group in the intra-operational period had the lowering of the blood pressure more than 40% from the reference quantity and bradicardia (frequency of cordial contractions 52±2min).
The investigations of ABC of the blood showed the moderate respiration acidosis before the operation in both groups. In intra and post-operative periods in both groups it was pointed the improving of ABC indexes, increasing PO_2 for 25.9%, lowering PO_2 for 19,5 % and normalization of BE in compare with the starting point. The indexes of the function of external respiration in the post-operative period pointed to the more early recovering of the good ventilation of the patients from the main group. Patients of the control and main groups had the good level of analgesia in early post-operative period. It was proved by VAS indexes at the same time the duration of analgesia in the main group was 6 hours and did not need the usage of analgesics.
Conclusion(s): TPVA in the thoracic cavity is the simple and reliable component of anesthesia in thoracoscopic surgeries. Its provides the stability hemodynamics during operation and postoperative period in patients with thorax trauma.

8AP8-2

Formula-based prediction of skin-to-root distance is not reliable for paravertebral block in children

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Background and Goal of Study: Preoperative prediction of skin-to-root distance (SRD) may be a useful adjunct to objective techniques to improve paravertebral block (PVB) quality and patient safety. The goal was to test whether a set of variables can be used to predict SRD when administering PVB in children.
Materials and Methods: A group of 50 children (1.5-15 yo) undergoing ultrasonography (US) were assessed to determine the STD and skin-to-psoas fascia distance (SPD). Another group of 48 children (1.5-16 yo) undergoing inguinal hernia, hydrocele and varicocele surgery were operated under nerve stimulator (NS)-guided PVB with IV sedation. STD (by needle depth) and SRD-surrogate (needle depth, at which abdominal wall twitches were elicited by 0.4 mA current) were measured.
Pearson's correlations between anthropometric variables, SPD and SRD were calculated. Multiple regression was applied to draw equations for SRD from different variables.
Results and Discussion: SPD (measured by US) correlated well with STD (r=0.86), waist circumference (r=0.97) and weight (r=0.75). Medium correlation was found between SPD and height (r=0.78).
SRD-surrogate (measured by NS) correlated well with STD (r=0.86). Medium correlation was found between SRD and waist circumference (r=0.62), height (r=0.57), and weight (r=0.54).
Following equations were derived for SRD from STD:
- based on US measurement:
SRD=0.48+0.92STD (p< 0.00013, R^2=0.86)
- based on needle insertion depth:
SRD=0.9+0.92STD (p< 0.0027, R^2=0.86)
(R^2 - determination coefficient).
Following equations were derived for SRD from anthropometric measurements:
- based on US measurement:
SRD=1.8-1.29H+1.88BW+0.45WC (p < 0.012, R^2=0.82)
- based on needle insertion depth:
SRD=-3.59+0.5H-0.03BW+0.36WC (p < 0.45, R^2=0.67)
(R^2 - determination coefficient; H - height, BW - body weight, WC - waist circumference).
SRD prediction based on US differs substantially from SRD prediction based on NS. Anthropometric based equations are too complex for clinical use.
Conclusion: Equations can be derived from anthropometric variables and skin-to-transverse process distance to predict the skin-to-root distance in children. However, complexity and inaccuracy of these equations restricts their use in clinical practice.
References:
1. Naja et al. Anesthesiology 2005;103(3):600-605.
2. Finnerty et al. Anaesthesia 2010; 65(Suppl. 1):76-83.
3. Thavaneswaran et al. Anesth Analg 2010;110:1740-4.

8AP8-3

Comparison of dorsal penile nerve block plus ring block with 0.33% ropivacaine and intravenous tramadol for prevention of catheter-related bladder discomfort

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Background: Catheter-related bladder discomfort (CRBD) is a common side effect after surgery, especially in male patients who have had urinary catheterization after anesthetic induction under general anesthesia. In this study we compare the efficacy of dorsal penile nerve block (DPNB) plus ring block (RB) with 0.33% ropivacaine and intravenous tramadol 1.5mg/kg in prevention of CRBD.
Methods: Forty-six male patients (18-50 yrs), ASA physical status I~III, undergoing elective orthopedic surgery with urinary catheterization after anesthetic induction under general anesthesia were randomly divided into two groups with 23 each. Group DPNB received DPNB plus RB with 15ml of 0.33% ropivacaine 30 min before extubation, and Group TRAM received intravenous tramadol 1.5mg/kg 30 min before extubation. The patients were observed for the incidence and severity of CRBD, and postoperative pain score and side effects were evaluated at 0,1,2,4,6, and 24h after patients' arrival in the postanesthetic care unit. Data were analysed by one-way ANOVA, Z-test, and Fisher's exact test. $P < 0.05$ was considered significant.
Results: The incidence and severity of CRBD was significantly reduced in Group DPNB compared with Group TRAM at 0,1,2,4,and 6h. Pain score was comparable in two groups. The incidences of nausea and vomiting, vertigo, and sedation were significantly lower in Group DPNB than in Group TRAM at 0,1,2,4 and 6h.
Conclusion: DPNB plus RB with 15ml of 0.33% ropivacaine 30 min before extubation provides a better effect for prevention of CRBD than tramadol 1.5mg/kg 30 min before extubation.

8AP8-4

Anticoagulated patients receiving peribulbar block for cataract surgery: an 8-grade photographic comparison with non-anticoagulated patients

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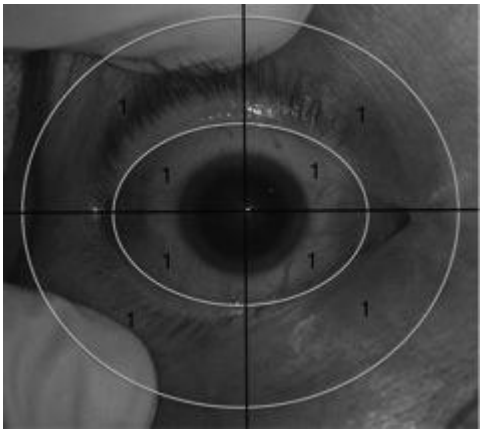
Background and Goal of Study: To study the incidence of hematomas after peribulbar blocks in both anticoagulated and non-anticoagulated patients undergoing clear corneal phacoemulsification.
Materials and Methods: A fifteen-month prospective, quasi-experimental design.
Fifty-two patients using either Aspirin, or Warfarin, or Clopidogrel, or Ticlopidine, were compared to fifty-eight non-anticoagulated patients. The patients were submitted to cataract surgery and had their eyes photographed ten minutes after the peribulbar blocks, to document the incidence of hematoma.
Three independent ophthalmologists analyzed the photographs, and gave grades to quantify the presence or absence of hematoma, from grade 0 (absence of hematoma) to grade 8 (maximum hematoma).



[Scale of scores according to the presence of them]

They were also asked, based on the photographs, if they would continue or postpone the surgeries, considering the appearance of the hematoma.
Complications were also recorded in the follow-up appointment, in the day after the surgery.
Results and Discussion: Grades in anticoagulated patients were higher than non-anticoagulated patients. However, in all cases, the experts would proceed with the surgeries, resulting in a zero-cancellation rate. Moreover, no patient showed visual harm, due to hemorrhage, in the follow-up appointment.

Grades	Anticoagulated (N/%)	Non-Anticoagulated (N/%)
Grade 0 (absence of hematoma)	124 (65.4%)	163 (84.5%)
Grade 1-8 (presence of hematoma)	32 (34.6)	11 (15.5%)
Total	156 (100%)	174 (100%)

[Grades in the groups, p= 0.0087, Mann-Whitney test]

Conclusion(s): Our findings provide evidence that the occurrence of hematoma is higher in anticoagulated patients submitted to peribulbar blocks, compared to non-anticoagulated patients. However, these minor hemorrhages are irrelevant and cause no harm. Peribulbar block is safe in anticoagulated patients submitted to clear corneal phacoemulsification.
References:
1. Douketis, J. D., Berger, P. B., Dunn, et al. The perioperative management of antithrombotic therapy: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition). *Chest*, 2008; 133(6): 299s-339s

8AP8-5

Are landmark-based techniques still considered acceptable for vascular cannulation and regional nerve blocks?

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Background and Goal: The use of ultrasound-guided neurovascular procedures is increasingly regarded as "gold standard" due to reduced complications and increase in success[1,2]. We surmise that anaesthetists are becoming less confident at using landmark techniques(LMT) as a result of the increasing popularity of ultrasound(U/S).
Materials and Methods: With audit committee approval, a survey of anaesthetists was undertaken at a general hospital in Essex, UK. Questions included duration of anaesthesic practice, confidence with U/S nerve blockade and vascular procedures; the concomitant acceptability of performing these via LMT. Complications of U/S techniques and free text comments were elicited.
Results and Discussion: There were 40 responses to the survey.Two groups were formed; junior (up to five years experience) and senior (greater than five years experience). The table below outlines the results.

	Acceptability		Comfort	
Neuro-Vascular Procedure	<5years experience (n=12)	>5years experience (n=28)	<5years experience	>5years experience
Femoral CVC	10 83%	17 61%	11 92%	25 89%
Internal Jugular CVC	5 42%	11 39%	2 17%	21 75%
Brachial Plexus Interscalene	2 17%	6 (21%	1 8%	4 14%
Brachial Plexus Axillary	2 17%	11 39%	1 8%	4 14%
TAP	3 25%	6 21%	6 50%	8 29%
Femoral Nerve	9 75%	17 61%	7 58%	11 39%
Fascia-Iliaca	11 92%	21 75%	11 92%	7 25%

[Acceptability and Comfort of LMT Procedures]

With confidence in LMT vascular cannulation, there was no difference in femoral access, however a marked difference with internal jugular cannulation between the groups. Fewer seniors felt it acceptable to perform either procedures blind. Overall there was more confidence in the junior group in performing neuraxial blocks via LMT, and there was no difference in the acceptability. Two major complications were recorded despite U/S use: carotid artery puncture and pneumothorax. Eight respondents expressed concern about the lack of skill in junior anaesthetists without U/S.
Conclusion: We conclude that anaesthetists still consider it acceptable to do neurovascular procedures via landmark technique, however the confidence in performing internal jugular central cannulation was reduced in junior an-

aesthetists, with seniors expressing concern regarding de-skilling. Ultrasound was considered preferable and should be used where available.

References:
1. Karakitsos et al Critical Care 2006, 10:R162
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8AP8-6

Effect of loco regional anaesthesia on tumor progression of sarcomas: a retrospective study

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Background and Goal of Study: Local or general anaesthesia is necessary for oncology surgery. It's difficult to think that anaesthetic drugs may influence on the prognosis of a chronic and recurrent disease like cancer. Recent retrospectives studies suggest that loco regional techniques may influence on the progression of the underlying malignant disease when compared with general anaesthesia. The aim of our study was to analyze the tumor recurrence in patients with sarcomas who had been treated with surgery and radiotherapy.
Materials and Methods: This was a retrospective consecutive series of 53 patients affected by soft tissue sarcomas and treated with surgery and intraoperative radiotherapy with electrons +/- external radiotherapy between 1996 and 2009. Abdominal sarcomas were excluded. Patients were divided in two groups: general (n 29) or loco regional anaesthesia (n 24). Both groups were balanced in cancer staging, histology, tumour cells type and resection margin, age, ASA status….
Results and Discussion: Our series showed significant differences in the overall survival (OS) , disease free survival (DFS), loco regional control (LRC) and metastases free survival (MFS) when loco regional anaesthesia was used (table 1) with a following median follow up of 58 months. The Survival curves were statistically significant.

	General Anaesthesia	N	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Global Survival	yes	16	55,8152	51,92828	12,98207	,063
	no	25	86,7745	49,74725	9,94945	,068
Loco regional control	yes	16	42,9671	42,79837	10,69959	,023
	no	25	80,0434	52,52134	10,50427	,018
Disease-free survival	Yes	15	37,1625	34,83402	8,99410	,018
	No	25	76,1363	54,28694	10,85739	,009
Metastases free survival	Yes	16	38,3244	38,41396	9,60349	,006
	No	25	82,8675	52,13597	10,42719	,003

[Table 1]

These results suggest that as well as ordinary predictors for tumor recurrence and long term survival for sarcomas, the anaesthetic technique can play an important role. However, this is a retrospective study so it's possible that several factors could not have been controlled and subsequently may have affected the oncology results of these patients.
Conclusion(s): In our retrospective study, then use of loco regional anaesthesia for soft tissue sarcomas surgery was associated with a better OS, DFS, LRC and MFS. However, prospective, randomized studies are needed to clarify the exact role of the loco regional anaesthetic techniques in the oncologic surgery of these tumors.

8AP8-7

Friedreich's ataxia and combined regional anaesthesia

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Background: Friedreich's ataxia (FA) is a rare autossomal recessive neurodegenerative condition associated with cardiomyopathy, kyphoscoliosis and generalized sketetal muscle weakness.(1) Perioperatory implications must be weighted when tailoring anaesthesia for this patients.
Case report: Male, 44 yrs old patient for internal fixation of proximal femoral fracture.FA,dilated cardiomyopathy, impaired cardiac function (ejection fraction of 35%), totally dependent, cachectic.Performed ultrasound guided femoral nerve block (levobupivacaine 50mg) and continuous spinal block (levobupivacaine 2,5 mg, needle over microcatheter technique). Comfortable for 60min; increased resistance to injection unabled further spinal administration: intravenous fentanyl (50μg) and propofol (20mg) were necessary to finish procedure. Catheter,kinked near fixation site, was removed. There was no cardiovascular or respiratory instability during perioperatory care.
Discussion: FA implies risk for acute cardiac failure, ventilatory impairement and gastric content aspiration and there may have altered responses to muscle relaxants.Neuraxial blocks decrease stress response to surgery,perioperative blood loss and postoperative thromboembolic events. Depressed cardiac function requires avoidance of abrupt falls in systemic vascular resistance. Continuous spinal block combines rapid onset reliable block with titrability,keeping sympathectomy only as extensive as needed(2). Small bore catheters minimize post dural headache. Abnormal pooling and neurologic toxicity is lessened by low concentration, non hyperbaric solutions(3). Extra care is needed when fixing catheters, particularly position changes are required, in order to avoid jeopardizing a successful technique. Combination with peripheral nerve blocks allows diminishing even more the spinal dose required to achieve appropriate anesthesia and analgesia.

References:
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Learning points: Combined very low dose continuous spinal and peripheral nerve block permited uneventful major orthopaedic surgery in FA, severely compromised cardiac function patient in whom haemodynamic and respiratory stability were of paramount importance.

8AP8-8

The sonoanatomy of psoas compartment block in pediatric patients

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Background and Goal of Study: Psoas compartment block (PCB) is an anesthetic and analgesic technique that blocks anterolateral and medial side of thigh, knee, and the complete innervation area of saphene nerve under the knee. In order to apply PCB, techniques such as paresthesia, loss of resistance and neurositumulation were described. Ultrasound(US) guided lumbar plexus blocks has been a valuable technique in the recent years. The aim of this study was to describe PCB sonoanatomy in children and to measure the possible depth of lumbar plexus(LP) which can help decreasing possible complications.
Materials and Methods: After the approval of institutional Ethics Committee of Kocaeli University, 36 ASA I-II patients from 1 to 6 years old were included in this prospective study. After induction of general anesthesia, patients were turned to the lateral position with the hip joints flexed 90º. Spinous(SP) and transverse processes(TP) were localized at L5, L4, L3, L2, and L1 levels after sacral bone was localized with the help of linear US probe. The depths of SP,TP and facet joint(FJ) were measured with the help of US at the L4 level. In 16 patients, PCB was performed. In these patients the needle depth and the distance between the needle and the line drawn vertically from L4 SP mid-point to caudo-cranial line were also recorded in addition to PCB sonoanatomy
Results and Discussion: In patients at the age group 1-6; mean depth of SP, TP and FJ were measured as 3.07 ± 1.30 mm, 14.25 ± 2.37 mm and 13.17 ± 2.31 mm respectively. In the 16 patients, whom PCB were applied, mean depth of needle and needle to middle line depth are measured as 21.89 ± 1.66 mm and 19.73 ± 3.29 mm respectively. The TP dept, which can be used as an anatomical landmark in PCB, was significantly correlated with BMI, height, weight and age (p: 0.001). Needle depth, which showed the LP depth, was correlated with TP depth and patient weight (p: 0.008 and p: 0.05). There was also a significant correlation between the needle depth and needle to mid point distance (p: 0.03).
Conclusion(s): PCB should be applied to pediatric patients by carefully scanning the depth of TP and relavent anatomical structures in paravertebral region because of its complications. Our study can help anesthesiologists to predict LP possible depth, maximum needle depth and also help decreasing possible complications related to PCB. Our data should be examined with clinical research.

8AP8-9

The impact of continuous psoas compartment block on surgical stress response and postoperative pain after hip replacement surgery

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Background and Goal of Study: Hip replacement surgery can cause significant acute postoperative pain and surgical stress response. The following study examines the impact of continuous psoas compartment block on surgical stress response and postoperative pain comparing to intravenous opioids in patients who underwent hip replacement surgery.
Materials and Methods: After approval of the local ethics committee, two groups of patients were included in this prospective randomised study. The Psoas Compartment Group (PC) of 32 patients aged of 59,2±6,8 (ASA II-III) and the Morphine group (M) of 30 patients aged 61,5±7,2 (ASA II-III). In all patients, general anasthesia was induced with 2.5 mg/kg propofol, 5 mg/kg fentanil and 0.6 mg/kg rocuronium. Following intubation, anaesthesia was maintained with 1.5-2% sevoflurane in a N_2O/O_2 (2:1) mixture.
Preoperatively, in the PC group catheter was inserted into psoas compartment using Contiplex Tuohy set (BBraun, Meslungen Germany) and 20 ml bolus of Levobupivacane 0.25% was given. Postoperatively, analgesia was maintained by continuous infusion of Levobupivacane 0.25% 7±1.8ml/h. In the M group, morphine hydrochloride 1mg/ml was administered via PCA (patient controlled analgesia) pump (patient bolus 1mg, lockout period 7 minutes). Blood samples were collected preoperatively (0h), 4h, 12h and 24h postoperatively. Serum glucose (mmol/l), cortisol (mcg/dL), insulin (μU/ml) levels were measured.
Pain intensity at rest and upon movement was assessed using visual analogue scale (VAS) 4h, 12h and 24h postoperatively. Statistics were analysed with the Chi-Squared test and Student's t test.
Results: PC group (n=32) Vs. M group (n=30)
Assessed at 0h, 4h, 12h, 24h, 0h, 4h, 12h, 24h
Pain VAS (at rest) 2(4h) 1(8h) 0(24h) Vs.5(4h) 4(8h) 2(24h) p< 0.05
Pain VAS (movements) 4(4h) 2(8h) 0(24h) Vs. 8(4h) 6(8h) 2(24h) p< 0.05
Glucose 4,1±0,6 7,1±0,8 6,6±1,1 5,1±0,8 Vs. 4,4±0,5 11,2±1,1 7,8±0,8 6,0±0,9 p< 0.05
Cortisol 14,4±3,1 25,2±5,21 17,2±3,4 13,8±2,2 Vs. 14,8±1,1 36,8±4,4 25,2±2,1 15,4±2,4 p< 0.05
Insulin 9,2±2,1 13,2±2,2 11,4±1,1 9,8±0,9 Vs. 8,9±1,0 8,9±1,9 15,8±2,0 9,5±1,6 p< 0.05
Conclusion(s): Continuous psoas compartment block showed significantly better postoperative pain relief comparing to PCA morphine. Cortisol, insulin and glucose levels were significantly lower in PC group which indicates reduced surgical stress response.

8AP8-10

Post-operative continuous transversus abdominis plane (TAP) blocks for analgesia after abdominal aortic aneurysmectomy (AAA)

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Background and Goal of Study: In abdominal aneurysmectomy (AAA), epidural analgesia has risk of extradural hematoma because of intraoperative heparization. Our institute, systemic administration of fentanyl had been used for intra- and post-operative main analgesics. But intensive pain increased opioid consumption and induced intestine dysfunction.
In years (from 2010), we introduced ultrasound-guided TAP blocks for abdominal major surgery, applied this technique to AAA. We evaluated its analgesic efficacy and post-operative outcomes retrospectively.
Materials and Methods: From January 2008 to September 2011, fifty patients under eighty-five years old underwent elective AAA with bifurcated graft replacement.
In Both groups, Anaesthesia was maintained with sevoflurane, fentanyl or remifentanil. Post-operative pain treatment consisted of Flurbiprofen axetil 50mg, DIV fentanyl (fentanyl continuous administrarion) 0.01γ (μg/kg/min).
In addition, nineteen patients underwent both-sided TAP block with bupivacaine (TAP group, N=19), and twenty-nine did not (non-TAP group, N=29). Two patients who coule not be extubated were excluded.
We (retrospectively) compared the outcomes of hospital stay, ambulation, liquid intake, incidence of delirium, postoperative analgesic requirements (supplemental analgesic.) We (retrospectively) compared the outcomes of hospital stay, ambulation, liquid intake, incidence of delirium, postoperative analgesic requirements (supplemental analgesic.)
Results and Discussion: The patient demographics did not significantly differ between the 2 groups, and there were no hospital deaths in either group. Compared with no TAP block group, TAP block group reulted in significantly less total requirement for fentanyl at 24 hours [Mean±SD, 1.9±1.7mg versus 1.3±0.9mg (p=0.027)]. As with TAP blocks made no impact on postoperative analgesic requirements (p=0.225), Incidence of delirium (p=0.867), hospital-stay (p=0.941), liquidintake (p=0.0551), ambulation (p=0.191).
Mean time of first solid diet was shorter in group TAP (than in no TAP group) (p=0.00043). Solid diet was significantly shorter.
Conclusion: In this study, there is no apparent reduction in postoperative (nausea and vomiting) or analgesic from the small numbers of studies to date. But in nowadays ERAS and Fast-Track surgery, use of continuous TAP block within postoperative period for AAA may be able to improve patients'recovery.

Pharmacology

9AP1-1

Efficacy of sugammadex for the reversal of moderate and deep rocuronium-induced neuromuscular block in patients pretreated with magnesium sulfate. Randomized study

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Background and Goal of Study: Sugammadex, a modified gamma cyclodextrin, is a selective binding agent specifically designed to encapsulate the neuromuscular blocking agent rocuronium. Pre-treatment with intravenous magnesium sulfate ($MgSO_4$) prolongs spontaneous recovery time after a single intubation dose of rocuronium by about 25%.(1) Our hypothesis was that after pre-treatment with intravenous $MgSO_4$, the time to reverse a moderate and a deep neuromuscular block induced by an intubation dose of rocuronium with standard doses of sugammadex was significantly prolonged.
Materials and Methods: Thirty-two men (18-65 years) were randomly allocated to receive $MgSO_4$ 60 mg kg^{-1} or matching placebo (saline) in a double-blinded manner. Study drugs were given intravenously for 15 min before induction of anesthesia with propofol, sufentanil and rocuronium 0.6 mg kg^{-1}. Anesthesia was maintained with a target-controlled propofol infusion. Neuromuscular transmission was measured using train-of-four (TOF) -Watch SX® acceleromyography. In part I of the study, sugammadex 2 mg kg^{-1} was administered in 16 patients (8 $MgSO_4$ and 8 placebo) at reappearance of the second twitch ("moderate" block). In part II, sugammadex 4 mg kg^{-1} was administered in 16 patients (8 $MgSO_4$ and 8 placebo) at post-tetanic count 1-2 ("deep" block). The primary endpoint was the time in seconds from injection of sugammadex to a T4/T1 ratio ≥0.9.
Results and Discussion: Data from all 32 randomized patients could be analyzed. In part I (moderate block), time from injection of sugammadex to a T4/T1 ratio ≥0.9 was on average 72 [SD=19] seconds with $MgSO_4$ and was 74 [30] seconds with saline (P=0.874). In part II (deep block), time was 74 [27] seconds with $MgSO_4$ and was 75 [17] seconds with saline (P=0.922).
Conclusion(s): Pre-treatment with intravenous $MgSO_4$ has no impact on the efficacy of recommended doses of sugammadex for the reversal of moderate and deep rocuronium-induced neuromuscular block.
References:
1. Czarnetzki C et al. Time course of rocuronium-induced neuromuscular block after pre-treatment with magnesium sulphate: a randomised study. Acta Anaesthesiol Scand 2010; 54:299-306.
Acknowledgements: The study was funded by institutional funds. Sugammadex was provided by Merck Sharp & Dohme AG, Werftestrasse 4, CH-6005 Lucerne, Switzerland.

9AP1-2

A new way of dosing sugammadex for reversal of vecuronium induced muscle relaxation and its economic impact

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Background and Goal of Study: Sugammadex is is a selective relaxant binding agent that binds aminosteroid muscle relaxants. Each molecule of sugammadex binds one molecule of muscle relaxant. To produce the same depth of neuromucular block (NMB) much less molecules of vecuronium are needed than molecuis of rocuronium. In theory less sugammadex would be needed to neutralise neuromuscular block if vecuronium was used to produce neuromuscular block. Our aim was to compare reversal of vecuronium induced muscle relaxation between a new way of dosing sugammadex, which takes into account TOF value at the end of surgery and amount of vecuronium given during surgery with neostigmine-atropine combination. We also wanted to know how much this dosage regime can save compared to standard per kg dosage.
Materials and Methods: 20 adult patients requiring a general anaesthesia for surgery were randomized in to two groups. First group (SUG) received sugammadex at the end of the surgery according to table one for NMB reversal. Second group (NEO) received neostigmine and atropine. Train-of -four (TOF) value was recorded at the end of the surgery and then continuously until the TOF value reached more than 0.9 and patient was extubated. The time required for the TOF value reaching 0.9, was compared between groups. Results were statistically analysed using one way ANOVA. For economical evaluation we compared the amount of sugammadex used in the SUG group to standard sugammadex per kg dosage.

vecuronium (mg)	6	8	10	12	14
TOF value	bridion dose (mg) *if inadequate dose add additional 10 mg				
0	40	60	60	75	90
1 or 2	35	40	50	60	70
>2	30	40	40	40	50

[table one]

Results and Discussion: Mean time to recovery to a TOF ratio of 0.9 with sugammadex was 6.12 min (1.2- 10.8 min) versus 12.6 min (1.53- 25 min) with neostigmine-atropine ($P < 0.05$). No sing of postoperative residual curarisation was observed in the SUG group. For patients in our study 530 mg of sugammadex was used to neutralise the NMB. If standard per kg sugammadex dosing was used we would use 2420 mg for the NMB reversal.
Conclusion(s): New dosing for sugammadex was successful in neutralising the NMB regardless of the TOF value at the end of surgery. The economic impact of proposed dosing is significant as an average cost for the vecuronium NMB reversal is reduced from around 80 € to 20 € per patient.

9AP1-3

Anaphylactic reaction following administration of sugammadex with positive result in the basophil activation test

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Background: Some cases of suspected sugammadex-induced allergic reactions were reported. But its detail is still unclear.
Case report: A 65-year-old man underwent levator muscle shortening for ptosis. He had hypertension, diabetes, hyperlipidemia, gout and no history of allergy. General endotracheal anesthesia was provided with propofol and rocuronium induction and with sevoflurane, fentanyl and remifentanil for maintenance. Piperacillin was given as a prophylactic antibiotic. After satisfactory progress of operation, 100mg of sugammadex (SGX) was administered at the end of surgery. Three minutes after administration, the patient recover his consciousness and regular breathing, and then his trachea was extubated. Five minutes after extubation, he suddenly lost his consciousness and showed cyanosis, fell into a shock state. Immediate re-intubation, fluid loading, and vasopressors were administrated. Marked edema with erythema was observed in his face, lips, tongue, and body. Anaphylactic shock was suspected. SGX was suspected as an allergic cause because no drug except for SGX was administrated around extubation. Cutaneous findings were improved and tracheal tube was removed in several hours by chlorpheniramine and methylprednisolone administration.
He showed no troubles thereafter, and left hospital. Tryptase elevated to 82.6mcg/L after the reaction. Allergy testing was later performed against rocuronium and SGX in two ways. Negative test result against all drugs was shown in the drug lymphocyte stimulation test (DLST). SGX after deliberate light exposure was positive in the basophil activation test (BAT). Light-exposed SGX was possibly considered as an allergen.
Discussion: BAT is one of the diagnostic test for immediate-type drug allergy mediated by drug-specific IgE antibodies. Light exposure makes SGX change structurally. In this case, SGX after deliberate light exposure was positive with BAT. The changed compound possibly caused allergic reactions. Further examination is required about the light exposure conditions and the responsible compounds.
References:
1. Three cases of suspected sugammadex-induced hypersensitivity reactions. Br J Anaesth. 2012 Aug;109:216-8.
2. Allergy to low dose sugammadex. Anaesthesia. 2011 Mar;66:217-9.
Learning points: Sugammadex may cause allergic reactions, and its essential allergen is some decomposition products by light exposure, possibly.

9AP1-4

Can sugammadex be effective with Pipecuronium as well as with rocuronium?

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Background and Goal of Study: Sugammadex (S) is a novel and unique antagonist of rocuronium (R) and possibly other steroidal neuromuscular blockers. Pipecuronium (P) also steroidal myorelaxant is most popular in Russia and in some other countries because of its cheapness. However duration of its action is long and actually unpredictable, that is associated with high risk of postoperative residual curarization. The aim of this study was to evaluate the efficacy of reversal with S of NMB induced by P in comparison with R.
Materials and Methods: Ninety four patients, ASA I - III, after EC approval and written IC, underwent abdominal surgery under propofol with fentanil anaesthesia were randomized to two groups. First - RS (n-66, mean age 51; male 26%, female 74%) received R for NMB and in the end of surgery S 4 mg/kg at PTC2. Second - PS (n-28; mean age 49, male 39,3%, female 60,7%) received P for NMB and S 4 mg/kg at TOF2. Neuromuscular transmission was monitored by acceleromyography with TOF stimulation at 2 Hz and PTC on demand (TOF-Watch®SX, Organon, registration on PC with appropriate software).
We registered: time from the S administration at reappearance of PTC2 (RS) or T2 (PS) to the recovery of TOF and to extubation; time from last administration of relaxant to recovery of TOF ≥ 0,9. Statistical comparison was analyzed using Student's t-test. The results of both groups were compared through the Fisher's f-test. Statistical significance was assumed at $p < 0.005$.
Results and Discussion: Geometric mean time till TOF≥ 0,9 from last dose of R was 13,3 (11,6-15,3) min. That is more than eight time faster than after P - 113,7 (93,2-134,2) min. Recovery mean times after administration of S till TOF≥ 0,9 and till extubation in group RS was shorter (2,4 and 3,7 min) than in group PS (3,62 and 4,89 min) ($p<0,005$) despite of more deep NMB in patients of PS group. Our findings are in full accordance with literature data concerning S affinity to steroid relaxants (rocuronium > vecuronium > pipecuronium).
Conclusion: We have confirmed that duration NMB after P is much longer, than after R with variation in wide range. This is direct indication to the reversal of NMB. S substantially reduces time of restoration of neuromuscular conductance after P, but operates 1,5 times more slowly, than after R.

9AP1-5

The use of sugammadex eliminated postoperative residual neuromuscular blockade at post-anaesthesia care unit admission in abdominal surgery

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Background: The use of neuromuscular blocking drugs (NMBD) is associated with an increased risk of postoperative respiratory complications.[1] Residual neuromuscular blockade (NMB), defined as a train-of-four T_4/T_1 ratio < 0.9, occurs frequently after abdominal surgery and is associated with adverse respiratory events and delayed discharge from the post-anaesthesia care unit (PACU).[2]
We tested the hypothesis that sugammadex reversal of NMBD at the end of

abdominal surgery helps avoid residual NMB at PACU admission.
Methods: This assessor-blinded study (NCT01479764) conducted at the Massachusetts General Hospital enrolled adult patients (aged ≥18 years) undergoing elective abdominal surgery. Patients were randomized to receive sugammadex (2 or 4 mg/kg) for reversal of rocuronium-induced NMB or neostigmine/glycopyrrolate (according to standard clinical practice; usual care group). Treatment-blinded personnel recorded T_4/T_1 ratio at PACU admission (primary endpoint) and conducted safety assessments. Primary endpoint was analyzed using the odds ratio (OR) of having residual NMB (defined as T_4/T_1 ratio < 0.9) for sugammadex vs usual care, with 95% confidence interval (CI) and p-value calculated for comparison of treatment groups by Pearson chi-square test.
Results: In total, 154 patients were randomized, 151 were treated (sugammadex n=74 and usual care n=77), and 150 had a T_4/T_1 ratio value at PACU entry. No patient (0%) in the sugammadex group and 33 patients (43.4%) in the usual care group had a T_4/T_1 ratio < 0.9 at PACU admission (OR 0.0, 95% CI 0.00 to 0.06; p < 0.0001). Eight patients (10.5%) in the usual care group had a T_4/T_1 ratio of < 0.7 at PACU entry. Adverse events (AEs) occurred in 39 (52.7%) sugammadex patients versus 41 (53.2%) usual care patients, with four (5.4%) and 10 (13.0%) patients, respectively, experiencing AEs considered to be drug-related. Serious AEs occurred in seven (9.5%) sugammadex patients and eight (10.4%) usual care patients.
Conclusion: Following abdominal surgery, 43% of patients receiving neostigmine/glycopyrrolate reversal presented with residual NMB in the PACU. The use of sugammadex eliminated postoperative residual NMB at PACU admission, which may help prevent postoperative respiratory complications associated with the use of NMBD.
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9AP1-6

Effect of sugammadex on progesterone level in pregnant rats

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Background and Goal of Study: Sugammadex is used for reversing the effects of the steroid muscle relaxants. It has been reported to decrease the efficacy of progesterone, in women using oral contraceptive progesteron with steroids structure. During the first trimester of pregnancy, which is of great importance not to increase progesterone levels drop, or a regular pregnant rats resulted in abortions and dead births. In this study, we aimed to investigate the effect of Sugammadex on progesterone levels in pregnant rats and accordingly it's effect on the physiological course of the pregnancy.
Materials and Methods: The pregnancy of rats confirmed by the presence of sperm in the vaginal smear in the first day after mating, then randomly divided into three groups. On the seventh day of pregnancy, the following applications were done to the rats. 1.5 ml physiological saline iv applied to the Group C (n:6), 30 mg/kg Sugammadex as 1.5 ml in volume iv applied to the Group S (n:10) and 30 mg/kg Sugammadex and 3.5 mg/kg rocuronium as 1.5 ml volume iv applied to the Group S+R (n:10). 35 minutes after drug application, the progesterone levels from the blood samples taken with a solution of Beckman Coulter were measured in the access immunoanaliz device system. The rats were followed during pregnancy and births. Offspring were evaluated in terms of the number and morphology. A one-way analysis method of variance were used to compared the difference between the calculated parameters of the experimental groups.
Results and Discussion: The progesterone levels in rats included in the study were measured as; 94.16±15:54, 87.86±12.48 and 94.53±16.10 ng / ml in group C, S and S+R respectively. There were no statistical significant difference between the groups (p>0.05). During the course of pregnancy, stillbirth and miscarriage was not occurred. Average number of offspring was 6.8±1.47, 6.5±1.35 and 6.4±1.17 in group C, S and S+R respectively. The mean duration of pregnancy and the offspring number of the rats were similar in all groups (p>0.05). The offsprings were born macroscopically normal.
Conclusion(s): Although statistically not significant, the low level of the progesterone did not affect the clinical course in group S. In rats, smooth completion of the pregnancy, absence of stillbirth and miscarriage give us an idea for new studies about the use of the Sugammadex especially during the first trimester of pregnancy.

9AP1-7

Clinical and cost-effectiveness of sugammadex versus neostigmine reversal of rocuronium-induced neuromuscular block in super obese patients undergoing open laparotomy for bariatric surgery. A randomized controlled trial

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Background and Goal of Study: To date, the dosing of reversal agents (RA) for neuromuscular block (NB, e.g., sugammadex [SUG] or neostigmine [Neo]) in morbidly obese patients has been addressed only in a few studies. However, no study in super-obese (SO) patients (BMI ≥ 50 kg m^{-2}) has been performed yet.
Materials and Methods: Following IRB approval, we compared the reversal of profound rocuronium (R) induced NB in SO pts who were allocated to 4 groups (Gr) to receive SUG and Neo in 2 different weight corrections. 57 SO patients, scheduled for open bariatric surgery under propofol remifentanil BIS anaesthesia, were randomly assigned to: Gr 1, ideal body weight (IBW) SUG (2 mg kg-1) or Gr 3 Neo-IBW (0.05 mg kg-1) with atropine (0.02 mg kg-1) and Gr 2 SUG-CBW (=IBW + 40% IBW [corrected body weight, CBW]) or Gr 4, Neo-CBW, when adductor pollicis monitoring showed two responses, respectively. The primary endpoint was full decurarisation. Secondary endpoints were the ability to get into bed independently on arrival to the post-anaesthetic care unit (PACU) and clinical signs of residual paralysis. Total consumption of R, doses of NB-RA and clinical criteria of post operation residual curarization were recorded. Statistics was with ANOVA and Fisher's exact test as appropriate.
Results and Discussion: Major finding are shown in table 1.

	Gr. 1: SUG IBW (n=15)	Gr. 2: SUG CBW (n=13)	Gr. 3: Neo IBW (n=14)	Gr. 4: Neo CBW (n=15)
BMI (kg m<-2)	57.5 ± 7.7	56.5 ± 3.8	57.4 ± 7.4	56.2 ± 6.3
Real BW (kg)	166.7 ± 29.7	160.4 ± 20	162.3 ± 31	168.5 ± 21
Corrected BW (kg)	105.5 ± 15.8	103 ± 13.5	102.3 ± 17.6	105.2 ± 13.4
Total rocuronium dose (mg)	195.3 ± 77.5	206.7 ± 53.5	187.6 ± 78.1	177 ± 48.6
Time to TOF=0.9 (sec)	145 ± 89.5	138.3 ± 105.3	716.7 ± 409.9 *** $$$	802.3 ± 363 *** $$$
Dose of SUG vs Neo (mg)	138.2 ± 32.6	206.1 ± 27.1 ***	3,1 ± 0,51	5.4 ± 1.1
Cost of SUG vs Neo in Euro	57.8 ± 13.6	86.1 ± 11.3 ***	0,2 ± 0,03 *** $$$	0,36 ± 0,07 *** $$$
Extubation time (min)	16 ± 8.9	10.8 ± 4.1 *	43.2 ± 12.4 *** $$	40.7 ± 9.1 *** $$
Transfer to ward (min)	137.7 ± 37.8	129.8 ± 19.1	189.6 ± 37.4 *** $$	182 ± 28.9 *** $$

[Table]

Data are means ± SD.
*P< 0,05,**P< 0,01, ***P< 0,001 for comparison between Gr. 1 vs Gr. 2,3, and 4 respectively.
$$ P< 0,01,$$$ P< 0,001 for comparison between Gr. 2 vs Gr. 3 and 4 respectively.

Only extubation time was slightly faster in Gr. 2, indicating that SUG should be dosed by using IBW rather than CBW.
Conclusions: Although transfer times to the wards in Gr. 3 & 4 were ~ 53 min longer compared to the SUG groups, the cost of SUG was > 400 times higher compared to Neo. Under current economic crisis conditions one should take this seriously into consideration.(1)
References:
1: Fuchs-Buder T et al: Curr Opin Anaesthesiol. 2012;25:217.

9AP1-9

The use of sugammadex for reversal of residual blockade after administration of neostigmine and atropine

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Background and Goal of Study: Our goal was to investigate the use of sugammadex for reversal of residual blockade after administration of neostigmine and atropine.
Materials and Methods: Thirty consecutive patients undergoing lower gastrointestinal tumor resection were randomly divided into two groups after local Ethical Commitee approval in a prospective study. All patients initially received intravenous rocuronium 1 mg kg-1, followed by 0.07 mg kg-1 when one twitch is observed in train of four (TOF) stimulus at the adductor pollicis muscle using TOF-watch monitor.
In Group 1 (n=15) patients received standard intravenous neostigmine 0.07 mg kg-1 and atropine 0.02 mg kg-1 doses before extubation.
In Group 2 (n=15) patients received an intravenous bolus dose of 1 mg kg-1 of sugammadex five minutes after standard reversal dose. In both groups, reversal agents of blokade was provided if there is at least one twitch at TOF monitor. Extubation times, recovery times, after extubation tidal volumes, respiratory rate, arterial oxygen saturation (SaO2) values were collected every hourly for a total of 24 hours. Side effects and complications were recorded.
Results and Discussion: Age, sex, gender, operation types and duration of operations were not different between groups ($p>0.05$).
In Group 1, the extubation time (12.5 ± 8.3 minute) was longer than Group 2 (6.2 ±2.3 min) ($p=0.0001$). In Group 1, the recovery time (Aldrete score >9) after reversal of neuromuscular blokade (26.8 ± 12.3 minute) was longer than Group 2 (10.3 ±3.4 min) ($p=0.0001$). In Group 1, tidal volumes after extubation was smaller (158.4 ± 23.8 ml) in comparison to Group 2 (259.8 ± 32.7 ml) ($p=0.0001$). Reintubation was observed in 3 (20 %) patients in Group 1 whereas, none in Group 2 ($p=0.224$).
Conclusion(s): Sugammadex can be safely used after administration of neostigmine and atropine for reversal of residual neuromuscular blokade of rocuronium.
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9AP1-10

Sugammadex on a nemaline rod myopathy patient

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Background: Nemaline rod myopathy is a rare congenital disease that affects skeletal muscle. Usually this disease presents with muscular weakness and dysmorphic features in face, chest and extremities.
To the anaesthesiologist, this pathology presents some challenges: increased susceptibility to neuromuscular block, ventilation depression and eventual difficult airway management.
Despite insufficient data, there are concerns about the association of this disease with malignant hyperthermia[1]
Case report: We present a 38y female patient, 76kg, with mammary hypertrophy, proposed to reduction mammoplasty. As co-morbidities she had: nemaline rod myopathy, oligophrenia, heart failure, mitral prolapse and paroxysmal supraventricular tachycardia.
A TIVA technique was planed. After informed consent, the patient was monitored with ASA standard monitorization and BIS. Qualitative neuromuscular monitoring was used in the procedure.
General anaesthesia was induced with 2mg midazolam, remifentanil perfusion (0,25 $mcg.Kg^{-1}.min^{-1}$), 150mg propofol, and 35mg rocuronium, and it was mantained with propofol and remifentanil perfusions. The patient remained hemodynamic stable during the procedure. 2 hours after the induction, 10mg of rocuronium were administered to facilitate ventilation and 1 hour later the procedure was finished. At that time, train-of-four of orbicularis oculi revealed 4 contractions with fade. 150mg of sugammadex was administered and, 10 minutes later, the patient was extubated. She was admitted on PACU and transferred to the infirmary without respiratory, cardiovascular or muscular complications.
Discussion: This patient presented us some challenges: we adopted the TIVA technique regarding the possible association with malignant hyperthermia and the risk of pos-operative nausea and vomit associated with this surgery; in spite of the susceptibility to the neuromuscular block, we used rocuronium and reversed it at the end of surgery with sugammadex, rather than with an anti-cholinesterase drug. This new drug permitted a quickly extubation without any complications, avoiding residual curarization or the need of ICU bed.
References:
1. Klingler W. *Core Myopathies and Risk of Malignant Hyperthermia*, Anesth Analg 2009;109:1167-73
Learning points: The utilization of sugammadex permitted the rapid and safe reversion of neuromuscular blockage in a patient with a neuromuscular disease, avoiding serious complications.

9AP2-1

Propofol induces the expression of factors associated with the proliferation and differentiation of osteoblasts under hypoxia/ reoxygenation conditions

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Background and Goal of Study: Oxygen deprivation in bone occurs in fractures, osteotomy, arthritic joints, tumors, wounds, and limb ischemia. Under these conditions, reduction and disruption of blood supply to the tissues causes tissue hypoxia, which can cause pathologic bone loss. The effects of propofol on osteogenesis have received little attention. Therefore, we investigated the effects of propofol on the proliferation and differentiation of osteoblasts during hypoxic/ reoxygenation conditions.
Materials and Methods: Human osteoblast cell line hFOB 1.19 was cultured under 1 % oxygen tension for 24 h. The osteoblasts were then treated with various concentrations of propofol (3 μM, 30 μM and 300 μM) in the hypoxia chamber for 2 hours. Thereafter, the cells were reoxygenated for 24 h at 34^{o}C. Quantitative real time PCR and western blot methodologies were utilized to determine BMP-2, TGF- β1, type I collagen, osteocalcin, HIF-1s and Akt expression levels. We also measured cell viability via MTT assay.
Results and Discussion: Under hypoxic/reoxygenation conditions, propofol treatment induced the expression of BMP-2, TGF-β1, type I collagen and osteocalcin and Akt in osteoblasts(Fig.3, *$P< 0.05$). Additionally, propofol promoted the activation of hypoxia-mediated HIF-1(Fig.2). Cells treated with 300 μM propofol showed significantly decreased cell viability compared to controls(Fig.1, *$P< 0.05$).
Conclusion(s): Clinically relevant concentrations of propofol are not cytotoxic to hypoxic osteoblasts in vitro. Propofol treatment under hypoxia/reoxygenation conditions stimulates proliferation and differentiation of osteoblasts through enhanced expression of BMP-2, TGF-β1, type I collagen, and osteocalcin. We assume that propofol treatment promoted angiogenesis and bone regeneration through HIF-1 activation. Our results suggest that propofol might help in the recovery of bone fractures.

9AP2-2

The effects of intravenous anesthetics on *in vitro* angiogenesis and cell proliferation

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Background and Goal of Study: Angiogenesis is one of the regenerative therapies which has started to be used for clinical application. We previously reported that midazolam and diazepam stimulated the release of vascular endothelial growth factor (VEGF), a main regulator of angiogenesis, from rat aortic smooth muscle cells. However, the detailed effects of intravenous anesthetics on angiogenesis have not yet been clarified. The aim of this study was to determine the effects of intravenous anesthetics on *in vitro* angiogenesis and cell proliferation.
Materials and Methods: The effects of anesthetics on the capillary tubule formation were investigated in co-cultured human umbilical vein endothelial cells (HUVEC) and normal human diploid fibroblasts (NHDF) (Kurabo Industries Ltd., Osaka, Japan). Cells were incubated for ten days with medium with or without 10 ng/ml VEGF-A, and stimulated with midazolam, diazepam, propofol, ketamin (1, 10, 50 μM each) or 50μM of suramin (VEGF inhibitor). The area and the length of tubules, and the number of joints and paths in *in vitro* capillaries were assessed. The effects of anesthetics on proliferation of each cell for 72 hours were determined by using the WST-8 reagent (Dohjindo

Molecular Technologies, Kumamoto, Japan). Results were expressed as mean±SD. Data were compared by means of one-way repeated ANOVA followed by the Scheffe test.

Results and Discussion: Fifty μM of midazolam significantly impaired all the factors in *in vitro* angiogenesis in the presence of VEGF (the area of control: 330.8±63.7x10^3 pixels, midazolam: 42.1±11.1x10^3 pixels, p< 0.001; the length of control: 31.7±6.1x10^3 pixels, midazolam: 4.2±1.3x10^3 pixels, p< 0.001; the joints of control: 197.7±59.6 pixels, midazolam: 16.8±7.1 pixels, p< 0.001; the paths of control: 449.1±101.3 pixels, midazolam: 77.4±25.7 pixels, p< 0.001) and the proliferation of HUVEC for 72 hours (absorbance of control: 0.71±0.04, midazolam: 0.49±0.02, p< 0.001). The fact that midazolam had no effect on the proliferation of NHDF suggests that high-dose midazolam inhibited *in vitro* capillary tube formation by suppressing proliferation of endothelial cells. Diazepam, propofol and ketamine did not show any enhancing or suppressive effects on capillary tube formation.

Conclusions: Intravenous anesthetics except high-dose midazolam had no effect on *in vitro* angiogenesis.

9AP2-3

Inflammation in cancer: neutrophil:lymphocyte ratio and the use of ketorolac or diclofenac are prognostic factors in breast, lung and kidney cancer surgery

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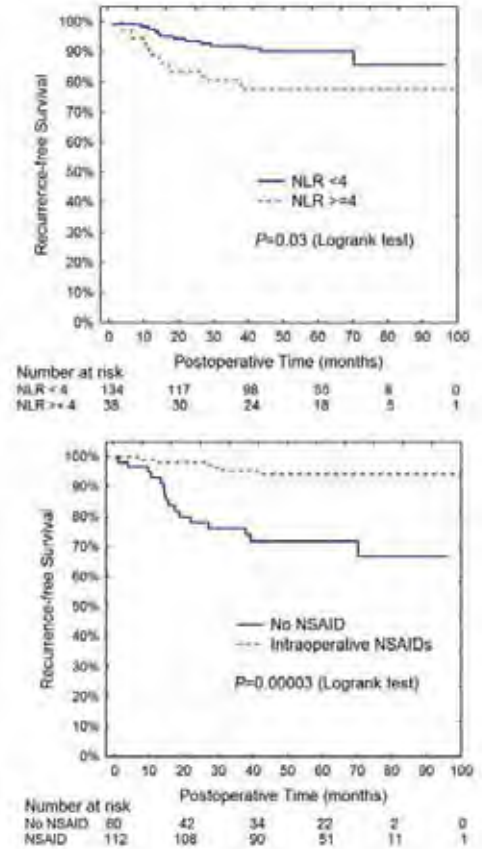
Background and Goal of Study: Inflammation and Neutrophil:lymphocyte ratio (NLR) have been identified as strong prognostic factors in cancer. Additionally, the anticancer properties of non-steroidal anti-inflammatory drugs (NSAIDs) could be of major interest. We investigated the prognostic significance of NLR and the impact of ketorolac and diclofenac in cancer surgeries.

Materials and Methods: We performed an observational study in patients with early breast, kidney and lung cancers. We included, respectively, 172, 185, 227 and 255 patients and investigated the effect of NLR and NSAIDs on recurrence rate and overall survival.

Results: In breast cancer (Centre 1), a NLR≥4 is associated in uni- and multivariate regression model with a higher risk of relapse (HR=2.41; [95%CI: 1.01-5.76], *P*=0.048).



[Breast cancer patients]

In breast cancer (Centre 2), a NLR≥3 is associated in univariate analyses with a higher risk of relapse (HR=4.6; [95%CI: 1.09-19.1], *P*=0.04) and mortality (HR=4.0; [95%CI: 1.12-14.3], *P*=0.03).

In kidney cancer, a NLR≥5 is associated in uni- and multivariate analyses with a higher risk of relapse (HR=1.63; [95%CI: 1.00-2.66], *P*=0.05) and mortality (HR=1.67; [95%CI: 1.0-2.81], *P*=0.05).

In lung cancer, NLR≥5 is associated in uni- and multivariate analyses with higher mortality (HR=1.45; [95%CI: 1.02-2.06], *P*=0.04).

The intraoperative use of NSAIDs in breast cancer patients (Centre 1) is associated in uni- and multivariate analyses with a reduced recurrence rate (HR:0.17; [95%CI: 0.04-0.43], *P*=0.0002) and a lower mortality (HR=0.25; [95%CI: 1.08-0.75], *P*=0.01). NSAIDs use at the beginning of the surgery is associated with a lower metastases risk after lung cancer surgery (HR=0.16; [95%CI: 0.04-0.63]; *P*=0.009). Ketorolac use is associated with a lower mortality (HR:0.55; [95%CI: 0.31-0.95], *P*=0.03).

Conclusion(s): These analyses show that NLR is a strong and independent prognosis factor after surgery for early breast, lung and kidney cancers. In this context, intraoperative NSAIDs administration could be associated with a better outcome.

9AP2-5

Propofol induces cellular protective autophagy in hypoxic cultured COS-7 cells

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Background and Goal of Study: Autophagy mediates bulk degradation and recycling of cytoplasmic constituents to maintain cellular homeostasis. In response to stress, autophagy is induced and may either contribute to cell death or serve as a cell survival mechanism. Propofol is a well known anesthetic drug against hypoxic stress in several organs. Very little is known about effect of propofol on autophagy in hypoxic codition. This study investigated the effects of propofol by autophagy on hypoxia-induced cell damage using a COS-7 cell line.

Materials and Methods: After pretreatment with different concentrations of propofol (0 μM, 3 μM, 30 μM) for 2 hours, COS-7 cells were incubated under 1 % oxygen tension for 6 hours in the absence or presence of lysosomal protease inhibitor. At the end of treatment, cell viability was analyzed using the MTT assay. Cells were stained with MDC and observed with a fluorescence microscope and vital staining was then performed using acridine orange, it is observed with a confocal microscope. Using western blot analysis, we analyzes the expression of LC3, becline1 and P62.

Results and Discussion: We found that propofol induced autophagy in hypoxic cultured COS-7 cells. Blockade of autophagy by 3-methyladenine inhibited propofol induced autophagy and sensitized the COS-7 cells to hypoxia-induced apoptosis.

Conclusion(s): The results demonstrated propofol induced autophagy during hypoxic condition. Under these pathological conditions, autophagy may provide a protective mechanism for cell survival.

9AP2-6

Ketamine-induced developmental toxicity and apoptosis in zebrafish embryos

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Background and Goal of Study: Ketamine is widely used for analgesia and anesthesia. Special concerns have been raised since several studies have reported the occurrence of ketamine-induced neuroapoptosis in the developing brain.

With this study we aim to use zebrafish embryo as an alternative neurotoxicity animal model to evaluate neurodevelopmental effects of ketamine.

Materials and Methods: Two-hour post-fertilization (hpf) zebrafish embryos were exposed 20 minutes to ketamine (0.2, 0.4 and 0.8 mg/mL). An exposure to ethanol 2% for 21 hours was used as positive control and system water as negative control. Morphological parameters and apoptosis, using acridine orange, were analyzed to assess lethality and/or developmental anomalies as well as cellular death until 6 days post-fertilization (dpf).

Statistical analysis was performed using SPSS. Parametric data were evaluated by one-way analysis of variance (ANOVA) followed by the Tukey multiple comparison test. Nonparametric data were evaluated using the Kruskal-Wallis analysis of variance, followed by Dunn's test with a Bonferroni correction for multiple comparisons. Correlation coefficients were calculated using the

Pearson test. Significance level was set for $p < 0.05$.
Results and Discussion: Most of the analyzed parameters did not differ significantly among groups.
However, exposure of embryos to ketamine elicited a concentration-related increase in cumulative mortality as well as in skeletal deformities incidence and others anomalies. Curved trunk and tail malformation and yolk sac anomalies were the most prominent deformities observed after exposure to the highest ketamine concentration. Acridine orange staining also indicated that more apoptotic cells were present in ketamine-treated embryos than in control embryos.
Conclusion: Our study demonstrates the morphological sensitivity of the developing zebrafish to ketamine suggesting that embryonic malformations induced by ketamine might be mediated through induced apoptosis. Our results also establish zebrafish embryos as alternative method for future study of anaesthesia effects in mammals.
Acknowledgements: This study was supported by the Portuguese Foundation for Science and Technology (Lisbon, Portugal) and co-funded by the COMPETE: -01-0124-FEDER-009497 through the project grant: PTDC/CVT/099022/2008.

9AP2-7

Modulation by intravenous lidocaine of apoptotic lung response in an experimental model during one lung ventilation

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Background and goal of study: Lung resection surgery (LRS) with one lung ventilation (OLV), is associated with an intense local and systemic inflammatory response and important increase of apoptotic mediators. The aim of this work was to study the effects of the administration of intravenous lidocaine (IV-LID) on the apoptotic response during LRS with OLV.
Material and methods: Eighteen swines were divided in three groups: Control (C), lidocaine (L), Sham (S), all animals received general anesthesia and underwent left caudal lobectomy and OLV. Animals of L group received a lidocaine bolus and a continuous IV-LID during the surgery. Sham group underwent thoracotomy without LRS or OLV. Then animals were awake and the next day they were anesthetized another time to take tissues samples. Lung biopsies were collected before starting surgery and 24h after surgery from mediastinal lobe(ML) and from left craneal lobe (LCL). Optical densities of Caspase 3, 9, bcl2, Bad, Bax, Bak were measured. Variations between the groups were calculated by ANOVA test, values of $p < .05$ were considered significant.
Results and Discussion: We observed significant differences between groups in apoptotic mediators 24 hours after surgery.

	Group	ML24h Mean(SD)	LCL24h Mean(SD)
	S	4.1(0.0)	4.14(0.0)
Caspase3	C	4.83(0.1)	4.4(0.1)
	L	4.22(0.1)	4.31(0.1)
ANOVA		**.000(*&)**	**.008(*)**
	S	14.01(0.2)	13.9(0.1)
Caspase9	C	15.03(0.1)	16.13(0.2)
	L	14.3(0.1)	14.6(0.2)
ANOVA		**.000(*&)**	**.000(*&#)**

[caspase]

	Group	ML(24h) Mean(SD)	LCL(24h) Mean(SD)
	S	0.95(0.1)	0.81(0.1)
BAD	C	1.11(0.0)	0.92(0.1)
	L	0.87(0.1)	0.74(0.0)
ANOVA		**.042(*,&)**	.182
	S	1.25(0.1)	1.11(0.0)
BAX	C	1.81(0.0)	1.51(0.1)
	L	1.19(0.0)	1.22(0.1)
ANOVA		**.000 (*,&)**	**.001 (*,&)**

[BAD,BAX]

	Group	ML24h Mean(SD)	LCL24 h Mean(SD)
	S	1.1(0.1)	1.03(0.1)
BCL2	C	0.54(0.0)	0.93(0.1)
	L	1.64(0.1)	1.22(0.1)
ANOVA		**.000(*&#)**	.109

[BCL2]

CvsS(*).CvsL(&). SvsL(#)
Conclusion: Intraoperative administration of IV-LID is useful to decrease lung apoptotic response.

9AP2-8

DNA damage and wound infection after use of nitrous oxide in anesthesia for major surgery

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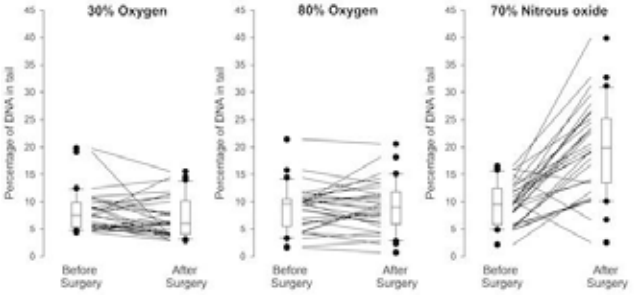
Background and Goal of Study: Nitrous oxide inactivates methionine synthase and may lead to deoxyribonucleic acid (DNA) strand breakage, base damage and subsequent wound infection. Using single cell gel electrophoresis (comet assay), we determined the effect of nitrous oxide on DNA damage in circulating leukocytes.
Materials and Methods: In this double-blind, randomized controlled trial, 91 patients undergoing major colorectal surgery were randomly allocated to receive 70% nitrous oxide (n = 31) or nitrous oxide-free anesthesia using 30% (n = 30) or 80% (n = 30) oxygen according to a computer-generated list. Venous blood samples were collected before anesthesia and 24 hours after surgery. The primary outcome of the study was the extent of DNA damage. This was quantified as the percentage of DNA intensity in the comet tail using digital fluorescence microscopy. We also recorded surgical wound infection within 30 days after surgery.
Results and Discussion: The median (interquartile range) duration of anesthesia was 2.6 (2.0 to 3.7) hours. Nitrous oxide exposure was associated with a 2-fold increase in the percentage of DNA intensity in tail, but this did not occur in the 30% or 80% oxygen groups. There was a positive correlation between the duration of nitrous oxide exposure and the extent of DNA damage, r = 0.33. However, no correlation was observed in nitrous oxide-free patients receiving 30% oxygen, r = 0.02, or 80% oxygen, r = -0.04. The incidences of postoperative surgical wound infection were similar among groups (70% nitrous oxide, 19.4% (6/31); 30% oxygen, 6.7% (2/30); 80% oxygen 6.7% (2/30), p = 0.15). However, an increase in DNA damage after surgery with nitrous oxide administration was associated with a higher risk of surgical wound infection, adjusted odds ratio (95% confidence intervals): 1.19 (1.07 to 1.34), p = 0.003.



[DNA damage]

Conclusions: Nitrous oxide administration increased DNA damage compared with nitrous oxide-free anesthesia, and was associated with postoperative wound infection.
Acknowledgements: General Research Fund, Research Grants Council, Hong Kong. Project Grant, Australian and New Zealand College of Anaesthetists.

9AP2-9

The genotoxicity of occupational exposure to sevoflurane in anesthesiologists

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Background and Goal of Study: Inhalation anesthetics are often used for general anesthesia of patients. However several studies reported that sevoflurane anesthesia caused reversible genotoxic effects in patients and in animal models. Additionally the other studies showed that occupational exposure to inhalation anesthetics induced DNA damage in anesthesiologists and other medical workers. These findings are still controversial. The aim of this study was to investigate genotoxic effects of occupational exposure to sevoflurane in anesthesiologists as compared with non-exposed volunteers and to reveal the relevance of DNA damage and working environment of anesthesiologists.
Materials and Methods: In this study two groups were included;53 anesthesiologists (exposed group) and 37 office workers (control group). The alkaline comet assay in peripheral blood lymphocytes was performed for detecting genotoxicity. Images of 100 randomly selected cells were classified into 5 classes (0-4):0-no migration, 4- very high migration, the distance of migration is dependent on the degree of DNA damage. The number of cells was counted and the total comet score (TCS) was calculated as follows:$TCS=n_1+2\times n_2+3\times n_3+4\times n_4$. And then we divided exposed group into high group (H group) and low group (L group) according to the frequency in use, such as sevoflurane, uncuffed endotracheal tube, laryngeal mask (LMA), and one lung ventilation (OLV), respectively.
Results and Discussion: No statistically significant differences ($p>0.05$) were detected between exposed group and control group regarding the demographic characteristics of the subjects. TCSs between exposed group and control group were no differences (6.30±8.26 vs. 8.73 ±7.17). We described the TCS of H group and L group. TCSs about sevoflurane were 5.91±10.11 vs. 6.60±6.68, uncuffed endotracheal tube were 4.65±4.27 vs. 7.30±9.87, LMA were 6.88±9.95 vs. 5.74±6.38, and OLV were 7.84±10.53 vs. 4.93±5.36. There were no significant differences. While TCSs were significant lower in anesthesiologists who have used endotracheal tube cuff pressure monitoring those than who have never used (3.84±4.73 vs.9.77±10.75, $p< 0.05$). However multiple regression analysis showed no significant influence. This study showed that in anesthesiologists exposure to sevoflurane was just low concentration, therefore there was no significant increase in TCSs.
Conclusion(s): Our study did not detect that chronic occupational exposure to sevoflurane caused DNA damage.

9AP2-10

Effect of propofol on mitochondrial DNA in HeLa cells

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Background: Propofol is extensively used for general anaesthesia although little is known about possible genotoxic effects[1]. Propofol mechanism of action, such as uncoupling oxidative phosphorylation and inhibition of electron transport chain, decrease the ability of mitochondria to produce energy, through a complex mechanism[2]. Mitochondrial (Mt) function depends on proteins that are encoded by both nuclear DNA and mtDNA, indicating that mtDNA represents a potential target. The aim of this study was to assess the genotoxic effect of propofol, thought the quantification of mtDNA copy number using HeLa cells.
Materials and Methods: Using HeLa cells in culture, we examined effects of propofol exposure, in different concentrations (4, 20, 100 μg/ml), at two different exposition times (15 minutes and 1 hour), using genotoxicity analyse thought the avaliation of mtDNA copy number. The copy number of mtDNA and nDNA was determined by real-time PCR with SYBR with specific primers for mitochondrial tRNALeu(uur) gene and for nuclear β-2-microglobulina (β2M) gene (Bai and Wong, 2005). Statistical analysis was performed by Two Way ANOVA and then a post hoc test with the Dunett Method. Differences were considered statistically significant when $p< 0.05$.
Results and Discussion: We have observed that high propofol concentrations (100 μg/ml) can induce mtDNA copy number depletion with respect to low concentrations (4 μg/ml), $p=0.028$ in HeLa cells culture.
No alterations in mtDNA copy number were detected with different exposition times, $p=0.588$.
Conclusion: The authors conclude that propofol masks genotoxic effects in HeLa cells, at high concentrations and that the copy number mtDNA isn`t affected by exposition time. The effect of propofol on mtDNA copy number is reported but other studies need to be performed, namely the validation of these results in human cells. Emulsion used as vehicle of propofol seems to have no significant impact on mtDNA copy number.
References:
1. Braz MG, Magalhães MR, Salvadori DM, et al. Eur J Anaesthesiol. 2009 Aug; 26(8):654-60
2. Schenkman KA, Yan S. Crit Care Med 2000; 28:172-177

9AP2-11

The influence of anaesthetic technique on apoptosis in ER negative breast cancer cells

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Background and Goal of Study: Metastatic recurrence is a major cause of cancer-related deaths.
Several perioperative factors, including general anaesthesia and opioid analgesia, adversely affect immune function, potentially increasing metastatic recurrence. Whether the mechanism behind the influence of anaesthetic technique on metastatic rate is due to an effect on apoptosis in immune and neoplastic cells is not known. To investigate the potential effect of perioperative anaesthetic technique on apoptosis, we tested the hypothesis that serum from patients receiving a standard general anaesthesia with volatile anaesthetic (sevoflurane) and opioid analgesia would reduce apoptosis rate in MDA-MB-231 cells to a greater extent compared to serum from patients who received propofol/paravertebral anaesthesia.
Materials and Methods: After approval from ethics committee patients were randomized to receive propofol/paravertebral anaesthesia-analgesia (PPA, n.10) or sevoflurane general anaesthesia with opioid analgesia (VMA , n.10). The ER-negative MDA-MB-231 cell line was treated with patient serum from both groups. The effects on apoptosis were measured. Apolive Glo Multiplex assay from promega was used to assess cell viability and apoptosis.
Results and Discussion: All 20 patients completed the study according to the protocol, with 10 patients randomized to propofol/paravertebral anaesthesia-analgesia and 10 randomized to sevoflurane/opioid anaesthesia-analgesia. There was no significant difference in cell viability ratio between the two groups in both preop and postop serum samples. There was however a significant difference in apoptosis rate in the two groups. The rate of apoptosis was significantly reduced in the MDA-MB231 cells when exposed to serum of patients in sevoflurane/opioid group compared to MDA cells exposed to serum of patients in propofol/paravertebral group ($P=0.001$)
Conclusion(s): In summary, in this in vitro MDA-MB-231 model of breast carcinoma cells, 10% serum from patients receiving a sevoflurane/opioid anaesthetic technique reduced apoptosis to greater extent, compared with that from patients receiving propofol/paravertebral anaesthesia. This suggests that relatively minor alterations in anaesthetic technique may alter the serum molecular profile of breast cancer patients in a way that may influence breast cancer cell proliferation.

9AP3-1

The impact on drug mass flow rate during multi-infusion therapy: an in vitro study on a new multi-lumen infusion device

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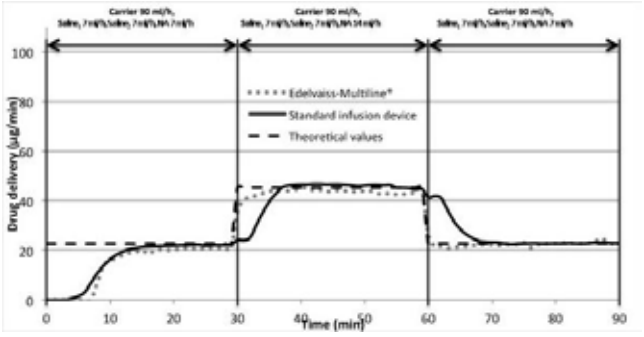
Background and Goal of Study: Multi-infusion therapy may be performed through a single 1-way angiocatheter. The infusion device has a significant impact on drug delivery, especially with a low dead space volume, improving the accuracy of this delivery. The aim of this present study was to assess *in vitro* whether using a new multi-lumen infusion access device with a low dead space volume could prevent noradrenaline disturbances caused by multi-infusion therapy.
Materials and Methods: Two infusion devices were studied : a standard device with a four-port manifold and 150cm extension line (dead space volume V=11.6mL) and a nine-lumen infusion device (Edelvaiss-Multiline®) with eight accesses connected to nine separate lumens in a single tube of 150cm: seven accesses reserved for drugs are connected to seven peripheral lumens (V=0.9mL) and the eighth access reserved for the carrier fluid is connected to one central and one peripheral lumens (V=2.9mL). Carrier fluid flow was infused at a rate of 90 mL/h. Multi-infusion therapy conditions were simulated by infusing two pure saline syringes at 7mL/h and one with noradrenaline diluted in saline. The protocol compared the two devices on drug delivery after each noradrenaline flow rate change every 30 minutes (7, 14 and then

7mL/h), whereas saline administration regimens remained stable. Effluent noradrenaline concentration was measured continuously using UV spectrophotometry (n=5 trials). Two parameters were studied: drug mass flow rate and flow change efficiency (FCE). The Mann-Whitney test was used to compare FCE for the two devices.
Results and Discussion: Variations in noradrenaline mass flow rate were faster with the Edelvaiss-Multiline® when the noradrenaline infusion rate was increased or decreased (Figure 1), giving a higher FCE than the standard device after an increase in noradrenaline flow rate (standard vs. Edelvaiss-Multiline®: 58% vs. 84%; p=0.008) and a lower one after a decrease (175% vs.108%; p=0.008).



[Figure 1]

Conclusion(s): The Edelvaiss-Multiline® with a low dead space volume can reach the noradrenaline mass flow rate plateau faster after each change in infusion rate, compared to the standard device.

9AP3-2

Influence of body weight and age on external validity of published pharmacokinetic models for propofol in paediatrics

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Background and Goal of Study: Pharmacokinetic (PK) models for paediatrics often include covariates such as body weight. The goal of study is to examine the influence of body weight and age on external validity of propofol PK models for paediatrics.
Materials and Methods: After the institutional review board approval and obtaining written informed consent from the parents of the patients, we included paediatric patients undergoing elective surgery into the study. Overweight was an exclusion criteria. Without premedication, anaesthesia was induced with either sevoflurane or propofol. All patients were given propofol 1.5 to 2.0 mg/kg as a bolus and then continuously at 8 to 14 mg/kg/h during the operation. Remifentanil and/or fentanyl was also administered. We took 0.7 ml of venous blood samples 30 to 60 minutes after the start of propofol infusion, every 30 to 60 minutes during surgery, at the end of propofol infusion, and at extubation. Individual median prediction error ($MDPE_i$) reflecting bias of predicting plasma concentrations (Cp) was evaluated as a median of prediction error (PE = (measured Cp - predicted Cp) / predicted Cp x 100 [%]). Predicted Cp was calculated using published twelve PK models of propofol (Paedfusor, Kataria, Marsh, Short, Rigby-Jones ICU, Rigby-Jones Healthy, Schüttler, ShangGuan, Coppens, Saint-Maurice, Murat, and Schnider). Linear regression analysis was performed for the relation between body weight and $MDPE_i$ or between age and $MDPE_i$. A P value less than 0.05 was regarded as significant.
Results and Discussion: All data from twenty one patients weighing 15 to 40 kg and aged 3 to 11 years were analysed. Age and weight showed strong correlation (R^2 = 0.812, P < 0.001) Nine models resulted in weak but significant correlation between weight and $MDPE_i$ (R^2 = 0.20 - 0.31), and between age and $MDPE_i$ (R^2 = 0.19 - 0.25). All remaining three models (Paedfusor, Rigby-Jones Healthy, and Schüttler) include allometric scaling of weight, whereas other eight models have weight as a covariate without allometric scaling.[1] Although both age and weight influence on prediction bias of the PK models, it is unclear which is a primary covariate in the PK models.
Conclusion: Body weight influences on prediction bias on many PK model for paediatric although weight is a covariate in the models. Allometric scaling of weight may reduce the prediction bias of PK models.
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9AP3-3

Does profound neuromuscular block improve abdominal compliance in laparoscopic surgery?

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Background and Goal of Study: Work space during laparoscopic surgery can be affected by several factors1,2. The aim of the study was to compare the effect of two different levels of neuromuscular blockade on the abdominal compliance (work space) during the pneumoperitoneum.
Materials and Methods: 28 women ASA 1-2, 42±14 years old and normal-range BMI scheduled for laparoscopic surgery were included in the study after the evaluation by the hospital review board. 18 women had previous abdominal surgery and/or pregnancy (GROUP A) while 10 women did not have neither previous abdominal surgery nor pregnancy (GROUP B).
Anesthesia was induced and mainteined with propofol and remifentanyl infusions. Rocuronium was used for neuromuscular block (NMB) and monitoring of NMB was assessed with TOF-WATCH accelerometer.
Volume-pressure relationship was measured 2 times during pneumoperitoneum establishment before surgery, one time at **clinical** NMB (1-3 TOF responses) and one time at **profound** NMB (0 TOF responses, 1-3 post-tetanic count). All CO2 introduced with Verres needle was allowed to escape after the insertion of the abdominal trocar. During insufflation through the trocar at a flow of 1,5L/min the abdominal pressure was measured at 1,2,3, and 4L of insufflation at **clinical** NMB. After this first measurement, all CO2 was allowed to escape and a new measurement was done when **profound** NMB was established. Volume-pressure data were fit by a linear least-square regression to calculate the compliance and a paired t test was used for comparison.
Results and Discussion: Abdominal compliance was increased in a non significant manner when **profound** NMB was established, both when the 28 patients were considered together (0,29±0,15 vs 0,31±0,15 L/mmHg, p=0,16) both when the 2 GROUPS were analyzed separately (GOUP A 0,33±0,16 vs 0,35±0,17 L/mmHg, p=0,21; GROUP B 0,22±0,07 vs 0,23±0,08 L/mmHg;p=0,56). GROUP A had a significant greater abdominal compliance than GROUP B at the 2 levels of NMB.
Conclusion(s): The study shows that **profound** NMB does not improve significantly abdominal compliance during laparoscopic surgery in comparison with **clinical** NMB. Women with previous abdominal surgery and/or pregnancy showed higher abdominal compliance that women without previous surgery/pregnancy did.
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9AP3-4

Comparison of actual and simulated plasma concentrations of rocuronium after continuous infusion under sevoflurane and propofol anaesthesia

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Background: Pharmacokinetics of rocuronium (ROC) after continuous infusion has not been examined in detail. This study aimed to compare actual and simulated plasma concentrations (Cp) of ROC under sevoflurane and propofol anaesthesia.
Methods: After obtaining informed consent and approval from our institutional Ethics Committee, patients of ASA physical status I or II undergoing laparoscopic surgery for at least 3 hours were randomly allocated to two groups according to an anaesthetic agent used (sevoflurane [Group S] and propofol [Group P]). Anaesthesia was induced with propofol 1-1.5 mg/kg iv in Group S and propofol 4 µg/ml using target-controlled infusion technique in Group P along with remifentanil 0.3 µg/kg/min.
All patients received 0.8 mg/kg of ROC iv to facilitate tracheal intubation. Sevoflurane and propofol were titrated to maintain Bispectral Index value between 40 and 55. Neuromuscular blockade was assessed with train-of-four (TOF) at abductor pollicis longus. After T1 recovered more than 5%, ROC was infused at a rate of 7 µg/kg/min. Infusion rate of ROC was changed by an up-down method (1 µg/kg/min) to archive T1 3-10% at the two-minute interval. At the end of peritneal suturing, ROC infusion was discontinued.
Blood samples were collected at two points (P1: the end of ROC infusion, P2: T1 25% recovery). Cp of ROC was determined by high performance liquid chromatography and simulated by Wierda's model.
Parametric data was analyzed by unpaired t-test and expressed as mean ± SD. Relationship between simulated and measured Cps was assessed by li-

nier regression. P< 0.05 was considered statistically significant.
Results: Twenty-five patients (Group S: n=12, Group P: n=13) completed the study, and blood samples were collected from 15 patients (Group S: n=7, Group P: n=8). There were no significant differences in patients' profile and surgical characteristics between two groups. Two groups were similar in total dosage and infusion rate of ROC.
Although Wierda's model showed no difference between both groups (P1: p=0.23, P2: p=0.22), actual Cp in Group S was lower in Group P at both points (P1: 541±264 vs. 826±245 ng/mL; p=0.05, P2: 326±153 vs. 513±200 ng/mL; p=0.06). Simulated and actual Cp in Group S had a strong relationship in linier regression model (P1: R^2=0.82, P2: R^2=0.78) and simulated Cp was higher than actual one.
Conclusion: Sevoflurane decreased actual Cp of ROC compared with propofol, probably due to its weak muscle relaxation effect.

9AP3-5

Rocuronium dosing schemes applicable to obese patients

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Background and Goal of Study: Dosing of muscle relaxants for obese patients in clinical practice is not easy. The aim of the study was to reveal optimal dosing schemes of rocuronium used for the induction and maintenance of multi-component endotracheal anaesthesia in the course of abdominal laparoscopic surgeries of obese patients.
Materials and Methods: Fifty-two patients aged 18-65 yr and BMI>30 kg/m^2 scheduled for laparoscopic cholecystectomy (time of duration 25-35 min), were enrolled in the prospective randomized study. All patients were introduced rocuronium 0,45 mg/kg. Dose of rocuronium was calculated on total body weight (TBW) or to an ideal body weight (IBW) (according to the Lorentz formula (IBW(L)) and the Broc formula (IBW(B)). Induction of anaesthesia consisted of consecutive administration of fentanyl, propofol and rocuronium. Anaesthesia maintenance was made by inhalation of sevoflurane in oxygen-air mixture. Neuromuscular transmission was measured using train-of-four (TOF)-Watch SX acceleromyography.
Results and Discussion: The minimal onset time (to TOF=0 or maximal TOF depression) of rocuronium action was recorded when dosing was based on TBW - 80 s (52-127) (Me(25%-75%)). When the calculation of the dose was carried out according IBW complete neuromuscular blocking took more time: (125 s (75-340) in group IBW(L) and 110 s (80-200) in (IBW(B)). In 90-120 s all patients underwent tracheal intubation. The intubation conditions in all groups were good or excellent. Duration of action (to TOF 25%) was statistically quicker in IBW(L) and IBW(B):31 min (28-33) and 32 min (29,5-35) respectively, p>0,05). The calculation of rocuronium based on TBW facilitated longer duration of action - 39,5 min (35-51) (p< 0,05 with IBW(L) and IBW(B)). The inverse correlation with the onset time is observed only when the dose is calculated according to the Lorentz formulae (Spearman rank R=-0,47). Duration of action had the strongest correlation with the rocuronium dose in IBW(L) (R=0,58), than for dosing in TBW and IBW(B) R=0,46 and R=0,48, respectively (p< 0,05 with IBW(L)).
Conclusion: The results showed that for obese patients undergoing laparoscopic surgical procedures 25-35 minute under multi-component endotracheal sevoflurane anaesthesia the dose of rocuronium 0,45 mg/kg should be calculated for the IBW according to the Lorentz formula.

9AP3-6

Efficacy of the oral neurokinin-1 receptor antagonist aprepitant administered with ondansetron for the prevention of postoperative nausea and vomiting

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Background and Goal of Study: 5-HT_3 receptor antagonist, dexamethasone and droperidol were used for the prevention of postoperative nausea and vomiting (PONV). Recently, neurokinin-1 (NK1) antagonist has been is used for PONV. We evaluated the effect of oral aprepitant premedication in addition to ondansetron.
Materials and Methods: A total 90 patients scheduled for elective rhinolaryngological surgery were allocated to three groups (Control, Ap80, Ap125), each of 30 at random. Ondansetron 4 mg was injected intravenously to all patients just before the end of surgery. On the morning of surgery, 80 mg and 125 mg aprepitant were additionally administered into the Ap80 group and Ap125 group, respectively. The Rhodes index of nausea, vomiting and retching (RINVR) was checked at 6 hrs and 24 hrs after surgery.
Results and Discussion: Twelve patients who used steroids unexpectedly were excluded. Finally 78 patients (control: Ap80: Ap125 = 24: 28: 26) were enrolled. Overall PONV occurrence rate of Ap125 group (1/26, 3.9%) was lower (P = 0.015) than the control group (7/24, 29.2%) at 6 hrs after surgery. The Nausea distress score of Ap125 group (0.04 ± 0.20) was lower (P=0.032) than the control group (0.67 ± 1.24) at 6 hrs after surgery. No evident side effect of aprepitant was observed. Only 1 out of 26 patients who were additively administered with 125 mg of aprepitant complained of mild PONV, and there was no patient who required an additional rescue drug. This reveals that PONV can be effectively prevented through the combined administration of these two drugs. However, since the subject patients did not have a high degree of risk of PONV, additional research on patients with high risk of PONV is needed.
Conclusion(s): Oral aprepitant 125 mg can be used as combination therapy for the prevention of PONV.

9AP3-7

Etomidate induction in an adult patient carrier of a CYP 2C9 polymorphism- Case report

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Background: Human cytochrome P450 2C9 (CYP2C9) accounts for approximately 20% of total hepatic CYP content and metabolizes approximately 15% clinically used drugs, including S-warfarin, phenytoin, losartan, diclofenac, and celecoxib[1]. CYP2C9 is one of the clinically significant drug metabolizing enzymes that demonstrates genetic variants with significant phenotype and clinical outcomes[1]. No studies have been found about the relationship between CYP2C9 polymorphism and the etomidate metabolism. We report a case of a patient carrier of a CYP2C9 polymorphism in which we used etomidate.
Case report: We report a case of a 62 years old male, with history of dementia and beddriden, carrier of a CYP 2C9 polymorphism who underwent a colostomy and a surgical debridement of decubitus ulcers. Etomidate's manufacturer was contacted in order to establish if this drug was metabolized by CYP 2C9, who clarified us that there is no data on this enzyme, but this hypothesis could not be ruled out because of the hepatic metabolism. We used etomidate (0,2 mg/kg) as inductor agent, alfentanil (0,01mg/kg) and succinylcholine (1 mg/Kg) for a balanced general anesthesia.
Maintenance was with sevoflurane, cisatracurium (0,08 mg/kg) and alfentanil, the surgery had duration of 45 minutes, the patient remained hemodynamically stable and had a normal uneventful recovery 10 minutes after the end of surgery. He was discharged from the recovery room after 4 hours.
Discussion: CYP2C9 polymorphisms, potentially, could affect the toxicity of CYP2C9 metabolized drugs.
We avoid in this patient propofol or ketamine, because of the expected prolonged time of action. As there is no data if etomidate is subjected to CYP2C9-mediated polymorphic metabolism, we decided to use it as inductor of anesthesia. We didn't verified a prolonged patient's recovery time in this case.
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Learning points: We used safely etomidate in an adult patient carrier of a CYP 2C9 polymorphism, in which it could be expected a prolonged time of action, that wasn't verified. More studies are necessary to know which enzymes are responsible for the thiopental and etomidate metabolism.

9AP3-9

Anaphylaxis to rocuronium: a case report

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Background: Anaphylaxis during anesthesia is a rare event that in 60-70% of cases is secondary to neuromuscular blocking agents with either rocuronium or succinylcholine being most commonly implicated[1]. Due to the life-threatening nature of anaphylaxis, rapid recognition and immediate management are essential to prevent mortality and morbidity[2].
Case report: ASA I, 32-yr-old-man, scheduled for femoral allograft. Following induction with fentanyl and propofol, 50mg of rocuronium were given to facilitate tracheal intubation. Shortly after, he became profoundly hypotensive, with angioedema developing bronchospasm and diffuse rash. The airway

was immediately secured and anaphylaxis treatment protocol initiated with administration of epinephrine (500mcg IM followed by bolus of 50mcg, making a total of 3mg), clemastine (2mg IV), inhaled salbutamol, and aggressive fluid resuscitation followed by epinephrine infusion. Surgery was delayed and patient transferred to intensive care unit. Blood was drawn for serum tryptase levels 1h after initial symptoms. Subsequent skin prick testing, demonstrated strong positive reaction to rocuronium and negative reaction for latex, propofol or fentanyl.

Discussion and learning points: Perioperative anaphylaxis may be a life-threatening clinical condition. The authors reinforce the importance of optimal management of this rare condition and the need for training through teaching applications (eg: anesthesia simulator)[3]. Off-label use of sugammadex for this indication has already been documented in case reports; however, there is no evidence that sugammadex should be used for the treatment of rocuronium-induced anaphylaxis[4]. Moreover, the authors highlight the relevance of a detailed allergological assessment to identify the culprit agent and the need of having a protocol in place to guide the clinician when performing the appropriate laboratory tests at the time of a suspected reaction. Doctors shoud be urged to systematically register such events and inform their patients to avoid these agents in the future[5].

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9AP3-10

Postoperative residual curarisation in patients with butyrylcholinesterase deficiency

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Background: Hereditary butyrylcholinesterase (BChE) deficiency may result in severely prolonged duration of action of succinylcholine and mivacurium. In this study we analysed if the use of neuromuscular monitoring (NM) protected from premature termination of anaesthesia and respiratory complications.

Methods: We retrospectively included probands referred to Danish Cholinesterase Research Unit (DCRU) for analysis from 2004 to 2012. The records were reviewed to determine the genotype, use of NM, description of emergence from anaesthesia, and signs of residual curarisation as well as medication and concurrent disease. Outcome measures were proportion of premature termination of anaesthesia and respiratory complications following tracheal extubation measured in patients with NM or no NM. Termination of anaesthesia was defined as premature if signs of residual curarisation were present. Respiratory complications were defined as arterial oxygen saturation below 90%, need for assisted ventilation, pulmonary aspiration or need for reintubation of the trachea.

Results and Discussion: During the study period 134 patients (age 0-92 years) were eligible of which 87 and 37 patients received succinylcholine and mivacurium, respectively. Ten patients received both. NM was applied before emergence in 48 patients (36%), while 79 patients (59%) were unmonitored of which 4 patients lacked detailed description of emergence. Time of application of NM was unclear in 7 patients. Premature termination of anaesthesia and respiratory complications were significantly more common in patients without NM (Table). Homozygous and heterozygous mutations in the butyrylcholinesterase gene were found in 83 and 27 cases, respectively. In 16 patients other reasons explaining BChE deficiency (comorbidity or medication) were found. Signs of residual curarisation were caused by rocuronium in 4 patients. A total of 72 patients (53%) had to be re-sedated. In 9 patients anaesthetics were terminated in spite of documented incomplete neuromuscular recovery. Education in monitoring the neuromuscular blockade is needed.

Conclusion: Neuromuscular monitoring was associated with a lower risk of premature termination of anaesthesia and respiratory complications in patients with prolonged duration of action of succinylcholine or mivacurium.

	Neuromuscular monitoring (n=48)	No neuromuscular monitoring (n=75)	P - value Fisher's test
Premature termination of anaesthesia	14 (29%)	75 (100%)	0.0001
Respiratory complications	4 (8%)	19 (25%)	0.019

[Complications in patients reffered to DCRU]

9AP3-11

A single intravenous dose of clonidine (4 μg/kg) given before induction reduces postoperative nausea and vomiting in patients after myomectomy under general anesthesia

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is still common, especially among female patients. Our hypothesis is that clonidine before anesthesia induction reduces the incidence of PONV in patients undergoing myomectomy.

Materials and Methods: In a prospective double-blind study, forty women were randomly allocated to receive 4μg intravenous clonidine (group C) or saline (group S) pre-operatively before induction of anaesthesia. Anesthesia was standardized for both groups.The primary endpoint was the incidence of PONV . Hemodynamic parameters and the postoperative need for morphine were noted.

Results and Discussion: Patients in group C had a significantly higher number of PONV-free compared with group P (14 and 5 of 20, respectively; $P < 0.02$). There was no difference between the tow groups regarding intraoperative blood pressure and heart rate, as well as morphine consumption in post operative period.

Conclusion(s): A single intravenous dose of clonidine (4 μg/kg) given before induction of anaesthesia reduced significantly the incidence of PONV in patients after myomectomy under general anesthesia.

9AP4-1

Exposure to phenytoin during rapid synaptogenesis results in decreased seizure threshold in corneal kindling model in the adult rat

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Background and Goal of Study: The experimental results concerning perinatal exposure to anesthetics raised serious concerns about the safety of drugs used in pediatric anesthesia. The window of vulnerability to the neuronal effects produced by anesthetics is limited to the period of rapid synaptogenesis, which is affected by either NMDA antagonists and GABA agonists. Our previous experiments clearly showed that neonatal exposure to phenobarbital, but not phenytoin, results in decreased learning and memory skills in adult rats. The aim of the present study was to evaluate the impact of neonatal exposure to phenobarbital and phenytoin on epileptogenesis in the adult rat.

Materials and Methods: The experimental protocol was approved by the Ethical Committee of the Medical University of Lublin, and all the procedures were in compliance with the European Communities Council Directive of 24 November 1986 (86/609/EEC). All experiments were carried on male Wistar rats. In order to induce apoptosis rat pups were treated with phenobarbital (50 mg/kg *ip*) or phenytoin (50 mg/kg *ip)* during the first two postnatal weeks of life (day 3,5,7, and 9). Long-term effects of phenobarbital and phenytoin exposure on epileptogenesis in adulthood (at the age of 2-3 months) were assessed with the use of corneal kindling model. The susceptibility of studied animals to carbamazepine was performed on fully kindled subjects (stage 5 seizures according to Racine's scale).

Results and Discussion: Phenytoin pretreatment during synaptogenesis resulted in a significant decrease of latency to stage 4 (6,7 vs. 8,9 stimulations) and stage 5 (9,6 vs. 11,7 stimulations) seizures in the corneal kindling model in the adult rat, indicating facilitation of epileptogenesis. We have also observed that animals pretreated with phenytoin in the postnatal period exhibited an exaggerated response to carbamazepine given at 20 mg/kg in fully kindled rats (a significant reduction of seizure severity and duration of seizures versus controls). Surprisingly, we did not observe any changes in susceptibility to electrical kindling in rats exposed to phenobarbital, contrary to our previous results.

Conclusion(s): The presented finding indicate that exposure to phenytoin during rapid synaptogenesis in the rat may result in facilitated epileptogenesis in the adult life.

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9AP4-2

Effects of sevoflurane and propofol anesthesia in the prenatal period on seizure threshold in adult rats

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Background and Goal of Study: General anesthetics are used in millions of children every year to facilitate surgical procedures in operating rooms and provide adequate sedation in intensive care units. Compelling evidence from animal studies strongly suggests that exposure to these compounds during postnatal period may induce widespread neuronal cell death and neurological sequel, seriously questioning the safety of pediatric anesthesia. Recently, we have shown that application of some antiepileptic drugs during synaptogenesis in the rat results in decrease seizure threshold in the adult life. The presented study was conducted to evaluate the effects of sevoflurane and propofol in newborn rats on epileptogenesis in the adult subjects.
Materials and Methods: The experimental protocol was approved by the Ethical Committee of the Medical University of Lublin, and all the procedures were in compliance with the European Communities Council Directive of 24 November 1986 (86/609/EEC). All experiments were carried on male Wistar rats. In order to induce apoptosis rat pups were treated with propofol (30 mg/kg *ip* every 1,5 h up to cumulative dose of 90 mg/kg) or sevoflurane (2,0 - 3,5 Vol% for 6 h*)* on the seventh day of postnatal life. Long-term effects of propofol and sevoflurane anesthesia on epileptogenesis in adulthood (at the age of 2-3 months) were assessed with the use of corneal kindling and pilocarpine-induced seizure models.
Results and Discussion: Exposure to both propofol and sevoflurane anesthesia during synaptogenesis did not result in changes of the seizure threshold in the adult rat in both experimental epilepsy model used. We failed to observe decreased latency to seizures in the propofol and sevoflurane treated rats as compared to control group in the corneal kindling model. Similarly, the CD_{50} value of pilocarpine did not differ significantly between anesthetized rats and controls (339.4 vs. 344.1 mg/kg).
Conclusion(s): The results shown in this study clearly indicate that drugs used in pediatrics anesthesia and intensive care, which produce increased neurodegeneration in the experimental setting, may be devoid of unwanted effects on epileptogenesis in the later stages of life.
Acknowledgements: This study was financed by the Polish Ministry of Science and Higher Education (2011/2012)

9AP4-3

Dexmedetomidine increases EAAT3 activity in Xenopus oocytes: the role of protein kinase C

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Background and Goal of Study: This study aimed to evaluate the effect of dexmedetomidine on the activity of EAAT3s, which are neuronal glutamate transporters, and to investigate the role of protein kinase C (PKC) in this effect.
Materials and Methods: EAAT3 expression was induced in *Xenopus* oocytes by injecting EAAT3 mRNA. Using two-electrode voltage clamping method, membrane currents were recorded before, during, and after applying l-glutamate (30 μM) in the absence and presence of dexmedetomidine (0.01-30 nM). To study the effect of PKC on the dexmedetomidine-induced change in EAAT3 activity, oocytes were preincubated with 100 μM phorbol-12-myristate-13-acetate (PMA), a PKC activator, or PKC inhibitors (2 μM staurosporine and 100 μM chelerythrine) before the recording. Responses were quantified by integrating current traces and are reported in microCoulombs (μC).
Results and Discussion: Dexmedetomidine increased EAAT3 activity in a concentration-dependent manner (0.01-30 nM). Treatment of oocytes with PMA significantly increased the baseline EAAT activity but did not further increase dexmedetomidine-enhanced EAAT activity ($P < 0.05$).
Conclusion(s): These results suggest that dexmedetomidine enhances EAAT3 activity through PKC inhibition.
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9AP4-4

Small-conductance calcium-activated potassium channels (SK3) are upregulated following denervation

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Background and Goal of Study: Hyperkalemia after succinylcholine injection in critically ill patients, after denervation, and in patients with neuromuscular disorders has been attributed to an upregulation of nicotinic acetylcholine receptors. However, there is evidence that small-conductance calcium-activated potassium channels (SK3) are also etiologically involved; if the postnatally down-regulated SK3 channels are re-expressed again in these acquired pathologic states. Activation of acetylcholine receptors by succinylcholine increases intracellular calcium levels which in turn activate SK3 channels. These activated SK3 channels additionally promote cellular potassium efflux and thus aggravate the hyperkalemic response. Goal of this study is to investigate a potential upregulation of SK3 channels after denervation as well as the time course thereof.
Materials and Methods: After approval, 61 male Sprague-Dawley rats were unilaterally phrenicotomized or sham operated. After 1, 3, 9, 27 and 81 days, respectively, animals were killed and both hemidiaphragms excised. SK3 channels were determined by Western Blot (WB) and cellularly localized by immunohistochemistry (IHC). Data were statistically analyzed by Mann-Whitney-U- and χ^2-test. ($p < 0.05$).
Results and Discussion: Upregulation of SK3 began as early as 3 days after denervation. Maximum upregulation of SK3 was at day 9 [WB: SK3: 20.54 ± 9.41 (denervation) vs. 1.00 ± 0.43 (sham operation); arbitrary units], where they are expressed not only at the junctional site, but also extrajunctionally throughout the muscle membrane of all muscle fiber types. Upregulated SK3 values returned to baseline values by day 81.
Conclusions: We could demonstrate a reappearance of SK3 channels in mature muscle after denervation. For the first time we could demonstrate this in the diaphragm. These re-expressed SK3 channels are able to release potassium from the muscle after activation and thus aggravate the hyperkalemic response after succinylcholine.

9AP4-5

The hypnotic activity of propofol formulation was enhanced by dilution with crystalloid solution at the induction of anaesthesia in ddY mice

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Background and Goal of Study: Propofol is insoluble in water and usually formulated as 1% (w/v) of oil/water emulsion composed of soya bean oil. Intravenous infusion was generally carried in line with crystalloid solution and the propofol emulsion is practically administered as a dilution. However, the effect of dilution on hypnotic activity of propofol was scarcely investigated.
Material and methods: Male adult mice (35 - 45 g) were given propofol intravenously. Propofol was diluted with physiological saline, 3%, 10% and 20% soya bean oil. Each injection volume was set at 10 μl g^{-1} and 2.5 to 15 mg kg^{-1} of propofol was administered. Achievement of hypnosis was defined as a loss of the righting reflex (LRR) and the time from LRR to recovery of reflex was determined as anesthetic time. The 50% effective doses (ED_{50}) for each regimen were calculated by probit analysis. Thereafter, another mouse was administered 2-fold dose of propofol following each dilution regimen and measured the anesthetic time.
Results and Discussion: ED_{50} of propofol was 5.79 (0.61) (mean and SE) with saline dilution, 6.12 (0.81) with 3% oil, 9.46 (0.59) with 10% oil and 12.08 (1.0) mg kg^{-1} with 20% oil dilution. (Fig. 1). The anesthetic time was 118 (10.0), 121 (14.5), 187 (15.4) and 201 (20.3) sec, respectively (Fig. 2). The ED_{50} of propofol was significantly smaller in crystalloid-diluted group than in oil-diluted group, whereas, the anesthetic time was depend on the amount of actual dose of propofol. The results of current investigation suggested that the dilution with crystalloid solution could change the pharmacodynamics of propofol by increasing non-emulsified free propofol in aqueous phase and by modifying equilibrium constant at the induction of anesthesia. The infused propofol molecules are thereafter slowly distributed from emulsified form and are into metabolizing and excretion pathways determining the duration of anesthesia.
Conclusion: The difference of solvents diluting propofol could modify the pharmacodynamics of propofol. The further investigation is required.
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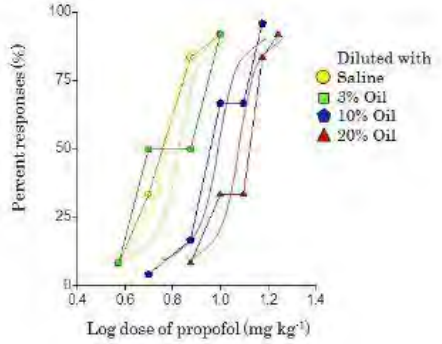

Fig. 1. The results of percent responses of hypnosis induced by diluted propofol.

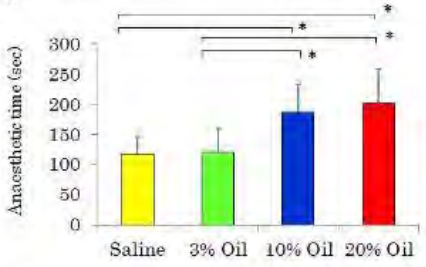

Fig. 2. The results of anesthetic time of diluted propofol. *: $P < 0.05$ between groups.

[Fig. 1, 2.]

9AP4-7

Comparison of the effect of single and repeated exposure of desflurane and sevoflurane on spatial memory performance of young adult mice

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Background and Goal of Study: Volatile anesthetics are known to disturb the spatial memory in aged rodents(1). However, there is insufficient information on their effects on young adult rodents. The aim of this study was to compare the effects of single and repeated exposure of desflurane and sevoflurane in young mice on spatial learning and memory functions.
Materials and Methods: Balb/c mice (60 ± 5 days old) were randomly divided into six equal groups (n=8 for each group). The groups with single inhalation were exposed to 1minimum alveolar concentration (MAC) of sevoflurane and 1 MAC of desflurane and oxygen for 4 hours, respectively. The groups with repeated inhalation were exposed to 1 MAC of sevoflurane and 1 MAC of desflurane and oxygen for 2 hours a day for 5 consecutive days. Spatial learning (acquisition phase) and memory (probe trial) were tested in the Morris water maze 24 hours after exposure. In the learning phase, the parameters associated with finding the hidden platform and swimming speed, and in the memory phase, time spent in the target quadrant and the adjacent quadrants, were assessed and compared between the two groups.
Results and Discussion: In the 4-day learning process, there was no significant difference between the groups in terms of the total distance traveled (the mean pathway length), the average speed and the mean escape latency time($P > 0.05$). During the test phase (in the probe test), the time spent in the target quadrant was significantly longer compared to the time spent in the adjacent quadrant ($P < 0.05$). All mice have exhibited spatial memory, but there was no significant difference between the groups in terms of the time spent in the target quadrant ($P > 0.05$). In addition, the groups did not differ significantly with regard to the total pathway length and the average speed ($P > 0.05$).
Conclusion(s): Sevoflurane and desflurane anesthesia did not impair acquisition learning and retention memory in young adult mice.
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9AP4-8

Sedative and anxiolytic properties of flumazenil in rats and rabbits

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Background and Goal of Study: Flumazenil antagonizes the actions of benzodiazepines on the central nervous system and its use in humans is connected with agitation, anxiety reactions or seizures. There are some reports in the published literature that flumazenil acts as a weak partial agonist in some animal behavioral models. The aim of our study was to characterize flumazenil action in two independent animal models and to assess its sedative and anxiolytic properties.
Materials and Methods: Firstly, we have employed the ultrasonic vocalization test in male Wistar rats. The rats were administered flumazenil (0.1, 1 and 10 mg/kg) and USV was measured 30 minutes later in the environment connected with painful stimuli. In the second experiment, we have assessed the sedative effect of flumazenil (0.1 mg/kg) alone and in combination with midazolam (0.5 mg/kg) in rabbits.
Results and Discussion: Flumazenil dose-dependently inhibit the ultrasonic vocalization in rats. Statistically significant results were obtained after the dose of 1 mg/kg and this effect was more pronounced after the dose of 10 mg/kg. In rabbits, flumazenil (0.1 mg/kg) itself caused loss of righting reflex, which occurred approx. after 3 minutes after administration and sustained for about 10 minutes. When flumazenil was administered with midazolam, the loss of righting reflex occurred also after approx. 3 minutes, but the effect lasted for more than 20 minutes. In both settings, there was no effect on oxygen saturation of hemoglobin, pulse rate or blood pressure.
Conclusion(s): Flumazenil relative surprisingly showed anxiolytic properties in the USV test in rats and was also able to possess sedative action in rabbits. These results suggest that the effect of flumazenil shows the characteristic of agonist/antagonist and its effect depends on the baseline status of animal.
Acknowledgements: This work was supported by the grant IGA MZ NS/10503-3 from the Czech Ministry of Health.

9AP4-9

Mixture of JM-1232(-) and propofol showed minute increases of recovery time from hypnosis after the repeated administration and the anesthesia was completely antagonized by flumazenil in ddY mice

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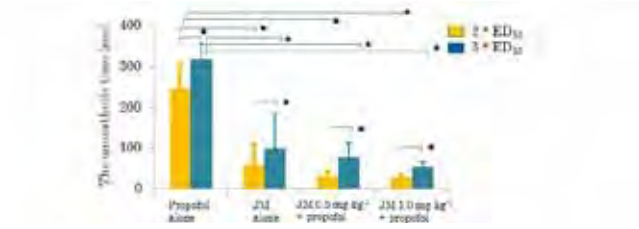
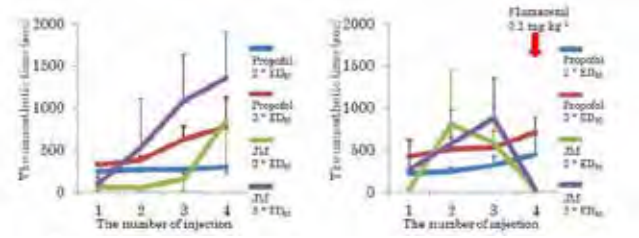
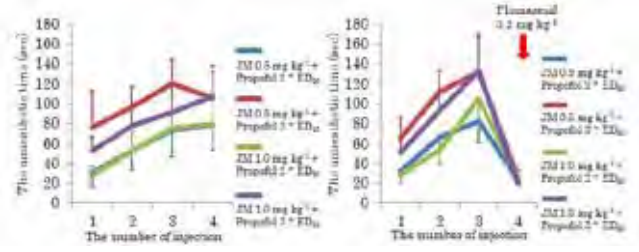
Background and Goal of Study: JM-1232(-) (JM, isoindoline derivative anesthetic) has a short duration of action and shows no accumulation effect. We previously demonstrated the synergistic hypnotic interaction between propofol (Pro) and JM. JM produced quick recovery from anesthesia by the reduction of anesthetic dose of Pro.
Moreover, the context sensitive half time of mixture after repeated injections was not prolonged. Thus, we investigated the reversing effect of supplemental administration of flumazenil on the recovering properties after the multiple injections.
Materials and Methods: Male adult mice (35 - 45 g) were given Pro, JM and the mixtures intravenously to determine the hypnotic dose. Achievement of hypnosis was defined as a loss of the righting reflex. 2- and 3-fold ED_{50} doses of Pro (18.8 and 28.2 mg kg^{-1}), JM (7.4 and 11.1 mg kg^{-1}) and the mixture (3.0- and 4.6-mg kg^{-1} Pro with 0.5-mg kg^{-1} JM, 1.6- and 2.4-mg kg^{-1} Pro with 1-mg kg^{-1} JM) were administered through the cannulated tail vein. All anesthetic injections were adjusted as 5 ml kg^{-1}. When the recovery of righting reflex was observed, the same regimen was immediately injected and repeated up to 4 times. Another 8 groups were administered flumazenil immediately after the 4th injection.
Results and discussions: The time of hypnosis after the first injection was shown in Fig. 1. The repeated injections of the larger dose Pro and JM increased the anesthetic time (Fig. 2) and flumazenil reversed the anaeshtesia with JM, not with Pro. Supplemental administration of flumazenil completely antagonized the anesthesia with the mixtures (Fig. 3).



*[Fig. 1. The time for recovery of righting reflex after the first injection (the anesthetic time). The data were demonstrated as mean and SD. All larger dose administrations prolonged the anesthetic time JM-1232(-) (JM) showed shorter recovering time and the mixtures demonstrated more prompt emergence from anesthesia. ED_{50}: 50% effective dose. *: P<0.05 between groups.]*



[Fig. 2. The change in the anesthetic time to the repeated injection of 2- and 3-fold dose of ED_{50}. The anesthetic time was prologed after the multiple injection (left), and Flumazenil completely antagonized the effect of JM, but not of propofol.]



[Fig. 3. The change in the anesthetic time to the repeated injections of 2- and 3-fold dose of ED_{50} in propofol-JM mixture. The anesthetic time was slightly prolonged after the multiple injection (left), and flumazenil absolutely antagonized the effect of propofol-JM mixture.]

Conclusions: The co-administration of Pro and JM demonstrated rapid recovery profiles comparing to Pro itself. After the multiple injections, the prolongation of recovery time, indicating the increase of context sensitive half time, was observed, however, the extension of anesthesia could be completely antagonized by administration of flumazenil..

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9AP5-1

The rule of LTB4/BLT1 signaling in the ischemia reperfusion injury of liver

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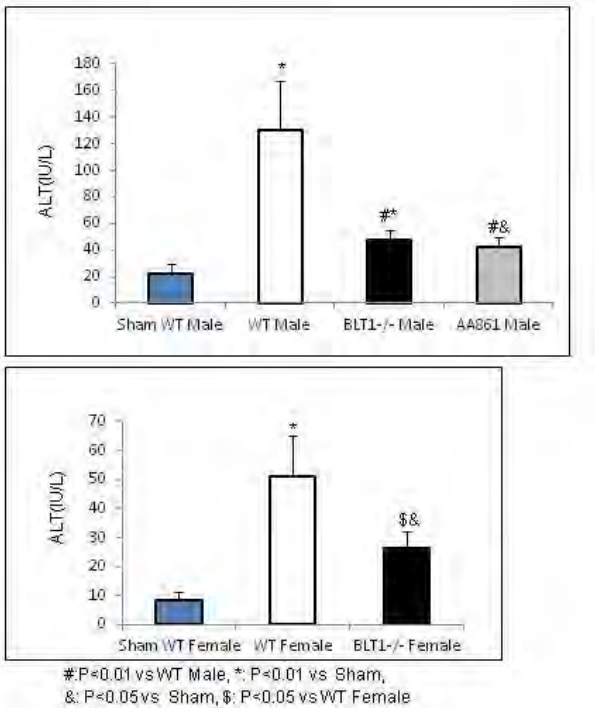
Introduction: Leukotriene B_4 (LTB_4) is a chemoattractant for leukocytes and plays a focal role in the mechanism of inflammatory and immune diseases.We have demonstrated that LTB4/BLT1 signaling contributes hepatic microcirculatory dysfunction during endotoxemia. Thus, we hypothesized cardiac arrest damages hepatic parenchymal cell through the LTB4/BLT1 signaling.
Methods: We made 3 groups in the male mice, wild type (WT) male (n=12), BLT1-/- male (n=14), AA861 treatment WT male (AA861, n=9) and 2 groups in the female mice, ovarectomized (OVX) WT female (n=9) and OVX BLT1-/- female (n=9). AA-861 is a specific inhibitor of 5-LOX, and AA-861 (100mg/kg in 0.5 ml saline, i.p.) was injected in 30 min before Cardiac Arrest. OVX were performed 7 days before CA/CPR. The mice were subjected to CA induced by intravenous (IV) KCL. After 8 min of CA, we reopened their ventilation with 100% oxygen, and the chest compressions were started at a rate of 300bpm. Moreover, the resuscitation was initiated with IV epinephrine (8-16μg in 0.5-1.0ml 0.9% saline). During surgery, the rectal temperature was maintained at 37.0±0.5°C. At the 24 hours after CA, we measured their Alanine aminotransferase (ALT; IU/L) in the serum.
Results: There were no significant differences in the body weight at time of surgery, CPR duration, and volume of epinephrine required for resuscitation between groups. In the male mice, ALT was significantly Lower in BLT1-/- group and AA861 treatment group compared with WT group (47.9±6.9 and 42.1±7.8 versus 129.8±37.4). Also, In the Female mice, ALT was significantly reduced in BLT1-/- compared with WT (26.5±5.9 versus 51.2±13.8). The mortality of WT, BLT1-/- and AA861 treatment groups were 53.3, 21.7 and 47.1% in the male. In the Female, the mortality of WT and BLT1-/- groups were 57.1 and 26.6%.
Conclusion: The mechanism of LTB4/BLT1 pathway in the ischemic liver is unclear. These results suggested that blockade of LTB4/BLT1 signaling may suppress liver tissue damage through inhibiting effect of the neutrophil recruitment.



[Kosaka 2013ESA]

9AP5-2

Interaction between Hydroxyethyl Starch 130/0.4 (HES) and propofol: computational, spectral and pilot laboratorial studies

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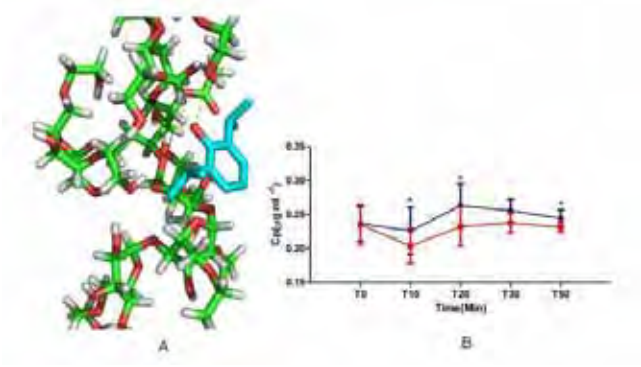
Background and Goal of Study: Previous results in pigs revealed a decrease in propofol concentrations with the administration of Hydroxyethyl Starch 130/0.4 (HES) after bleeding[1]. It was hypothesized that bindings between HES-propofol could cause this decrease. A docking study and laboratory experiments were performed to access this hypothesis.
Materials and Methods: Docking study was performed between HES and propofol. Hexanol and hexanal[2] were used as positive controls. The binding affinity between HES and propofol and controls, was evaluated by binding free energy approximation (ΔGb, kJ.mol^{-1}). Additionally, ten samples with 5 ml human plasma samples, 200 μg of propofol and 5 ml of HES or LR (n=5 for each fluid) were prepared, and the propofol free fraction was quantified at 0, 10, 20, 30, 40 and 50min, using GCMS[3]. ANOVA was used for statistical analysis. The Infra-red (IR) (in KBr disks) and ^{1}H NMR spectra (in DMSO-d6) were measured for propofol, HES, and a mixture of both obtained by the kneading method[4].

Results and Discussion: Docking studies: the predicted free energy for HES-propofol complexes was negative, -3.6 kJ.mol^{-1} (best ranking pose)



[Figure 1. A) Representation the best conformation for the connection between propofol and HES. B) Propofol concentrations measured in the two groups of samples (blue line - lactated Ringer's and human plasma) and red line (Hydroxyethyl starch 140/0.3 and human plasma). Mean and standard deviation of the concentrations at the different sampling time points (T0-T50 are shown.]

which favors the propofol-HES interaction and is strengthened by the values of free energy of -2.4 kJ.mol^{-1} obtained for the controls. The laboratorial study showed significant differences through time (p=0.032) and significantly lower propofol in the HES than LR (p=0.019), Fig1B. Shift variations in the IR and ^{1}HNMR spectra of the mixture provided evidence for the formation of inclusion complexes in solution.

Conclusion: Propofol is predicted as being able of establishing hydrogen interactions with the hydroxyl groups of the glucose units of HES which should be further investigated and considered in clinical situations where both drugs are used.

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Acknowledgements: COMPETE: FCOMP-01-0124-FEDER-009525, (PTDC/CVT/101999/2008), SFRH/BPD/75697/2011, PestC/EQB/LA0006/2011, CEQUIMED - PEst-OE/SAU/UI4040/2011.

9AP5-4

A nomogram to calculate estimated glomerular filtration rate (eGFR)

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Background and Goal of Study: eGFR provides a measure of renal function, and is usually calculated using the MDRD equation[1]. This is difficult to calculate without a calculator or computer, and un-noticed key-stroke errors may occur, giving erroneous results.

We have developed a nomogram which carries out the calculation rapidly to a high degree of accuracy. All data are constrained to appropriate clinical ranges; accuracy is greater at lower creatinine levels through use of logarithmic scales; and calculations may be readily perfomed in reverse to check for data entry error. Our nomogram also includes details of Chronic Kidney Disease (CKD) grading, and advice on the use of Non Steroidal Anti-Inflammatory Drugs in renally impaired patients[2].

Materials and Methods: The nomogram was created using standard techniques, and drafted in Pynomo, an open-source software package. A spreadsheet (Excel, Microsoft Corp, WA) was used to randomly generate 100 sets of simulated values for gender, age and creatinine level. The eGFR was then calculated in each case using both the nomogram and Excel; and Bland-Altman (BA) analysis was performed[3].

Results and Discussion: The BA plot (Fig 2) showed very close agreement between spreadsheet and nomogram. Bias of the nomogram was -0.13mL/min/1.73m^2, with limits of agreement -0.8 to 0.6mL/min/1.73m^2.

Conclusion(s): Our nomogram provides a low cost rapid method for calculation of eGFR to a clinically acceptable level of accuracy. It is a prescribing aid for healthcare professionals; and may be used to check calculations performed by other means; or as an alternative if these are not available.

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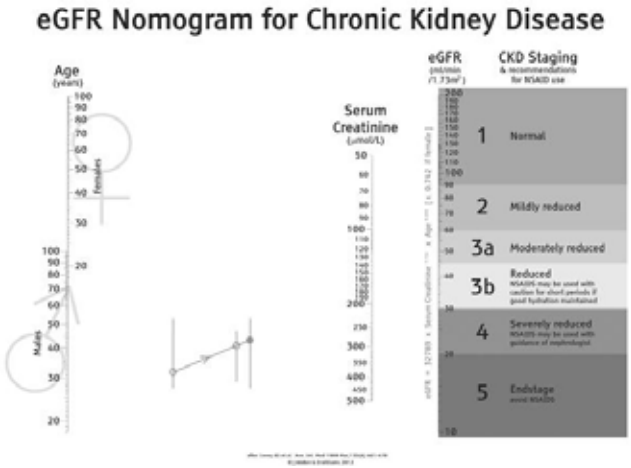
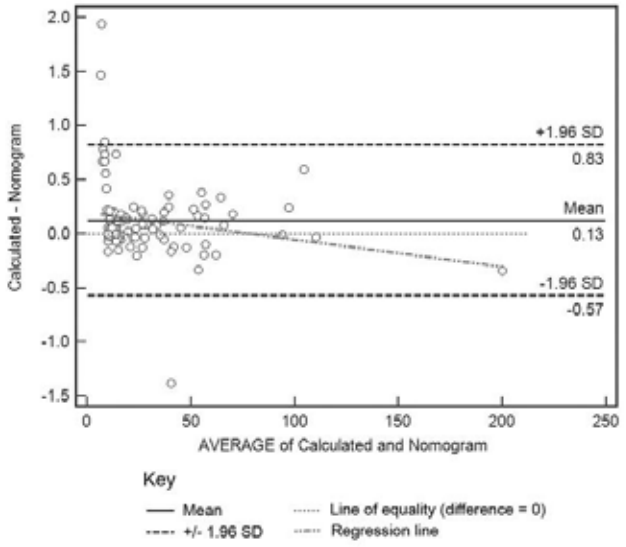


[Fig 1. The eGFR Nomogram]



[Fig 2. Bland-Altman plot]

9AP5-5

Influence of heparin on mediators of inflammation

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Background and Goal of Study: Surgical trauma leads to stress-response [1]. Overproduction of cytokines increases the risk of organ failure [2]. Heparin can probably reduce the symptoms of inflammation and improve outcomes [3].

The Goal: To study the effects of heparin on mediators of inflammation after selective abdominal surgery.

Materials and Methods: After local ethics committee approval and obtaining informed consent, 50 patients were prospectively divided into two groups depending on the type of thromboprophylaxis. Non-fractioned heparin (NFH) was used in group 1 (n=26): 5000 U 2 hours before surgery and 5000 U twice a day during 7 days after surgery. Bemiparin was used in group 2 (n=24): 2500 U 2 hours before surgery and 2500 U once a day during 7 days after surgery. The patients were comparable according to sex, age, concomitant pathology, ASA class (I-II), type of surgery (laparoscopic cholecistectomy, hernioplasty) and type of anesthesia (total intravenous anesthesia with relaxation).

The levels of IL-1α, TNFα, IL-10 were investigated before the operation (stage 1), on the 1 day (stage 2) and on the 5 day (stage 3) after surgery.
Results and Discussion: Against the background of NFH the level of IL-1α did not deviate from the norm all the time of observation. Level of TNFα was reliably lower than normal in stage 2 with increasing to stage 3 (7,21±0,93 vs 5,67±0,88 vs 11,24±0,97 pg/ml) ($p< 0,05$). This was accompanied by reliable reduction in IL-10 level (4,45±0,76 vs 5,10±0,57 pg/ml) ($p< 0.05$). Against the background of bemiparin levels of IL-1α and TNFα did not significantly differ from the norm the whole period of observation, whereas the level of IL-10 was reliably higher than normal from the 1 day after surgery (5,18±0,61 vs 6,38±0,96 vs 6,33±0,71 pg/ml) ($p< 0,05$).
Conclusion(s): The strength and duration of the anti-inflammatory effects of heparins increases with decreasing their molecular weight.
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9AP5-6

Effect of dantrolene on prevention of malignant hyperthermia crisis by decreasing the sensitivity of ryanodine receptor 1

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Background and Goal of Study: Dantrolene (Dan) is a unique agent used for the treatment of malignant hyperthermia (MH) crisis, a pharmacogenetic disorder caused by increased calcium (Ca) release from the sarcoplasmic reticulum (SR) through ryanodine receptor 1 (RYR1). Dan reduces myoplasmic Ca^{2+} concentrations ($[Ca^{2+}]i$, and a few studies[1)2)] have suggested the use of Dan pretreatment to prevent MH crisis. This study aimed to investigate the inhibitory effects of Dan on RYR1 sensitivity related to Ca^{2+} release in cultured myotubes obtained from MH-predisposed patients and assessed the possibility of preventing MH crisis with Dan.
Materials and Methods: We cultured myotubes from 7 patients with accelerated Ca-induced Ca release rates in skinned fibres. The $[Ca^{2+}]i$ in each myotube was determined using the fluorescent Ca indicator fura-2, and the effect of Dan in lowering $[Ca^{2+}]i$ was examined. Caffeine was used to activate RYR1 and half-maximal activation concentrations (EC_{50}) of caffeine were determined in myotubes. The effects of Dan pretreatment (concentrations, 5 and 15 μM) on the EC_{50} for caffeine were assessed. The values are expressed as mean ± SE. An analysis of variance and Tukey's test were used.
Results and Discussion: Dan reduced $[Ca^{2+}]i$ in myotubes in a dose-dependent manner, with an IC_{50} value of 4.56 ± 0.22 μM. The EC_{50} values for caffeine with and without Dan pretreatment are shown in Table 1.

Patient (gender/ age,y)	Dantrolene (-)	5 μM Dantrolene	15 μM Dantrolene	p Value
No1 (male/52)	2.94±0.15	3.72±0.55	4.49±0.53	0.0053
No2 (male/10)	3.02±0.24	4.03±0.26	4.32±0.16	0.0002
No3 (female/73)	2.75±0.27	3.89±0.56	4.66±0.38	0.0085
No4 (female/ 65)	3.03±0.23	4.15±0.51	4.34±0.42	0.0118
No5 (male/34)	2.05±0.34	2.65±0.21	3.46±0.35	0.0135
No6 (female/56)	2.40±0.23	3.05±0.38	3.43±0.11	0.0378
No7 (male/52)	2.30±0.27	3.39±0.23	3.52±0.36	0.0135

[Table 1 EC50 for caffeine (mM)]

All EC_{50} with 15 μM Dan were significantly higher (Table 1). Using 15 μM Dan increased the EC_{50} for caffeine to the normal range (> 3.62mM) [3)] in myotubes from 4 patients, but in the others, the myotubes still showed increased sensitivity to caffeine. These results indicate that MH crisis may be prevented by pretreatment with 15 μM Dan in some patients with MH predisposition.
Conclusion(s): Pretreatment with 15 μM Dan can prevent MH crisis in some but not all patients.
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9AP5-7

Effect of sevoflurane and propofol anaesthesia on mitochondria and postoperative hepatocellular injury in steatotic patients: preliminary data

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Background and Goal of Study: Volatile anesthetics such as sevoflurane preserve hepatic blood flow and function and clinical trials proved that are better than propofol in the protection of hepatic cells after Ischemia-reperfusion during liver surgery. Total intravenous anaesthesia (TIVA) with Propofol, compared with inhaled agents, reduce the risk of organ toxicity such as hepatic toxicity and has shown antioxidant properties in different clinical settings. However, there are no studies investigating the effects of anesthetic agents on post-operative liver function in patients with hepatic desease, thus we designed the present study to compare sevoflurane versus propofol anaesthesia in patients with steatotic hepatitis.
Materials and Methods: Patients with ultrasound diagnosis of steatototic liver (mild or moderate) scheduled to have laparoscopic cholecistectomy were recruited to the study and randomly assigned to receive Sevoflurane (S) or Propofol (P) anesthesia. Exclusion criteria were: cancer of liver, alcohol and drugs abuse, corticosteroid therapy. Serum concentrate of AST and ALT indicating liver damage, and total bilirubin, albumine and prothrombin time as indicator of liver function were collected before (T0) and 6 hours after surgery (T1). Liver mithocondria were isolated for measurement of bioenergetics parameters (oxygen uptake, membrane potential, respiratory complexes activity).
Results and Discussion: Twelve patients were enrolled in the study. In the Propofol group ALT, AST were significantly lower than Sevoflurane group 6 hours after surgery (63,4±37 and 61,2±28 Propofol group vs 195,0±148 and 113,3±69 Sevoflurane group, $p< 0.01$). There were no differences in liver function and other laboratory results between the two groups. Complex I and membrane potential were impaired in Sevoflurane group but not in Propofol group.
Conclusion(s): These results suggest that maintainance of anesthesia with Propofol in patients with steatotic desease is associated with attenuated postoperative hepatocellular injury and reduce mitochondrial dyfunction compared with Sevoflurane, the mechanism and potential effects merits clinical investigation.

9AP5-8

Isoflurane anesthesia EC50 and LC50 for zebrafish

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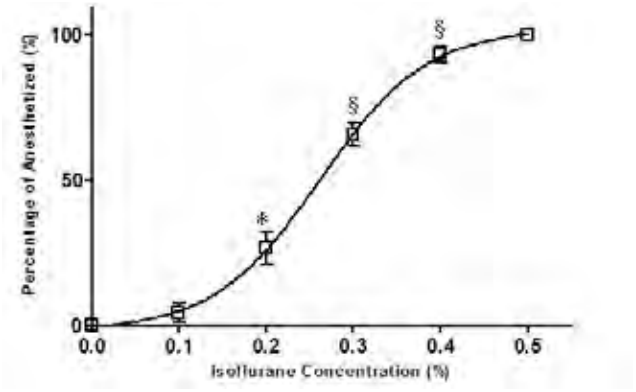
Background: Zebrafish is an ideal model animal for development, genetic, pharmacogenomic research. Zebrafish is easy to observe for their embryo, and easy to manipulate for the genetic expression. Pharmacology research for inhalational anesthetics has been studied for a long time, however, inhalational anesthesia effective concentration has never been studied on zebrafish. We try to establish the first zebrafish anesthesia model to determine the effective concentration (EC50) and lethal concentration (LD50) for further molecular biology research.
Methods: Under the approval of animal study committee, zebrafish larvae at 7 days post-fertilization were anesthetized with isoflurane water solution of different concentrations ranged from 0.0 to 0.5 % for EC50 and ranged from 0.0 to 5.0 % for LC50. 10 larvae were tested in each concentration group. For the EC50, after 15 minutes of exposure, electrical stimulation of 2 mA for 0.2 seconds were applied 4 times with 10 second interval between each stimulation. The escape responses were observed for anesthesia effect. For the LC50, heart rate and circulation were monitored under microscope for the vital sign after 10 minutes with higher isoflurane concentration exposure.
The data were fit to equation of Y = Ymin + (Ymax-Ymin)/(1+10 exp ((logED50-x)*HillSlope)) where x is the logarithm of concentration and Y is the escape response of the larvae.
Results and Discussion: The isoflurane EC50 for the 7 days post-fertilization zebrafish larvae is 0.262%. The LC50 is 2.499%. The concentration-response curves are presented at figure 1



[figure1]

Conclusion(s): A zebrafish isoflurane anesthesia animal model is developed and EC50 and LC50 were measured. This model may benefit further molecular biology and pharmacology research. Determination of EC50 may also be helpful in fisheries application.

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9AP5-9

Decrease of state III mitochondrial respiration by prolonged infusion of propofol vehicle in rabbit liver

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Background and Goal of Study: In humans, prolonged sedations with propofol or using high doses have been associated with Propofol Infusion Syndrome (PRIS). The main objective of this study was to evaluate the effects of prolonged administration of propofol in liver mitochondrial bioenergetics of rabbits.

Materials and Methods: Eighteen healthy New Zealand White rabbits, weighting 3,67±0.15 kg, were randomly allocated in three groups that were continuously treated for 20 hours. Each group of six animals received: NaCl 0,9% (saline control), Smoflipid® (vehicle control) and Lipuro® 2% (propofol group) using Asena® syringe pumps. A propofol bolus of 20 mg/kg IV was given to the propofol group to allow blind orotracheal intubation and mechanical ventilation with 100% O_2. Sedation was maintained using infusion rates of: 20, 30, 40, 50, 60 and 70 mg/kg/h, according to the clinical scale of depth of anaesthesia and the Index of Consciousness score, used to evaluate the level of sedation every 15 min. The infusion rates were adjusted for the control groups according to the propofol group. At the end, the animals were euthanized, livers immediately collected and mitochondria isolated by standard differential centrifugation. Mitochondrial respiration (monitored polarographically with a Clark-type oxygen electrode in a Hansatech oxygraph), membrane potential (estimated with a tetraphenylphosphonium cation (TPP^+) electrode) and swelling (evaluated via light absorbance) were analysed. Data were treated statistically using One-way ANOVA with the Tukey post-test ($P < 0.05$).

Results and Discussion: No statistical differences were observed when using pyruvate as substrate. However, when using succinate as respiratory substrate, significant decrease in ADP-stimulated respiration rate was observed for vehicle group ($P=0.0005$). No differences were observed between the mitochondrial respiratory control ratio and the mitochondrial membrane potential, indicating that respiratory coupling and electron transport chain function were not affected. No statistical differences were observed in mitochondrial swelling between groups.

Conclusion(s): These results suggest that the vehicle of propofol could regulate different pathways that ultimately lead to a decrease of state III mitochondrial respiration rate.

9AP5-10

Changes in lysozyme level and leukocytes migration inhibition factor in the patients at an postoperative period

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Background and Goal of Study: It is well known fact that lysozyme is synthesized by neutrophilic granulocytes. High activity of these cells is characteristic of non-specific immune response. It is possible to appraise the activity of the acute stage of inflammation reaction according to the level of intensity of a given enzyme synthesis.

The aim of the study was to investigate the non-specific immune response in the postoperative period on the basis of changes in the content of lysozyme and Migration Inhibition Factor levels.

Materials and Methods: 28 patients were examined; they had open abdominal operations under general anaesthetics (Propofol + Phentanyl). The average age was 40.3±6.7 years.The lysozyne level in blood serum was determined from the strength of suspension lysis of the culture Micrococcus lisodecticus on the spectrophotometer. Leucocytes Migration Inhibition Factor represents a peptide, which is synthesised by active lymphocytes as a response to inflammation.

Activity of Leucocytes Migration Inhibition Factor was examined in heparinised blood. Leucocytes Migration Inhibition Factor was appraised (rated) in standard units according to leucocytes migration in capillary under the microscope. The tests were conducted before operation and on the third and the seventh day after operation. Blood samples of 16 healthy donors were used for control. Statistical comparisons were based on the t test.

Results and Discussion: Before the operation patients' base level of lysozyme didn't differ from that of the control group and was 10.5±0.2 mkg/ml; and activity of Leucocytes Migration Inhibition Factor was 9.8±0.2 standard units. On the third day after operation level of lysozyme rose to 18.4±1.5 mkg/ml ($p < 0.05$); and activity of Leucocytes Migration Inhibition Factor increased to 14.6±1.1 standard units ($p < 0.05$). By the seventh day level of serum lysozyme decreased to 14.6±0.9 mkg/ml; and activity of Leucocytes Migration Inhibition Factor decreased to 6.5±0.5 standard units.

Conclusion(s): The increase of lysozyme level in blood and reduction of Leucocytes Migration Inhibition Factor is registered on the third day after operation. These changes indicate an increase of nonspecific resistance and depression of specific immune response. The increase of lymphocytes' activity and their secretion of Leucocytes Migration Inhibition Factor are registered by the seventh day.

9AP6-1

Lipid emulsion increase blood pressure by decreasing nitric oxide bioavailability

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Background and Goal of Study: Triglyceride-rich fat emulsion and triacylglycerol decrease nitric oxide (NO)-mediated relaxation and NO production, respectively. Intravenous administration of lipid emulsion (LE) induces an increase in blood pressure.

However, the mechanism responsible for the increased blood pressure induced by LE remains unknown. Therefore the goals of this study were to examine the effect of LE on the hemodynamics in rat, and to elucidate the associated mechanism with a particular focus on the vascular endothelium.

Materials and Methods: We measured the hemodynamic effect of intravenous LE (20% Intralipid and 20% Lipofundin MCT/LCT: 3 ml/kg) in an in vivo rat model pretreated without or with nitric oxide synthase inhibitor N^w-nitro-L-arginine-methyl ester (L-NAME, 10 mg/kg). Hemodynamic parameters were recorded before and after intravenous administration of LE. The fluorescence of oxidized dichlorofluorescein (DCF) indicating the presence of reactive oxygen species was measured in human umbilical vein endothelial cells incubated with LE in the presence or absence of a low-molecular weight superoxide anion scavenger, tiron.

Results and Discussion: Both LE increased blood pressure(BP), whereas the increase of BP induced by LE was nearly abolished in the rat pretreated with L-NAME. In addition, LVSP was higher in the Lipofundin MCT/LCT group than Intralipid group. Lipofundin MCT/LCT increased oxidized DCF. The increase of oxidized DCF was abolished by tiron pretreatment.

Conclusion(s): Taken together, the increased blood pressure induced by intravenous administration of LE appears to be associated with decreased NO bioavailability through inhibition or scavenging of NO release.

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Acknowledgements: This work was supported by clinical research fund (GNUHCRF-2012-012) from the Gyeongsang National University Hospital.

9AP6-2

The recovery speed of lipid emulsion therapy largely depends on "lipid sink": an electrophysiological study using voltage-gated proton channels

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Background and Goal of Study: Lipid emulsion therapy has become a standard treatment of local anesthetic systemic toxicity (LAST), but its mechanism remains largely unclear. Although "lipid sink" is one of the main mechanisms, several other mechanisms have been discussed to elucidate the rapid onset of lipid infusion *in vivo*. However, assessing the mechanism of speed in detail is difficult. We recently reported that LAs as weak bases reduced voltage-gated proton currents by increasing intracellular pH, which could be estimated from reversal potentials of the channels [1]. Using this characteristic, this time we evaluated the speed of "lipid sink".
Materials and Methods: A whole-cell voltage clamp technique was used to record proton currents in a rat microglial cell line (GMI-R1). We used 20% intralipid® as lipid emulsion, and we mixed this one-fifth of the solution (4% lipid solution). Data are means ± SD. The statistical significances ($p < 0.05$) were evaluated using Student's paired *t* test.
Results and Discussion: Proton currents were reduced by 1 mM bupivacaine (33 ± 10% vs. control), and fully recovered by both control and lipid solution. After filling the bath (2 ml) with 1 mM bupivacaine, control or 4% lipid solution was perfused to wash out bupivacaine at a constant rate (3 ml/min). The time course for each current recovery was fitted to the Boltzmann equation, from which slope factors, time index for recovery, were obtained. The lipid solution much more quickly recovered the current than control (slope factor, 13.4 ± 3.4 vs. 4.8 ±0.3 s, n = 4, $p < 0.05$). To understand this result more, we used U-tube system, which permitted us to exchange the external solution around the cell within 50 ms, and compared the speed. When the solution was instantly replaced, there were no differences in current recovery between the control and lipid solution (time constant; 2724 ±615 vs. 2631 ± 791 s, n = 5, not significant), indicating that lipid had little effect inside the cells. Therefore, the above results suggested that the difference of speed in bath perfusion would be attributed to "lipid sink", namely, lipid solution decreased bupivacaine concentration outside the cells much more quickly.
Conclusion(s): These results indicate that the onset of "lipid sink" is rapid, which may be considerably involved in the clinical course.
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9AP6-4

Effects of dexmedetomidine, alpha 2 agonist, on coronary vasoactivity and cardiac function during postnatal development in guinea-pig

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Background and Goal of Study: Alpha-2 agonists are widely used not only as adjuncts to anesthesia, but also as sedatives during mechanical ventilation in the intensive care unit. Despite the widespread use, dexmedetomidine is associated with risks of bradycardia and hypotension. Therefore, we evaluated the inhibitory effects of dexmedetomidine on cardiac function with electrical field stimulation (EFS) and the direct effects on the coronary artery and ventricular myocytes during postnatal development in guinea pig hearts.
Materials and Methods: All animal experiments were approved by The University Animal Ethics Committee. Guinea pigs (aged>6 weeks, >450 g or aged< 3 weeks, < 200 g) were anesthetized, and the heart was mounted on a Langendorff apparatus to measure coronary perfusion pressure (CPP). A saline-filled balloon was inserted into the left ventricle to measure left ventricular pressure (LVP). The EFS was applied to stimulate sympathetic nerve terminal. The action potential duration (APD) was investigated by the patch-clamp method. Group comparisons were conducted by one-way repeated - measures analysis of variance (ANOVA) with Dunnett's multiple comparison tests.
Results and Discussion: In guinea pigs aged >6 weeks, dexmedetomidine decreased CPP at concentrations of < 0.1 nM, followed by a rebound at concentration between 0.1 nM and 100 nM, and significantly increased at concentrations of >10 nM ($p < 0.05$, 10 nM dexmedetomidine vs. control; $p < 0.01$, 100 nM dexmedetomidine vs. control). A decrease in LVP was not observed, even though the coronary artery flow was decreased at concentrations of >10 nM. In guinea pigs aged < 3 weeks, dexmedetomidine decreased CPP at all concentrations. Dexmedetomidine had little effects on the APD. Dexmedetomidine almost completely inhibited the increase in LVP induced by EFS at concentrations of >10 nM, with little effect on the basal LVP. ($P < 0.01$, 10 nM and 100 nM dexmedetomidine vs. control).There was little difference in the results for guinea pigs aged < 3 weeks and >6 weeks.
Conclusion(s): The present findings demonstrate that the response of coronary artery resistance to dexmedetomidine changes during postnatal development. Dexmedetomidine had little direct effects on ventricular dP/dt and/or APD. The negative inotropic action was not found when coronary artery resistance was elevated. However, dexmedetomidine almost completely inhibited the increase in cardiac function activated by sympathetic stimulation.

9AP6-5

A mixture of three peptidase inhibitors on antinociceptive action of dynorphin A(1-17) by intrathecal administration in rats without neurotoxicity

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Background and Goal of Study: One dynorphin A(1-17) and its degradation products leads to antinociception, whereas the other is neurotoxicity. Our previous in vivo studies showed that a mixture of three peptidase inhibitors, amastatin, captopril and phosphoramidon, increased antinociception induced by penta- or octa-opioid peptide. Goal of this study is to evaluate if the peptidase inhibitors can prevent neurotoixicity, in other words allodynia, after significant expression of antinociception.
Materials and Methods: All the present animal experiments were performed in strict accordance with the Guidelines for Tokai University. The antinociception was measured by the tail immersion assay with 55ºC as the nociceptive stimulus. A cut-off time of 5 seconds was used to prevent any injury to the tail. The percent of maximal possible effect (MPE) for each animal at each time was calculated using the following formula: %MPE = [(test latency - baseline latency)/(5 - baseline latency)] x100. The AUC (area under the curve) value for the anti-nociception of an opioid on each rat was calculated for some experiments. The von Frey test was performed to the left hind paws to determine the stimulus intensity threshold stiffness required to elicit a paw withdrawal response. Log stiffness of the hairs is determined by log10 (milligrams X 10) and ranged from 2.83 (0.07 mg) to 5.18 (15,136 mg). Assessments were made prior to (baseline) and at specific times after intrathecal drug administration. The behavior (including agitation and allodynia), motor function, flaccidity, pinna reflex, and corneal reflex were examined by a blinded investigator after the tail-flick measurement. The behaviors were judged as present or absent. Agitation was judged as spontaneous irritable movement and/or vocalization.
Results and Discussion: Pretreatment of the mixtures of three peptidase inhibitors (10 nmol each) not only increased dose dependently antinociception induced by intratheacally administered dynorphin A(1-17) (0.03 - 5.0 nmol) by 30-fold, which were mediated by mu and kappa opioid receptors, but also inhibit the induction of allodynia.
Conclusion: The data obtaind in present study showed that a mixture of three peptidase inhibitors on antinociceptive action of dynorphin A(1-17) by intrathecal administration in rats without neurotoxicity.

9AP6-7

Comparative efficacy of lipid resuscitation from local anesthetics (levobupivacaine, ropivacaine) toxicity in rats

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Background and Goal of Study: The infusion of lipid emulsions is a promising approach to treat local anesthetics-induced cardiac arrest. We have reported that lipid therapy was more effective in resuscitation from levobupivacaine-induced than ropivacaine-induced cardiac arrest (15th WFSA World Congress of Anaesthesiologists, 2012). We compared the efficacy of resuscitation with and without lipid emulsions-treated groups in levobupivacaine (high lipophilicity) and ropivacaine (low lipophilicity)-induced cardiac arrest, respectively, in awake rats.
Materials and Methods: Twenty-four female SD rats anesthetized with sevoflurane underwent tracheostomy and cannulation through the femoral artery and vein. Two hours after sevoflurane anesthesia, the rats received one of the two local anesthetics, levobupivacaine 0.25% (n=6), or ropivacaine 0.2% (n=6) at a rate of 2 mg/kg/min. When pulse pressure decreased to zero, infusion of local anesthetics was stopped, and ventilation with 100% oxygen and chest compressions were begun immediately. Lipid emulsion group was infused 20% lipid emulsion (5 ml/kg bolus plus continuous infusion at 0.5 ml/kg/min) intravenously. Control group was infused the same volume of saline. Chest compressions were continued until the native rate-pressure product increased by more than 20% of baseline. Data were expressed as mean±SD. Statistical analysis were using Student-t test with Bonferroni correction, and $P < 0.05$ was considered statistically significant.
Results and Discussion: Baseline (before infusion of local anesthetics) arterial blood gas values, mean arterial blood pressure (MAP) and heart rate (HR) did not differ between groups. The values of MAP were higher in the lipid group than the control group at 3, 4, 5 and 10 min after the start of resuscitation from levobupivacaine-induced cardiac arrest (13±6 vs. 31±5, 18±15 vs. 38±13, 22±24 vs. 54±32, 75±86 vs. 184±15 mmHg, respectively) ($P < 0.05$). However, there was no significant difference between groups in ropivacaine-induced cardiac arrest. Although HRs were higher in the lipid group than the control group at 4, 5 and 10 min after the start of resuscitation from the levobupivacaine-induced cardiac arrest, no significant difference was found between groups in ropivacaine-induced cardiac arrest ($P < 0.05$).
Conclusion(s): Lipid therapy was effective in resuscitation from levobupivacaine-induced cardiac arrest, but not in ropivacaine-induced cardiac arrest.

9AP6-8

Pharmacokinetics of oxycodone in infants

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Background and Goal of Study: Use of oxycodone is increasing in acute pain management in children. However, there are limited pharmacokinetic (PK) data on the disposition of oxycodone in neonates and preterm infants (1, 2). In this study, approved by the Hospital District Research Ethics Committee and Finnish Medicines Agency, PK of oxycodone was studied in preterms, newborns, and infants aged 3-24 months.
Materials and Methods: The study population included 12 boys and 9 girls: 6 preterm, 5 newborns, 5 infants aged 3-6 months and 5 aged 6-24 months. The youngest had a postmenstrual age of 26+6 weeks and the oldest was 20 months in his postnatal age. The body weights ranged from 0.73-14 kg. All infants were given a single i.v. dose of oxycodone hydrochloride trihydrate 0.1 mg/kg. A population PK optimal design approach was employed in order to limit the number of blood samples and to maximize the usefulness of data. Thus, 3 samples were obtained form preterms and 5 from full-term infants. Plasma concentrations of oxycodone and metabolites were determined using a validated ultra performance liquid chromatographic-mass spectrometric (UPLC-MS) method. Population PK parameters were calculated with NONMEM 7.2.
Results and Discussion: In this data, clearance was found to be linearly predicted by bodyweight (clearance 0.34 L/h/kg), which is lower than the value reported for adults (0.67 L/h/kg) (3). The volume of distribution seemed to be higher in preterms, 2.9 l/kg vs. 1.4 L/kg l/kg in the older infants. The typical terminal elimination half-life ($T_{½el}$) was 6.0 h in preterms and 2.9 h in older infants. The value for preterms is significantly longer than that reported in adults (2-3 h).
Conclusion: These interim results data indicate that the elimination rate of oxycodone in preterms is significantly slower than in older children and in adults.

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9AP6-9

Epidural administration of oxycodone

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Background and Goal of Study: Parenteral and peroral oxycodone are increasingly used, but only two studies report epidural administration and with conflicting results. In one study, no advantage of epidural oxycodone compared to intravenous (IV) administration was noted (1), while another concluded that epidural oxycodone had an analgesic potency of 2:1 compared with epidural morphine and ocycodone was associated with less adverse effects (2).
The goal here was to evaluate central nervous system penetration and opioid sparing efficacy of oxycodone after epidural and IV dosing.
Materials and Methods: The study was randomised double-blinded and double-dummy with parallel groups. The local ethics committee and the national authority body approved the study design. 24 women presenting for elective gynaecological surgery with epidural analgesia were recruited. A low thoracic epidural catheter and lumbar spinal catheter were placed before anaesthesia for test drug administration and for cerebrospinal fluid (CSF) sampling. Patients were given oxycodone 0.1 mg/kg up to 10 mg either into the epidural (n=12) or IV (n=12) catheter at the end of surgery. Normal saline was used as a placebo. Blood and CSF sampling were performed at 2, 5, 15, 30, 45 min and 1, 2, 3, 4, 8, and 24 h after oxycodone administration for oxycodone assay.
Results and Discussion: Oxycodone permeated readily into CSF after epidural administration, the highest oxycodone CSF concentration (Cmax) 8960 ng/ml was achieved at 35 min that was 300-times higher and 30 minutes earlier than after IV dose, Cmax 28 ng/ml and Tmax 65 min, respectively. Seven out of 12 patients in the epidural-group and all in the IV-group needed fentanyl for rescue analgesia during the first 4 hours after surgery. Adverse effects were similar in the two groups.
The present study shows that when given epidurally, oxycodone readily diffuses into CSF and analgesic efficacy is better than achieved with a same dose given IV. Further studies are warranted to evaluate optimal dose and safety of epidural oxycodone in larger patient population.
Conclusion(s): After epidural dosing oxycodone enters CSF readily, decreases the need for rescue analgesia and could, thus be a feasible option for acute pain management in patients with epidural catheter in place.

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9AP6-10

Effect of dexmedetomidine as a sole anesthetic agent on arterial resistance index (RI) in experimental swine pedicle flap surgery

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Background and Goal of Study: Anesthetic technique maybe of great importance in reconstructive plastic surgery by controlling the hemodynamics and regional blood flow.
The overall goal is to maintain an optimal blood flow regionally for the flap. Dexmedetomidine is an novel anesthetic agent with great a2 adrenergic agonist selectivity compared with clonidine. Presynaptic a2 activation by dexmedetomidine causes sympatholysis, whereas postsynaptic a2 activation causes vasoconstriction on vascular smooth muscle cells and vasodilatation through a2 adrenoreceptors on endothelial cells. The overall effects on regional blood flow are difficult to predict.
Additional information for regional blood flow can be obtained from ultrasound

measurements. Current literature reports to main indices pulsatility index(PI) and resistance index (RI).
The aim of our study is to evaluate the effect of dexmedetomidine as a sole anesthetic agent in regional blood flow on pedicle flap in swine experimental model.
Materials and Methods: We evaluated blood flow changes after experimental pedicle flap surgery in a swine model. The surgical technique involves exposure of thoracodorsal vessels and raise of a transverse skin flap. Measurements involved standard anesthetic monitoring, invasive arterial blood pressure, cardiac output(CO), cardiac index(CI), stroke volume variation (SVV), regional tissue oxygenation (StO2), arterial RI. Induction in anesthesia induced with dexmedetomidine 5-15μγ/Kg. Anesthesia maintained. by an infusion of dexmedetomidine 0,5-5μγ/Kg/h.
Results and Discussion: During surgery all animals received infusion of Ringers Lactate so that each animal maintain a SVV< 13%. We obtained measurements from 10 animals from thoracodorsal artery and perforator vessels of the flap before and after surgical manipulation, by the end of the procedure and 1h after the completion. There were no alterations of the RI. For the thoracodorsal artery RI maintained from 0,50-0,70. For the perforator vessels values were 0,36-0,48 respectively. There were no statistical differences (P>0,05) between control measurements and study measurements at various time points.
Conclusion(s): Dexmedetomidine as a sole anesthetic agent did not alter regional blood flow in pedicle flap surgery compared with control group , and at the same time provided adequate level of anesthesia for the procedure.

Paediatric Anaesthesia and Intensive Care

10AP1-2

Comparison of oral premedication between midazolam and clonidine on children that undergo urology surgery

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Background and Goal of Study: Oral premedication is widely used in pediatric anesthesia to reduce preoperative anxiety and ensure smooth induction. The aim of this study is: To compare oral midazolam (0.5 mg/kg) versus oral clonidine (4 μg/kg) as a premedication in pediatric patients aged between 2-12 years with regard to sedation and anxiolysis.
Materials and Methods: Eighty pediatric patients belonging to ASA class I and II between the age group of 2-12 years scheduled for elective urology surgery were randomly allocated to receive either oral midazolam (group I) 30 min before induction or oral clonidine (group II) 90 min before induction of anesthesia.
The children were evaluated for levels of sedation and anxiety at the time of separation from the parents, venepuncture, and at the time of mask application for induction of anesthesia. %. We excluded patients with central nervous system disorders, obesity (weight >95 th percentile for age), gastrointestinal disorders that affect drug absorption, those on sedative medications, and those with previous reactions to clonidine or benzodiazepines. The children were randomly assigned to one of the two groups. Group I subjects received oral midazolam 0.5 mg/kg (maximum of 15 mg) along with oral atropine 0.04 mg/kg,30 min before induction.Group II received oral clonidine4 μg /kg (maximum of 200 μg) along with oral atropine 0.04 mg/kg, 90 min before induction.
Results and Discussion: After premedication, the percentage of children who were sedated and calm increased in both the groups. The overall level of sedation was better in the children in the clonidine group, but children in the midazolam group had a greater degree of anxiolysis at times of venepuncture and mask application.
In addition, midazolam did not cause significant changes in hemodynamics unlike clonidine where a significant fall in blood pressure was noted, after premedication, but preinduction.
Conclusion(s): However, clonidine with excellent sedative properties and other perioperative benefits like decrease in anesthetic requirements, reduced need for supplementary analgesics postoperatively, reduced incidence of shivering and postoperative vomiting, and decreased incidence of sevoflurane emergence agitation cannot be discounted as a viable alternative to midazolam in pediatric patients.. Clonidine with its sedative action especially at the time of separation from parents along with its other perioperative benefits cannot be discounted.

10AP1-3

Cerebrospinal fluid leak after adenoidectomy: a case report

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Background: The most commonly encountered complications after adenotonsillectomy in the pediatric population are hemorrhage, nausea and vomiting, postoperative pain and poor oral intake remain. The bacterial meningitis is a serious and rare complication. In 1996 two cases of meningitis after adenoidectomy were reported (1). Potential causes: coincidence, systemic hematogenous spread of bacteria to the central nervous system, and direct or indirect contamination of the cerebrospinal fluid by bacteria introduced by retropharyngeal injection of local anesthetic. Other cases have been reported (2, 3).
There are no references in the scientific literature about cerebrospinal fluid leak after adenoidectomy.
Case report: We report a case of a 3-year-old girl with a history of repetition bilateral otitis media. During the adenotonsillectomy was required extensive coagulation by bleeding. In the postoperative period, the pacient vomited, had high fever and mild nuchal rigidity. A cranial scanner was performed, was observed pneumocephalus and possible fistulous tract communicating with the cavum in the level of the foramen magnum.Several surgeries were required to repair cerebrospinal fluid leak at pharyngeal level. After 20 days in the Critical Care Unit she was discharged to the ward.
Discussion: The bacterial meningitis is a serious and rare complication after adenotonsillectomy. The cerebrospinal fluid leak hasn't been described like a cause. The extensive coagulation might help to its production. Other etiologies may have contributed also. In previous cases, could be present a small cerebrospinal fluid leak? When the surgery has been complicated, how long our pediatric patients should stay in the Postanestesia Care Unit?
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Learning points: Exceptional cause of bacterial meningitis after complicated adenotonsillectomy has been described. The anesthesiologist should monitor pediatric patients and be aware of the warning sings: fever, nuchal rigidity and lethargy.

10AP1-4

Risk factors of emergence agitation after general anesthesia in children; multicenter study

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Aims: Emergence agitation (EA) frequently occurs after general anesthesia in children. This multicenter study was investigated to determine incidence and risk factors of EA after general anesthesia in children.
Methods: This prospective study evaluated 816 pediatric patients receiving elective surgery under general anesthesia at 10 university hospitals. Emotional and behavioral status of the patients upon emergence from anesthesia was assessed by Aono's four point scale. Those with an Aono's four point scale of 3 or 4 were considered to be affected by EA. Patients', anesthetic, and surgical variables were analyzed to find the risk factors of EA.
Results: One-hundred-fifty-two children (18.6%) developed EA. No relationships between the incidence of EA and age, sex, ASA physical status, premedicants, anesthetic agents, anesthetic methods, or administration of analgesia were found. A multivariate analysis identified preanesthetic emotion state (OR=1.774, P< 0.001), perioperative airway complication (OR=1.867, P< 0.007) and rhinolaryngologic surgery (OR=1.597, P< 0.017) as risk factors of EA.

Conclusions: Preanesthetic emotion state, perioperative airway complication and rhinolaryngologic surgery were risk factors of EA after general anesthesiain children.

10AP1-5

Low dose-dexmedetomidine reduces emergence agitation in children after desflurane anesthesia undergoing strabismus surgery

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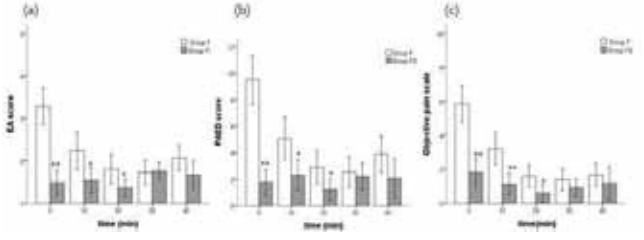
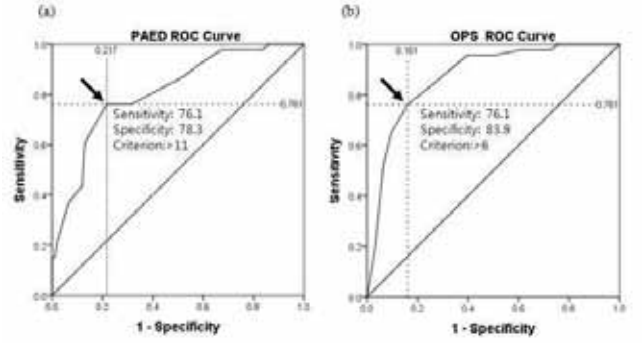
Background and Goal of Study: Emergence Agitation(EA) is a frequent complication in children undergoing general anesthesia. Recently many studies reported that dexmedetomidine could reduce EA in pediatric patients. We undertook this study to test intra-operative low dose infusion of dexmedetomidine (0.2μg/kg/hr) adding to fentanyl could be helpful to reduce the incidence of EA in children undergoing strabismus surgeries.
Materials and Methods: Total 96 children (1-5 years old) undergoing strabismus surgeries were enrolled.
Anesthesia was induced with propofol and maintained with desflurane. After the induction, fentanyl (1μg/kg) were injected in both groups. In Group FD (N=47), dexmedetomidine was infused during the surgery (0.2μg/kg/hr). Normal saline was infused during the surgeries in Group F (N=47).
Continuous hemodynamic variables were monitored every five minutes peioperatively.
Postoperative objective pain score(OPS), PAED (Pediatric Agitation and Emergence Delirium) scale and EA (Emergence agitation) scale were documented at every 10 minutes at PACU.
Results and Discussion: There were no significant differences between the two groups in demographic characteristics and hemodynamic changes. The means of maximum EA, maximum PAED and maximum OPS score are significantly lower in the Group FD than Group F at 0, 10th and 20th min after arrival of PACU. (P< 0.001)
We considered severe EA as EA score 4 and above. The thresholds of 11 (PAED) and 6 (OPS) are the best discriminators of severe EA by ROC curve respectively. By each scale, the incidence of severe EA was significantly lower in group FD than group F. (p< 0.001)
Conclusion(s): Intra-operative low dose infusion of dexmedetomidine adding to fentanyl is helpful to reduce emergence agitation following desflurane anesthesia in children undergoing strabismus surgeries.



[Fig 1.Postoperative emergence agitation and object]



[ROC curve of PAED score and OPS score for predic]

10AP1-6

Effects of sedation with propofol-sevoflurane or sevoflurane-alone on postoperative distress, fear and anxiety in pediatric patients undergoing invasive procedures for hematological diseases

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Background and Goal of Study: The potential for neurotoxic effects of anesthetics in pediatric patients is under scrutiny. In this study, in children undergoing sedation for invasive procedures for hematological diseases, we prospectively recorded the effects on postoperative distress, fear and pain of two different anesthesiological strategies.
Materials and Methods: Patients undergoing invasive diagnostic/therapeutic procedures (bone marrow aspiration, bone marrow biopsy, lumbar puncture, lymph node biopsy) for hematological diseases were prospectively recruited and assigned to receive anesthesia with propofol-sevoflurane or sevoflurane-alone. Presence of intravenous catheter access (peripheral or central venous) was considered discriminant for treatment assignment; when present, propofol-sevoflurane was selected as “standard of care”. Effects on postoperative distress were assessed using the behavioral observation scale for children’s distress (OSBD) and with parental interview before hospital discharge to evaluate fear and anxiety. The OSBD is based on 11 behavior categories coded with a relative value of 1 to 4 with highest values representing highest degree of distress (score range of 0-28). The OSBD was completed preoperatively in the operating room, right before the anesthesia and postoperatively 30 minutes and 1 hour after each procedure.
Results and discussions: A series of 71 patients (age range 9 months to 16 years, mean age 7.2; 27 females and 44 males) underwent a total of 174 procedures. In 95 was used propofol-sevoflurane and in 79 sevoflurane-alone. Postoperative OSBD mean score was higher in propofol-sevoflurane than in the sevoflurane-alone patients (4±2.2 vs 3.1±2.3; p< 0,001, by Student’s t test). Results from postoperative interview confirmed higher fear and anxiety in patients that received propofol-sevoflurane than in those treated with sevoflurane-alone (52.7% vs 23.5%; p< 0,05, by chi-square test) .
Conclusions: In pediatric patients undergoing invasive diagnostic/therapeutic procedures for hematological diseases, the use of sedation with both propofol-sevoflurane and sevoflurane-alone leads to low post operative distress, fear and pain. The latter strategy is associated with lower behavioral changes. Whether these results reflect neurotoxic effects and other clinical and demographic variables (age, number and type of procedure, etc) needs to be evaluated with uni- and multi-variate analysis in a larger sample population.

10AP1-7

Parental use of the internet regarding their child’s anaesthetic, assessment of the benefit of pre-operative information provision

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Background and Aim: Pre-operative information provision has been shown to reduce anxiety behaviour during induction of anaesthesia (1). Information available on the internet is not always reliable. The Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI) have produced age specific information booklets for parents and young people to better prepare them for their anaesthetic. We wanted to assess whether parents used the internet in the pre-operative phase to find out more about their child’s anaesthetic. We aimed to establish the usefulness of the online APA booklets.
Method: We surveyed 131 parents/young people presenting to the day case unit at Alder Hey Children’s Hospital (March-May 2012). They were given an initial survey and asked for an e-mail address for follow-up. The follow-up e-mail gave a link to the age specific APA booklet online and asked to complete a questionnaire using surveymonkey.
Results: Our initial survey was completed by 131 respondents. 129 out of 131 confirmed regular access to the internet. The majority, 86%, used a PC or laptop, 54% used their smartphone and 22% used a tablet computer. 32% (42/129) reported using the internet for information regarding their child’s anaesthetic. 28 e-mail addresses provided were unusable. We sent out 101 e-mails with an age-specific link to the APA information booklets online. We received 17 out of 101 completed follow-up questionnaires (17% response rate). 100% of people found the links easy to access. 94% felt that the information provided in the booklets was useful. 88% of respondents felt this information should be made available at the time of booking. Only 17% did not attempt

to find out about the anaesthetic either through the internet or through friends and family. This highlights the importance of directing parents to high quality reliable sources of information.
Conclusion: Almost a third of our parents/young people presenting for surgery use the internet to gain more information on their or their child's anaesthetic prior to arrival. When directed to the APA booklets, 94% found these to be a helpful resource. Further efforts should be made to improve pre-operative information provision for children and parents presenting for surgery.
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10AP1-9

Characterization of pediatric population undergoing posterior scoliosis surgery

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Background and Goal of Study: Particular characteristics of pediatric population undergoing scoliosis surgery are important to predict anesthetic management, specially transfusion therapy. The propose of present study was to characterize pediatric population submitted to posterior scoliosis surgery in our hospital.
Materials and Methods: A retrospective review of pediatric posterior scoliosis surgery during the period from February 2011 to July 2012 was performed. The data were collected from patient's charts and processed by statistical software SPSS 20.00. Data are presented as means, standard deviations and percentages and quantitative data were compared using the t-student test. Children with age < 10 years were excluded.
Results and Discussion: Forty six patients undergoing posterior scoliosis surgery were analyzed. 21,7% (n=10) were male and 78,3% were female patients, age of mean±standard deviation (SD) of 13,65±1,89 years, mean±SD body weight of 44,22±13,45Kg, American Society of Anesthesiologist (ASA) Physical Status Classification 1 of 34,8% (n=16), 2 of 43,5% (n=20), 3 of 21,7% (n=10). Idiopathic scoliosis was presented in 63% (n=29) and secondary scoliosis in 37% (n=17) of population. Patients with secondary scoliosis had lower body weight (mean±SD of 34,68±13,3Kg) than patients with idiopathic scoliosis (mean±SD of 34,68±13,3Kg) (p< 0,001). ASA Physical Status Classification was different in two types of scoliosis population: grade 2 presented in 47,1% (n=8) of secondary scoliosis vs 36,4% (n=12) of idiopathic scoliosis and grade 3 presented in 52,9% (n=9) of secondary scoliosis vs 3% (n=1) in idiopathic scoliosis. Packed red blood cells (PRBC) administered during surgery for secondary scoliosis had a mean±SD of 26,65±14,69ml/Kg vs 15,48±7,43ml/Kg for idiopathic scoliosis (p=0,008).
Conclusions: In this retrospective chart review, surgical correction of idiopathic scoliosis predominated. However, children with secondary scoliosis had important characteristics that may affect anesthetic management, as lower body weight, higher ASA Physical Status Classifications and higher PRBC requirements. An accurate knowledge of our population has a crucial importance to refine anesthetic care and management.

10AP1-10

The impact of cardiac surgery on the long-term psychosocial development of children - a preliminary study

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Background and Goal of Study: Critical illness, cardiac surgery and recently, general anaesthesia and its different intravenous drugs have found to be independently associated in affecting long-term psychosocial development in children. This study investigates the relationship between cardiac surgery and depression, anxiety, attention and coping disorders.
Materials and Methods: After obtaining national ethical committee approval and parental consent we ran surveys on patients and their parents. The patient population consisted of 81 patients (aged 5-21) who underwent open-heart surgery in a major national pediatric heart center between 1995 and 2012. For psychosocial evaluation we used adult and pediatric modified Beck and Spielberger depression scales, child behavior (CBCL) and KIDCOPE checklists for children, and attention-deficit hyperactivity disorder (ADHD) test for their parents. Patient demographics, perioperative data, and anesthetic usage have been retrospectively analyzed using a consecutively collected hospital database. For statistical analysis, independent T-test and Pearson's correlation have been used.
Results and Discussion: Higher scores of the "withdrawal" question in the KIDCOPE test showed association with the length of CPB-time and higher doses (mg/kg) of midazolam (p=0.037; r=0.418 and p=0.047; r=0.312, respectively), while higher scores of "adaptation problems" was associated with the use of more propofol (p=0.033; r=0.245) in the postoperative period. Length of surgery was associated with "somatization" in the CBCL query (p=0.004; r=0.328) and length of ICU stay was associated with a positive parental ADHD test (p=0.045; r=0.388). Longer overall hospital stay was associated with the sum of all behavioural problems score answered by parents (p=0.045; r=0.389). Analysis of children undergoing their first surgery under 1 year of age (n=22) yielded no significant differences other than the fact of receiving more anesthetics.
Conclusion(s): Our preliminary findings support the fact that major surgery and perhaps different types of anesthetics play an important factor in the psychosocial development of children. Further analysis of perioperative variables and the increase of patient population could help define more risk factors, while the validation of other psychological survey methods might refine the assessment of developmental disorders.

10AP2-1

Near-infrared spectroscopy (NIRS) for newborns and infants anesthesia

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Background and Goal of Study: Newborns's brain remains the most poorly monitored organ. Negative events may occur unnoticed and treatment delayed, which can affect long-term outcome (1). We describe application of cerebral NIRS in newborns undergoing general surgery. Our aim was to find out absolute values of cerebral oxygenation during uncomplicated anesthesia in otherwise healthy newborns undergoing general surgery and to correlate them with demographic and clinical variables.
Materials and Methods: We examined 10 term newborns and infants ASA class I or II without any documented neurological, cardiovascular disorders. All patients underwent general anesthesia with sevoflurane, fentanyl and muscle relaxants. After induction of anesthesia NIRS was started and used throughout the surgery (Fig.1). Continuous variables such as patients' weight, postnatal age, duration of surgery and Hb values were checked for normality of distribution and described as mean standard deviation (sd). Correlations between rSO2 and SpO2, arterial blood pressure, weight, and age were calculated using Pearson linear correlation coefficient. P< 0,05 was considered statistically significant.
Results and Discussion: Overall mean (sd) rSO2 value was 84±(8)% (Fig.2). There was a weak correlation between rSO2 and SpO2 and mean arterial blood pressure (r=0,3, r=0,2, (p< 0,05), respectively). All our patients breathed 50% oxygen in air during surgery, there were no Hb desaturation episodes, therefore a weak correlation with rSO2 was not unexpected. A moderate correlation between mean rSO2 value and weight (r=0.5; p< 0.05) was found. All our newborns were term, we did not consider gestational age as a significant variable, however weak correlation with postnatal age was found (r=0,3; p< 0,05). There was no correlation of rSO2 with preoperative Hb value. In clinically relevant anemia rSO2 may potentially be used as one of transfusion triggers (2).
Conclusion(s): NIRS is a noninvasive, continuous method for monitoring cerebral oxygenation, simple and easy to perform. Normative values in otherwise healthy term newborns and infants could be weight or age dependant. Further studies are required to assess clinical value of routine use of cerebral NIRS during general surgery in neonatal and pediatric population.
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10AP2-3

Anaesthetic management of a child affected by Lenz-Majewski syndrome: a case report

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Background: Lenz-Majewski Syndrome is a rare disorder of unknown etiology characterized by hyperostosis, craniodiaphyseal dysplasia, dwarfism, cutis laxa, proximal symphalangism, syndactyly, brachydactyly, mental retardation, enamel hypoplasia, and hypertelorism.

Case report: We report a case of a 4 year-old girl affected by this syndrome who underwent bilateral Tendo Achilles tenotomy as well as transcalcaneal Kirschner's wire insertion due to bilateral congenital talipes equinovarus. The patient was characterized by severe dwarfism (4kg weight, 55 cm height) and craniofacial dysmorphism with retrognathism which could predict difficult airway management.
General anaesthesia was induced with inhaled sevofluorane. Laryngeal mask airway n.1 was placed and a saline maintenance solution (Plasmalyte®) infusion was started. A caudal block with 2.5 ml of Bupivacaine 0,166% was performed. Anaesthesia was mantained with 2,5% sevofluorane, oxygen and air (50% FiO2). Spontaneous ventilation was possible during all the procedure, mean tidal volume of 45 ml and mean respiratory rate of 22/min which allowed to mantain SaO2 above 98% and EtCO2 around 38 mmHg. The surgery lasted for 95 minutes and the patient kept hemodinamic stability during the procedure. No further analgesic drugs were needed. Emergence ran satistactorily, so the patient was delivered to the PACU, where she stayed 2 hours before being transfered to a standard hospitalization unit.
Discussion: Though this is a rare syndrome we think it is important to keep in mind the following items: Facial dysmorphism is very common, so a difficult airway management strategy has to be planned before surgery. Repair of skeletal disorders is a quite common procedure in these patients. The combination of a neuroaxial or peripheral block together with the insertion of a laryngeal mask airway is an interesting option for anaesthetic management. It allows a simple and safe airway management, as well as a satisfactory perioperative pain treatment.
A satisfactorily performed block allows to avoid muscle relaxants or opioids. This permits spontaneous ventilation during general anaesthesia, a faster emergence as well as a satisfactory postoperative recovery.
References:
Expanding the phenotypic spectrum of Lenz-Majewski syndrome: facial palsy, cleft palate and hydrocephalus. Wattanasirichaigoon D et al. Clin Dysmorphol. 2004 Jul;13(3):137-42.
Learning points: Anaesthetic management of rare pediatric diseases.

10AP2-4

Evaluation of a near infrared vascular imaging device to support peripheral intravenous cannulation in children known difficult to cannulate

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Background: Recently, various near infrared vascular imaging devices claiming to facilitate peripheral intravenous cannulation has been marked which all claim to increase success rate PIC. In the present we evaluated the clinical utility of a near infrared vascular imaging device (VascuLuminator) in patients who are known difficult to cannulate.
Methods: 226 Consecutive children referred to pediatric anesthesiologist because of difficulties with intravenous cannulation by the treating pediatrician of the in- and outpatient clinic, were included in this cluster randomize clinical trial. The presence and use of the VascuLuminator for peripheral intravenous cannulation was randomized in clusters of one week. *Success at first attempt* (chi-square test) and time to successful cannulation (Log rank test) were assessed to evaluate difference between groups.
Results and Discussion: S*uccess at first attempt* in the group with the VascuLuminator (69/110 = 63%) was not significantly different from the control group (63/116 = 54%), neither was the time to successful cannulation: 241s and 300s, respectively.
Conclusion: Visualization of blood vessels with near infrared light with the VascuLuminator does not improve peripheral intravenous cannulation in pediatric patients who are known difficult to cannulate.

10AP2-5

Retrospective audit to establish if the complication rates from epidural infusion analgesia (EIA) in a UK tertiary paediatric centre are comparable to the UK National Paediatric Epidural Audit results

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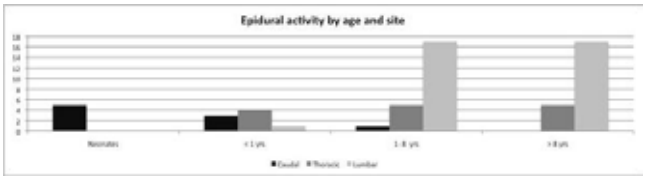
Background and Goal of Study: In the paediatric population epidural analgesia is commonly used to augment general anaesthesia and manage postoperative pain. Epidural analgesia is however not without complication and this has been highlighted by the UK National Paediatric Epidural Audit(1).Our retrospective audit was conducted to establish if the complication rates from paediatric epidural infusion analgesia (EIA) in a tertiary paediatric UK centre are comparable to the results found in the national audit.
Materials and Methods: A retrospective analysis of anaesthetic charts and EIA monitoring sheets in children receiving EIA between 2010 and 2011 was performed. Complications were categorised as major or minor as per the National Paediatric Epidural Audit. Management and outcomes of complications were investigated from the medical and nursing notes.
Results and Discussion: Over the two year period 58 patients with EIA were identified. Graph 1 identifies epidural activity by age and site.



[Epidural activity by age and site]

Levo-bupivacaine 0.1% with 2mcg/ml fentanyl was most commonly used as a maintenance infusion (66%) with the remaining 20 EIA using 0.125% L-bupivacaine.
There were no major complications identified. Two minor complications, in the form of dural punctures did however occur. The first dural puncture occurred during an attempt at a caudal epidural in a 5 month old baby, whilst the second occurred in a 12-year old patient who complained of a headache 24 hours postoperatively. No serious outcomes occurred and the children were discharged without follow up. The PDPH resolved with simple analgesia.
One child developed a pressure sore on their heel, this same child also had a significant motor block.
Conclusion(s): It is reassuring that there were no major complications identified.The incidence of dural puncture in our centre is markedly higher than the national standard 3.34% as compared to 0.05%. This may be potentially explained by the small data set. The identification of the pressure sore has led to changes in both the management of skin care and motor block on the ward.
References:
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10AP2-7

Effectiveness of a new anesthetic protocol in the morbidity associated with craniosynostosis: comparative study 2000-2012

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Background: Pediatric craniofacial reconstruction procedures, has been associated with significant morbidity including cardiac arrest, massive transfusion, coagulopathy, severe hypotension, air embolism, seizures, infections, largely related to blood loss.
A new anesthetic protocol was introduced, leading to optimized preoperative hematocrit level through the use of EPO as well as the intraoperative loss through continuous PRBC/FFP transfusion and tranexanic acd continuous perfusion.
Goal of Study: Compare the results of a new anesthetic protocol.
Materials and Methods: Prospective study of pediatric craniofacial reconstruction between 2010-12.
Protocol: 600ui/kg/weekly EPO (3 weeks) and continuous infusion (5ml/kg)

PRBC/FFP (1:1) and tranexánic acid (10mg/kg/h).
Results: We have performed 12 craniosynostosis: 7 anterior, 1 posterior and 4 full vault recons tructions that were compared with 17 similar procedures performed between 2000-2009.
The demographic characteristics of the patients were similar.
The most frequent intraoperative complications were metabolic acidosis(42%), anemia (42%) and hypotension(30%) as previously.
Intraoperatively, the mean volume administered was 47±21 ml/kg crystalloid, 18±11 ml/kg PRBC/PFC and 5±7 ml/kg colloid, while postoperatively was 60±32 ml/kg crystalloid and 4±5 ml/kg PRBC and 12±4 ml/kg FFP.
The average total blood volume lost was 0.54±0.25 (CI95: 0.36-0.73).
EPO pretreatment increased the mean Hemoglobin value 1.55 g/dl, being the preoperative Hbn 12.4±1.2 (CI95: 11.5-13.1) which was reduced to 10.1±1,5 (CI95: 9.9-12.8) in the immediate postoperative period ($p < 0.01$) and 9.25±1.3 (CI95: 8.1-10.3) at 24h ($p < 0.001$). The PT(%) decreased from 94.7±9.8 (CI95: 87.2-102.3) in the preoperative to 74.2±20.3 (CI95: 57.2-91.2).
Discussion: With this protocol, patients requiring transfusion in ICU were down from 53% to 25% and the required amount of PRBC also went down, from 8.2 ml/kg to 4.1 ml/kg. Only 15% patients presented postoperatively PT< 65% versus 38% in our control series, despite the increased complexity of reconstruction surgery determined by the average volume of blood lost that increased from 0,36±0.18 to 0.54±0.25.
Conclusion(s): The new protocol seems to improve significantly all the parameters associated with blood loss and coagulation factors, which are in the pathogenesis of craneosynostosis associated complications: hypotension, anemia and acidosis

10AP2-8

Torsade de pointes during placement of an implantable cardioverter-defibrillator in a child with long QT syndrome

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Background: Long QT syndrome (LQTS) is a congenital disorder characterized by a prolongation of the QT interval on electrocardiogram resulting a tendency to ventricular tachyarrhythmias especially torsade de pointes (TdP), which may lead to syncope, cardiac arrest, or even sudden death. Tachyarrhythmias may be provoked by various stimuli such as increased adrenergic activity and some drugs prolonging QT interval . The presence of QT corrected (QTc) >500ms is associated with the highest incidence of malignant arrhythmias. In these patients implantable cardioverter-defibrillator implantation can be considered.
Case report: In our case, a 6 years old girl with LQTS was scheduled for an implantable cardioverter-defibrillator placement procedure. She had a history of 4 syncope episodes and a sudden cardiac arrest. She was than diagnosed with LQTS (QTc:565 ms). The patient was sedated with oral midazolam 20 minutes before the operation in order to prevent stress responses . After monitoring, anesthesia was induced with propofol (2 mg/kg), rocuronium (0.6 mg/kg) and fentanyl (2 mcg/kg). The trachea was intubated and anesthesia was maintained with sevoflurane %2 and %50 oxygen in air. During the operation arterial blood and central venous pressures were monitorized continuously. The operation was uneventful during the first 45 minutes. Then recurrent TdP occurred requiring electrical cardioversion. Magnesium replacement and esmolol infusion were started. Arterial blood gas analyses showed no abnormalities. Electrolyte levels were also in between normal ranges. As recurrent TdP episodes were thought to be due to sevoflurane inhalation, it was stopped and propofol infusion was started 4 mg/kg/h instead. Arrhythmias disappeared right after the infusion. No other complications were recorded. The patient was extubated 4 hours after the operation and discharged on the 4th day postoperatively.
Discussion: Patients with LQTS have increased risk of generating arrhythmias during anesthesia. In our case sevoflurane was thought to be the cause of TdP. All volatile anesthetics are known to prolong QT intervals. However because sevoflurane was shown to be the most innocent one[(1)], we chose this agent for anesthesia maintenance. Unfortunately our patient's response was unpredictable.
References:
Kansara B, Singh A, et al. Ann Card Anaesth. 2011 May-Aug;14(2):122-6.
Learning points: We conclude that inhalation anesthetics should definitely be avoided in patients with LQTS.

10AP2-9

Anesthesia for paediatric heart catheterization, what has changed in one decade?

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Background and Goal of Study: The number of pediatric patients undergoing cardiac catheterization to treat congenital heart disease is increasing.[1,2] Since 2000 our hospital is performing these procedures with anesthesia or monitored anesthesia care.
Materials and Methods: A total of 1071 consecutive cardiac catheterizations performed between January 2000 and May 2012 were retrospectively analyzed and compared in two groups: before(A) and after 2007 (B), using SPSS.
Results and Discussion: Group A included 537 procedures (244 F, 293 M), 92.9% elective, group B 534 procedures (244 F, 290 M), 92.4% elective, which suggests the low incidence of critical events in this population. The mean age in group A was 5.4 years, mean weight 19.4±15.8 Kg and the average ASA status 2.15±0.7; group B age 5.6 years, weight 20.7±18.2 Kg, ASA 2.3±0.7.
In group A, 78.5% were diagnostic procedures (Dx), 10.3% Arterial ductus closure (AD), Pulmonar valvuloplasty (PV) 3.7%, Aortic angioplasty (AA) 1.3%, Interauricular communication closure (IAC) 1,3% Aortic valvuloplasty (AV) 1.1%, other 3%.
In group B: Dx 60.1%, AD 14%, PV 5.6%, AA 2.4%, IAC 8%, AV 2,2%, Intraventricular communication closure (IVC) 1.1%, other 6,6%. Dx frequency decrease suggests echocardiography and MRI are being prefered. AD is the commonest probably because it's more prevalent, its recent increase suggests that as the team's experience and skills grows, more complex abnormalities are being corrected by catheterization instead of open chest surgery.
Anesthetic technique in group A: 68.5% Balanced general anesthesia (BGA), 13.5% Total intravenous (TIVA), 0.7% Inhaled anesthesia (IA), 11.6% Dissociative (DA) and 5.4% Monitored anesthesia care (MAC); Group B: BGA 90.5%, TIVA 1.1%, IA 1.9%, MAC 6.9%. A vaporizer wasn't available in the first years, DA has been abandoned for this procedure in our center.
Procedure duration in group A: < 1hour 31.1%, 1-2h 58.4%, 2-4h 9.7% and >4h 0.7%. Group B: < 1hour 18.1%, 1-2h 63.9%, 2-4h 16.6% and >4h 1.5%.
Diagnostic procedures turned into therapeutic have increased as the spectrum of defects being corrected expanded. This explains the overall increase in procedure's duration, Dx duration is decreasing.
Conclusion: As the capabilities and indications of heart catheterization are growing, anesthesia will be required for longer and more complex interventions in the paediatric population.
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10AP2-10

Efficacy and safety of a sugammadex dose of 4 mg/kg in early reversal of a deep neuromuscular block rocuronium-induced in infants and children: a case series

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Background and Goal of Study: The efficacy and safety of a sugammadex dose of 4mg/kg in reversal of a deep neuromuscular block rocuronium-induced, widely proven by several clinical trials in adults, have not been studied in pediatric patients. Therefore the only recommended dose of sugammadex in neonates, infants and children is 2mg/kg to reverse a shallow block. The goal of this study was to asses efficacy and safety of a sugammadex dose of 4mg/kg in early reversal of a profound neuromuscolar block rocuronium-induced in pediatric patients.
Materials and Methods: After approval of the protocol by the Ethics Committee and obtaining informed consent by parents, 34 consecutive children, aged from 2 months to 8 years (mean 55 months, SD26), weighing between 5 and 28 Kg (mean 16,SD5,7), ASA 1-3, scheduled for short medical procedures requiring general anaesthesia were enrolled. Anaestesia was induced with propofol 3mg/kg and fentanyl 1mcg/kg. After induction, contraction of the adductor pollicis muscle in response to ulnar nerve train-of-four(TOF) stimulation was acceleromyographically quantified using a TOF-Watch SX. Hence, rocuronium 0,6 mg/kg was given and tracheal intubation was performed. Anesthesia was maintained with 2,5% end-tidal concentration of sevoflurane. At the end of the procedure the depth of block, considered as no response to TOF(TOF=0)and post-tetanic count(PTC)< 5, was verified. Then, if a deep neuromuscolar block persisted, sugammadex 4mg/kg was given

otherwise the patient was excluded. The time from sugammadex administration to recovery(RT) of neuromuscular function (TOFratio>0,9) was recorded, as well as the time from rocuronium to sugammadex administration(BT). The patients were monitored in PACU for six hours after extubation.
Results and Discussion: At the end of the procedure all 34 children enrolled still had a deep block (mode value of PTC: 2); all of them achieved TOFr>0,9 receiving sugammadex 4mg/kg: the mean RT was 104 seconds(30-240;SD47). The mean BT was 654 seconds (SD 229).
Very limited side effects (nausea:3 cases, vomiting:4, cough:4, delirium:3) were observed. The same side effects are common to be found after general anesthesia, therefore they may not be related to the administration of sugammadex.
Conclusion(s): A sugammadex dose of 4mg/kg is effective and safe in early reversal of a deep neuromuscular block rocuronium-induced even in infants and children.

10AP3-1

A prospective, non-randomised study to test the hypothesis if oculo-cardiac reflex (OCR) can be used to predict postoperative nausea and vomiting (PONV) after paediatric strabismus surgery. We found that despite a high incidence of OCR (86.4%) only 6% had PONV, so OCR cannot be used to predict PONV

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Background and Goal of the study: Without antiemetic prophylaxis the incidence of PONV after strabismus surgery can be up to 88%[1] with up to 30% hospital admissions rate. OCR can be one of the causes. In our study we tried to establish if there is any relation between intraoperative OCR and PONV and hence the use of more than one antiemetic for this group of patients.
Material and methods: After approval of the regional research and ethics committee and parents/guardians informed written consent, we conducted this prospective non randomized study. Using data from a previous study by Allen el al[3] a 65% incidence OCR is assumed. With a power of 80% and a significance level alpha = 0.05, a total of 88 patients would be needed to detect a difference between 47.1% of OCR patients with POV and 17.9% of non-OCR patients with POV, using a chi-square.
We included eighty eight ASA I, II patients aged between 2 and 16 undergoing strabismus surgery. Patients with known allergy to any of the anaesthetic agents used or those for a re-do procedure were excluded.
Anaesthetic and monitoring technique were standard; OCR was defined as a drop in the heart rate by at least 10% from the baseline. Data regarding PONV were collected from the nursing documentation and postoperative visit.
Results and Discussion:

Gender (N/%)	Male	39 (44%)
	Female	46 (56%)
Age (years)	Median	6
	Range	2-16
Weight (Kg)	Mean	23.5
	SD	10.3

[Patient's demographics]

OCR	No PONV	PONV	TOTAL
YES	9	3	12
NO	70	6	76
TOTAL	79	9	88

[Relation between OCR & PONV (number of patients)]

Conclusion: Our results showed that with the use of standard antiemetic prophylaxis, the incidence of PONV after strabismus surgery was low. OCR cannot be used to predict PONV in children and hence the use of more than one antiemetic is not justified.
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10AP3-2

Ultrasound-guided rectus sheet block in children with paraumblical hernia: case series

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Background: Umbilical hernia repair, a common surgery in children, is associated with significant postoperative discomfort. The most popular blocks used in umbilical hernia repair are rectus sheath block. The rectus sheath block may offer improved pain management following umbilical hernia repair.Ultrasonography guidance of peripheral nerve blocks has reduced the number of complications and improved the quality of blocks. This case series describes ultrasound-guided puncture technique of the 10th intercostal nerve in pediatric patients coming for umbilical surgery.
Methods: Eighteen (18) children (age range: 1.5-8 years) scheduled for umbilical hernia repair were included. Following the induction of general anesthesia, the ultrasonographic anatomy of the umbilical region was studied with a 5-16 MHz linear probe. An ultrasound-guided peripheral block of the 10th intercostal nerve in the lateral edge of both rectus abdominis muscles (RMs) was performed (total of 36 punctures). Isolated 20G short beveled sharp cutting needle 1.1x 30mm(BD Insyte - W, Vialon material.,Spain) used surgical conditions, intraoperative hemodynamic parameters, and postoperative analgesia by means of the modified CHEOPS scale were evaluated.
Results: ultrasonograghic visualization of the posterior sheath was possible in all children. The ultrasound guided rectus sheath blockade provided sufficient analgesia in all children with no need for additional analgesia except for one patient who requested morphine 0.1 mg kg-1with no complications.
Conclusions: Ultrasound guidance enables performances of an effective umbilical block in the lateral edge of the rectus muscle. Use of the Sharp beveled needle of 20GA IV cannula provided easy, less traumatic skin penetration and better clear visualization by the ultrasound.
The bilateral placement of bupivacaine 0.25% 0.5ml kg-1 in the space between the posterior aspect of the rectus sheath and the rectus abdominis, under real - time ultrasonographic guidance provides sufficient analgesia for umbilical hernia repair in children.
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10AP3-3

Evaluation of adherence to recommended fasting guidelines in paediatric surgery in a teaching hospital in the UK

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Background and Goal of Study: Despite the availability of clear fasting guidelines in children[1], prolonged or inadequate fasting are recognised issues in paediatric anaesthesia[2]. We conducted this prospective study to evaluate adherence to fasting guidelines in paediatric surgery in a teaching hospital in the UK.
Materials and Methods: Data was collected prospectively for three weeks using a standard questionnaire prior to induction by anaesthetists. The baseline data included age, surgical specialty, urgency, bowel preparation, preoperative intravenous fluid administration and any unexpected changes in the list order. Specific information regarding fasting times (food and fluids) and reasons for fasting was requested. 441 children underwent elective or emergency surgery during this period.
Results and Discussion: 110 questionnaires were returned . Out of these 107 patients were fasted for anaesthetic indication. Table 1 shows the results for different specialties.
Median age was 5 years (Range: 1day to 16 years). The average fasting time for solids and fluids was 13.3 hours (5.5, 29) and 6.84 hours(1.75, 25) respectively. 7 patients in the general surgical group received bowel preparation and only 1 patient received IV fluids preoperatively. 3 patients(2.9%) were not fasted adequately.. Patients posted for plastic surgery, acute/emergency surgery and those scheduled for afternoon (pm) lists had longer fasting times when compared to other groups.

	Plastics	General	ENT	Dental	Maxillo Facial	Others
Emergency Surgery	7	9	0	0	2	0
Elective Surgery	0	36	18	14	10	14
Age Median (range)years	5 (2,12)	3 (1day,16)	5.5 (2,14)	6 (3,15)	5 (0.75,14)	6.5 (0.25,16)
Time Scheduled AM,PM	4,3	28,17	15,3	7,7	6,6	9,5
list order change (n)	7	30	8	4	8	11
Fasting time (solids): mean (range) hours	18.2 (9.75,29)	13.5 (6.25,20.5)	13.3 (7,16.25)	11.5 (5.6,18.5)	13.2 (5.5,16)	12.2 (6.75,18)
Fasting time (fluids): mean (range) hours	8.8 (3.5,14.5)	7.75 (2.5,25)	6.06 (2.5,15.75)	5.63 (2,12.75)	5.95 (1.75,8.5)	6.3 (3,18)

[Table 1]

Conclusion(s): We observed that a considerable number of children were over fasted. A very small number of patients were inadequately fasted. Our work demonstrates the need to educate patients, parents and health professionals to optimise the fasting times for children.

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10AP3-5

Ketorolac and perioperative bleeding in paediatric adenotonsillectomy

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Background and Goal of Study:The most serious complication of adenotonsillectomy (A&T) is postoperative hemorrhage (PH), which occurs at a frequency of 0,1 to 8,1%. Approximately 75% of PH occurs within 6hours of surgery. Most of the remaining 25% occurs within the first 24h of surgery.[1,2] The use of nonsteroidal antiinflammatory drugs (NSAIDs) for analgesia for A&T is controversial because NSAIDs, through platelet inhibition, may increase the risk of perioperative bleeding.[3] The incidence of reoperations,intraoperative blood loss, readmissions to hospital until the 6th postoperative day and PH were recorded.

The purpose of this study was to evaluate the effects of ketorolac on perioperative bleeding in paediatric A&T.

Materials and Methods: We studied 517 patients, aged 2-12 yr, ASA I-II, scheduled for elective A & T. Exclusion criteria included asthma,history of bleeding diathesis and pre-existing nephropathy. All patients had normal coagulation indices. All children received a standard anesthetic protocol. In the NSAIDs group, patients received ketorolac (1mg/kg) + acetaminophen (15mg/kg) IV. In the non-NSAIDs group, patients received tramadol (2mg/kg) IV + acetaminophen (15mg/kg) IV. All operations were performed using a standardized surgical technique.

The incidence bleeding complications were compared by Chi-square test or the Fisher exact test where appropriate.

P values < 0.05 were considered statistically significant.

Results and Discussion:

	Ketorolac group (n = 130)	Non-NSAID group (n = 387)
Age (years)	6,28 ± 2,28	5,99 ± 2,14
Sexo (Male/Female)	66(50,8%) / 64(49,2%)	207(53,5%) / 180(46,5%)
Weight (Kg)	26,3 ± 9,5	24,2 ± 8,64
ASA physical status (I/II)	93(71,5%) / 37(28,5%)	286(73,9%) / 101(26,1%)

[Patient demographics]

	Ketorolac Group (n = 130)	Non-NSAID Group (n = 387)	*P value*
Intraoperative blood loss (Grade I/II/III)	115(88,5%) / 10(7,7%) / 5(3,8%)	346(89,4%) / 32(8,3%) / 9(2,3%)	0,644
Postoperative hemorrhage (first 6h)	11 (8,5%)	10 (2,6%)	0,003
Postoperative hemorrhage (first 24h)	1 (0,8%)	7 (1,8%)	0,406
Reoperations	8 (6,2%)	5 (1,3%)	0,002
Readmissions	2 (1,5%)	4 (1%)	0,642

[Perioperative bleeding]

Ketorolac was associated with a higher incidence of PH in first 6h and re-operations due to bleeding when compared to non-NSAID group (p< 0,05). Bleeding interfering with surgery was similar in both groups.

Conclusion(s): These results may indicate that ketorolac increase bleeding in children undergoing A&T and should be used cautiously in paediatric A & T until further data are available.

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10AP3-6

Occulocardiac reflex occurrence during chemoembolization of the ophthalmic artery for retinoblastoma treatment in children

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Background: Chemoembolization is a procedure performed by an interventional radiologist in which anticancer drugs are administered directly into a tumor through its feeding blood supply, with concurrent or subsequent blockage of the feeding vessel by occlusive agents that are injected through the delivery catheter. Intraarterial chemotherapy is a novel treatment for retinoblastoma whereby chemotherapeutic agents are precisely delivered into the ophthalmic artery minimizing systemic toxicity.

This procedure has shown impressive results and has allowed a dramatic decrease in the rate of enucleation (eye removal) in advanced and refractory retinoblastoma.(1)

Case report: A three-year-old child, who has been diagnosed with bilateral retinoblastoma since her 11 months of age, was submitted to a chemoembolization of the right ophthalmic artery throughout the right femoral access. After general anesthesia induction, femoral artery puncture was taken place. At the moment of the intraarterial chemotherapy injection, severe bradycardia occurred. Therefore, the surgeon was asked to stop the injection (stimulus) immediately and the heart rhythm got back to normal.

Discussion: The occulocardiac reflex is a decrease in heart rate secondary to traction applied to extra-ocular muscles and/or mechanical compression of the eyeball. This reflex is especially sensitive in neonates and children, and must be monitored during pediatric ophthalmological procedures, particularly during strabismus correction surgery. So far there are no reports in the literature on the occulocardiac reflex occurrence during chemoembolization procedure.

References:

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Learning points: We aimed to call attention for the occulocardiac reflex occurrence during chemoembolization of the ophthalmic artery for retinoblastoma treatment in children.

10AP3-7

Postoperative nausea and vomiting in children undergoing radiofrequency catheter ablation: a 5 year review of 475 patients

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Background and Goal of Study: Postoperative nausea and vomiting (PONV) is an important cause of morbidity in children. Radiofrequency Catheter Ablation (RFCA) is established as a key therapy in the management of tachyarrhythmias. In children, the procedure is typically performed under general anaesthesia. The objectives of this study were to quantify the incidence of PONV in the paediatric RFCA population and to identify those factors associated with increased risk of developing PONV.
Materials and Methods: Following Institutional Ethics Committee approval, a retrospective review of all patients who underwent RFCA over a 5 year period (July 2006-June 2011) was performed. We recorded 4 primary outcomes: Nausea in PACU; Vomiting in PACU; Nausea in first 24 hours post-procedure; Vomiting in first 24 hours post-procedure. In addition we collected extensive data relating to the patient, the type and duration of anaesthetic, the use of anti-emetics and to the procedure itself. The information collected was analysed in order to identify which factors, if any, influenced the development of PONV. Descriptive statistics were used to describe the sample and to calculate the incidence of nausea and vomiting after RFCA. Chi-square and t tests were used to detect factors significantly ($p < 0.05$) related to these complications. Logistic regression analysis was used to ascertain which of the variables were significantly and independently related to developing nausea and vomiting.
Results and Discussion: In total, 475 patients scheduled for RFCA were analysed. The overall incidence of nausea in PACU and in the first 24 hours post procedure was 21.3% (101 patients) and 29.5% (140 patients), respectively, while the incidence of vomiting in PACU and in the first 24 hours overall was 26.1% (124 patients) and 35.2% (167 patients), respectively. For all 4 primary outcomes, the use of intra-operative N2O, inhalational maintenance of anaesthesia, and the omission of an intra-operative anti-emetic were all associated with a significant increase in the incidence of nausea and vomiting in the post-operative period. In addition, a longer duration of anaesthetic was associated with an increased incidence of vomiting.
Conclusion(s): Our study confirms a relatively high incidence of PONV in children who undergo general anaesthesia for RFCA, and we have identified factors which significantly increase the risk of developing this significant complication.

10AP3-8

Inhibition of acetaminophen analgesic action by ondansetron after amygdalectomy in children: the Paratron randomized trial

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Background & Goal of the Study: The mechanism of action of paracetamol is still unclear. One hypothesis involves an interaction with the serotoninergic system. Furthermore, setrons have antiemetic properties by acting as antagonists at serotonin ($5\text{-}HT_3$) receptors.
Therefore, co-administration of paracetamol and a setron could lead to a decrease or a loss of paracetamol analgesic effects. Therefore, the aim of this study was to demonstrate that the association paracetamol/ondansetron is not as effective as paracetamol/droperidol in the treatment of pain in children following tonsillectomy.
Materials & Methods: This study was approved by our institutional ethics committee. Paratron trial was designed as a prospective, randomized, double blind, parallel group trial. Children aged 2-7 years old and scheduled for a tonsillectomy ± adenoidectomy were recruited. All patients received intraoperatively acetaminophen together with ondansetron or droperidol. At the end of surgery, patients received i.v. morphine. Pain scores using CHEOPS scores, morphine consumption and the incidence of postoperative nausea and vomiting (PONV) were measured during 24 hours.
The primary outcome was pain scores at 4 hours after administration of paracetamol and ondansetron/droperidol. Secondary objectives were morphine consumption, cumulated incidence of PONV. Comparison of CHEOPS scores and morphine consumption between groups was performed using Student t test or Wilcoxon rank signed test. The level of significance was set at 5%.
Results & Discussion: From October 2011 to June 2012, 69 patients were included: 35 in the ondansetron group and 34 in the droperidol group. CHEOPS scores were not different at all times during the first 24 hours.
However, mean morphine consumption (in mg) in recovery was 279.5 ± 271.5 and 97.6 ± 201.5 in the ondansetron and droperidol groups, respectively ($p = 0.004$). Furthermore, the percentage of patients who received morphine titration was 57.1% and 20.6% in the ondansetron and droperidol groups, respectively ($p = 0.008$). No significant difference was present for PONV. An interaction between paracetamol and ondansetron did occur with children receiving 3 times more morphine during pain titration in the recovery room.
Conclusion: This is the first time that the interaction between paracetamol and a setron is reported in a clinical setting. More studies are necessary to evaluate if it is clinically relevant to preclude the simultaneous administration of both drugs in the future.

10AP3-9

The effect of four different supraglottic airway device insertion on intraocular pressure and haemodynamic responses in children undergoıng extraocular ophthalmic surgery

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Background and Goal of Study: The aim of the study was to compare intraocular pressure (IOP) and haemodynamic responses to clasic laryngeal mask airway (LMA), I-gel LMA (ILMA), Proseal-LMA (PLMA) and Cobra-perilaryngeal airway (CPLA) insertion in children undergoing extraocular ophthalmic surgery.
Material and methods: In this prospective, randomized study, 60 ASA I-II children, aged 1-10 years undergoing extraocular ophthalmic surgery were randomly divided into four groups (Group LMA, Group ILMA, Group PLMA and Group CPLA). Anesthesia was induced with decreasing sevoflurane concentration in a mixture of 50% N_2O-O_2 through a facemask.
All devices were inserted under deep anesthesia. During this period, characteristics of insertion (ease and time of isertion, number of attempts) and complications were recorded. Mean IOP, mean arterial pressure (MAP), heart rate (HR) were measured before and after (2 and 5 min) insertion of the airway device.
Results and Discussion: There were no differences among groups in terms of characteristics of insertion. The mean IOP did not increase significantly after insertion of all (supraglottic airway device) SGADs. During follow-up period MAP and HR changes were similar among groups. Insignificantly increases in HR was recorded at 2 min after insertion of the SGAD in all groups. It returned to the baseline value 5 min after insertion.
Statistically significant correlation was found between HR and IOP change, at baseline and 2 min after insertion difference ($p=0,006$, correlation coefficient=0.352). Desaturation was seen in one patient in Groups LMA, PLMA and CPLA, laryngospasm was seen in two patients in Group CPLA and in one patient in Group LMA.
Conclusion: This study has shown that insertion of four different SGADs did not increase IOP and provides haemodynamic stability with minimal response in children undergoing extraocular ophthalmic surgery.

Obstetric Anaesthesia

11AP1-1

Predictors for complications in pregnant women with heart disease, a retrospective stud

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Background and Goal of Study: Heart disease is found to be a major cause of maternal death. Sui et al. proposed a risk index to predict cardiac complications in populations in which congenital heart disease (CHD) predominates. In Thailand the majority of pregnant women with cardiac disorder suffer from rheumatic heart disease (RHD). The aim of this study is to assess and predict cardiac, obstetric, and neonatal complications in pregnant women with heart disease.
Materials and Methods: This is a retrospective study at a tertiary care center including 175 pregnant women with heart disease who delivered at ≥28 weeks of gestation over a period of 10 years (2002-2011). Maternal cardiac, obstetric and neonatal outcomes were predicted using Cardiac in Pregnancy Score (CARPREG) score, which include NYHA-class, systolic ejection fraction, left ventricular obstruction and history of cardiac events. Statistical analysis was done by using Chi-Square test, Fisher's exact tests, and t tests. A p-value <0.05 was considered statistically significant.
Results and Discussion: RHD (n= 116, 66.3%) was the predominant cardiac problem. Maternal cardiac events occurred in 27.4%. CARPREG score was 0, 1, >1 in 65.1%, 24.6%, and 10.3% pregnancies, respectively. A higher score was associated with a higher rate of cardiac events (score 0 vs. score 1; OR (95%CI) 4.41(1.97-9.85), p <0.001; score 1 vs. score >1; OR (95%CI) 4.86(1.37-17.23), p= 0.01)). Fetal complications occurred in 24.4%.
The score was not predictive for other obstetric or neonatal outcomes, except for neonatal birth weight <2,500 gm (score >1; OR 2.57, 95%CI 1.29-5.11, p= 0.006).
Our cardiac events were comparable to the results of other studies which RHD was most frequent. This rate was higher than in the studies conducted in populations in which CHD predominates. Previously Sui et al. validated CARPREG score 0, 1 and >1 points being associated with cardiac event rates of 4%, 31% and 69%, respectively, compared with our rates of 14%, 41.9% and 77.8%, respectively. This score can be applied to our patients, though the majority has RHD. A higher score is associated with a higher rate of cardiac events.
Our neonatal events were comparable to the results of other studies. CARPREG score did not predict other neonatal outcomes, except for birth weight < 2,500 g.
Conclusion(s): CARPREG risk index can predict maternal cardiac events and neonatal birth weight < 2,500 g, but not outcomes of other pregnancies or of neonates.

11AP1-2

Sublingual microcirculation of pregnant women before and after epidural

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Background and Goal of Study: Pregnancy places significant cardiovascular demands on women. This leads to changes in macrocirculation, such as central venous pressure and cardiac output. Evidence now suggests there may be measurable differences in microcirculation in pregnancy. The microcirculation is comprised of the smallest vessels in the vasculature and is an important site for homeostatic regulation. During labour, both uterine contractions as well as the pain experienced can further impact the cardiovascular system. Pain is an important sensation that disrupts homeostasis of various organ systems. The objective of this observational study was to compare sublingual microcirculation in laboring pregnant subjects before and after pain relief by epidural analgesia.
Materials and Methods: With institutional REB approval, healthy pregnant, labouring women requesting epidural analgesia were recruited. A sample size calculation determined 12 subjects for this paired comparison. Subjects were excluded with hypertensive and cardiovascular disease, diabetes, obesity, smoking or recent caffeine intake. Microcirculation was assessed using side-stream dark field (SDF) imaging before and after receiving epidural analgesia. Pre-epidural images were collected prior to epidural insertion when the women reported their pain as >7/10 or "Severe". Post-epidural images were collected when the pain score was reduced to <2/10 or "none". Each participant provided 20 second SDF video clips from 5 visual fields on the sublingual surface.
Results and Discussion: A total of 12 participants completed the study. Images were analyzed blindly and randomly. The primary outcome measured was the difference between the microvascular flow index (MFI). Secondary outcomes measured were total vessel density (TVD), perfused vessel density (PVD) and proportion of perfused vessels (PPV). No statistically significant difference was found in the MFI, TVD, PVD, or PPV before and after receiving epidural analgesia. This study demonstrates that epidural analgesia does not impact sublingual microcirculation in healthy pregnant labouring women. Future projects should be directed at determining the impact of disease process on microcirculation and the possible relationship between maternal microcirculation and fetal outcomes.
Conclusion(s): This study supports literature regarding epidural analgesia as a safe, appropriate method of pain relief during labour with limited impact on microcirculation.

11AP1-3

Pre-anesthetic PVI (Pleth Variability Index) predicts hypotension after spinal anesthesia during cesarean section

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Background and Goal of Study: During cesarean section, spinal anesthesia-induced hypotension may exert severe adverse effects for mothers and new borns. If hypotension can be predicted before induction of spinal anesthesia, anesthesiologists can take preventive measures such as administration of vasopressors and/or intravenous colloids. However no easy and convenient indexes to predict hypotension before spinal anesthesia have been reported. Pleth variability index (PVI) is a non-invasive and convenient dynamic indicator of fluid responsiveness, and preload in mechanically and spontaneous ventilated patients. Thus we hypothesized that pre-anesthetic PVI would predict hypotension following spinal anesthesia. The aim of this prospective observational study was to test this hypothesis during cesarean section.
Materials and Methods: We enrolled women after 37 weeks of pregnancy who were to undergo elective cesarean delivery under combined spinal and epidural anesthesia. Pre-anesthetic PVI was measured for 5 min while the patient was lying supine. Then, epidural catheter was placed at the Th12 /L1 intervertebral space, and spinal anesthesia was induced at the L3/4 or L4/5 intervertebral space with 0.5% hyperbaric bupivacaine (10mg) and fentanyl (10mcg) with the patient in a right lateral position. Hypotension was defined as the systolic blood pressure (SBP) below 80 mmHg after spinal anesthesia, and was treated immediately with ephedrine 8mg. The ability of pre-anesthetic PVI to predict hypotension was examined generating the receiver operating characteristic (ROC) curve, and sensitivity and specificity were calculated. Values with P < 0.05 were considered statistically significant, and all parametric data are expressed as mean ± standard deviation (SD).
Results and Discussion: 50 patients were enrolled in this study. Hypotension occurred in 27 patients. Pre-anesthetic PVI of patients who developed hypotension and who did not were 20.3 ± 6.3%, and 16.8 ± 5.3%, respectively (P = 0.044). A threshold PVI value of >19% was a weak significant predictor of hypotension (sensitivity 61%, specificity 59%, area under the ROC curve 0.65, 95%CI 0.50-0.80)
Conclusion: Pre-anesthetic PVI predicts hypotension after spinal anesthesia during caesarean section.

11AP1-4

The effect of 6% hydroxyethyl starch 130/0.42 vs lactated Ringer's preload on the haemodynamic status of parturients undergoing spinal anaesthesia for elective caesarean delivery using arterial pulse contour analysis

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Background and Goal of study: Fluid loading appears to be the key in attenuating the hypotensive response to spinal anaesthesia (SA) in obstetric patients. The aim of this prospective study was to compare the preload efficacy of a hydroxyethyl starch (HES) vs lactated Ringers in the prevention of hypotension after SA for elective caesarean delivery (CD) using arterial pulse contour analysis.
Material and methods: After receiving approval by the institutional Ethics and Research Committee, 32 ASA I and II parturients scheduled for elective CD under SA were allocated to receive either 1 L lactated Ringers (Group R/L, n=16) or 0.5 L balanced HES 6% 130/0.42 (Tetraspan®) preload (Group T, n=16). FloTrac/Vigileo™ was applied to all participants. Maternal haemodynamic measurements including systolic arterial pressure (SAP) and cardiac output (CO) were recorded at predefined time points; before volume preload (baseline values), immediately after volume preload, immediately after SA and at one minute intervals thereafter. SA induced hypotension, defined as 20% drop of SAP from baseline or SAP< 100 mmHg, was treated with vasopressor administation according to a predetermined algorithm. The end points of the study included the incidence and duration of hypotension and the total dose of rescue vasopressors given. Longitudinal analysis was performed employing a linear mixed random effects piecewise model in order to assess changes in haemodynamic variables over time.
Results and Discussion: Although preloading increased similarly CO in both groups (p>0.05), the incidence of SA induced hypotension was 73.3% in R/L Group compared to 46.7% in T Group (p>0.05). Overall duration of haemodynamic instability was significantly prolonged in the R/L group (p< 0.001). The total amount of ephedrine and phenylephrine administered was significantly greater in the R/L group (p=0.015 and p=0.029, respectively). The mixed random effects model revealed statistical significant differences within groups (p< 0.001) concerning all haemodynamic measurements up to the 14th minute after SA. However, overall, no statistical difference was detected between groups over time due to prompt rescue vasopressor administration.
Conclusion: Preloading with HES 6% 130/0.42 (Tetraspan®) contributed to lower incidence of hypotension and less rescue vasopressor treatment, and resulted in better haemodynamic stability compared to lactated Ringer's preload in obstetric patients under spinal anaesthesia.

11AP1-5

Epidural anesthesia for cesarean delivery in a parturient with Ebstein's anomaly

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Background: Ebstein's anomaly is characterized by downward displacement of the septal cusp of the tricuspid valve. It is associated with thin-walled right ventricle, enlarged atrium, tricuspid regurgitation, atrial septal defect with intracardiac shunt, pulmonary hypertension and tachyarrhythmias. We present a case of a parturient with Ebstein's anomaly presenting for caesarean section.
Case report: The patient was 29-years-old, G2P1, with BMI 29.7 kg/m^2. The diagnosis was made in infancy. She had been on propranolol until the age of 20. Currently, she had no symptoms. Her ECG revealed RBBB. Ultrasound revealed dilated right atrium and ventricle, intense right ventricle contractility, tricuspid regurgitation, atrial septal defect 0.5 cm^2, with normal left ventricle. She had a caesarean section 3 years ago under epidural anaesthesia. In theater, in left lateral position, the epidural space was identified at the O2-3 level with a 18G Tuohy needle, using loss of resistance to air. A multi-orifice catheter was introduced 5 cm in and a test dose (3ml lidocaine 2%) was given. Subsequently, we administered 4 ml lidocaine 2%, 12 ml ropivacaine 0,75% and 100 mcg fentanyl over 20 minutes. Surgical anaesthesia to a T4 sensory block was followed by delivery of a healthy baby. The epidural catheter was used for postoperative analgesia and was removed 24 h after delivery.
Discussion: Symptoms of Ebstein's anomaly vary from mild to cyanosis to cardiac failure. Drugs mainly used are diuretics and digoxin. It is always crucial to remember that patients carry the risk of SVT and WPW. During pregnancy the function of the left ventricle and any shunt from right to left might deteriorate.
Although there are no randomized trials regarding anaesthesia in patients with Ebstein's anomaly presenting for caesarean section, epidural anaesthesia seems to be a safe choice.
References:
1. Misa VS, Pan PH. Evidence-based case report for analgesic and anesthetic management of a parturient with Ebstein's Anomaly and Wolff-Parkinson-White syndrome. Int J Obstet Anesth. 2007 Jan;16(1):77-81.
2. Groves ER, Groves JB. Epidural analgesia for labour in a patient with Ebstein's anomaly. Can J Anaesth. 1995 Jan;42(1):77-9.
Learning points: Epidural anaesthesia can be used safely in parturients with Ebstein's anomaly.

11AP1-6

Pregnancy and ascending aortic aneurysms: a quick review

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Background: Thoracic aortic aneurysms (AA) in pregnancy are rare, but they pose a risk of catastrophic complications. We present a condition for which the literature is scarce and review the recent guidelines in the management of patients with ascending aortic enlargement, as well.
Case report: A 29-year-old primigravida previously diagnosed with a 42 mm aortic root dilatation presented with a 34-week pregnancy. She was advised about the risks of arterial dissection and rupture during labor. A consensus was made by the multidisciplinary team to perform an elective caesarean section (c-section). However, our patient determinedly refused it for ideological reasons. At 40 weeks, she delivered a healthy newborn under epidural analgesia and invasive arterial pressure monitoring without complications.
Discussion: AA are rare in young women and usually occur in patients with other conditions. Physiologic hemodynamic changes during pregnancy can complicate the disease. Pregnant women with a thoracic AA have the risk of dissection or rupture during pregnancy, delivery, or the post-partum period[1]. The primary aim of intrapartum management is to reduce the cardiovascular stress of labor and delivery. The American and European guidelines are consensual about the need of pregnant women with aortic aneurysms to be delivered where cardiothoracic surgery is available, and surgery may be considered when progressive aortic dilatation occurs[2,3]. On the other hand, only the European guidelines are clear about the mode of delivery. If the ascending aorta diameter is 40-45 mm, vaginal delivery with regional anesthesia is advised to prevent blood pressure peaks. C-section should be considered when the aortic diameter exceeds 45 mm. The patient's hemodynamic status must be monitored closely. In this case, the obstetric team felt more secure performing an elective c-section to avoid the stress of vaginal delivery. As a trick of fate, the patient ended choosing according to the recommendations!
References:
1. Ann of Thorac Surg 2003; 76:309 -14
2. Circulation 2010; 121:e266-e369
3. Eur Heart J.2011; 32: 3147-3197
Learning Points: This is a valuable report because it reviews the current guidelines for a rare, but potentially devastating condition in pregnant women which requires a multidisciplinary approach. However, it lays on the anaesthesiologist the maintenance of hemodynamic stability and management of complications during labor and delivery.

11AP1-7

Crystalloid coload combined with variable rate phenylephrine infusion for prevention of hypotension during spinal anesthesia for elective cesarean delivery vs crystalloid coload alone

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Background: Phenylephrine infusion is safe and effective to reduce incidence and frequency of hypotension during spinal anesthesia for cesarean delivery. Prophylactic fixed rate infusions may have limited application in clinical practice, and a variable rate, i.e., adjusted in response to changes in blood pressure and heart rate, has been advocated. The bolus administration of phenylephrine to treat hypotension is commonly used, and is still considered as standard practice. However, this technique requests multiple interventions from the anesthesiologists, which is time consuming.
We hypothesized that combination of crystalloid coload with variable rate phenylephrine infusion may be associated with lower number of physician intervention needed to maintain maternal systolic blood pressure (SBP) within

20% of baseline and greater hemodynamic stability than crystalloid coload alone.
Methods: In this prospective, double-blind study, seventy-nine patients were assigned to receive immediately after spinal anesthesia crystalloid coload with 15 mL/kg of lactated Ringer's solution over period of 15-20 min, and infusion of normal saline in group S or variable infusion rate of prophylactic phenylephrine in group P started at 0.75 μg/kg/min. Maternal SBP was maintained within the target range using a predetermined algorithm. During the pre-delivery period, the number of physician interventions (primary outcome), hemodynamic performance, intraoperative nausea and vomiting, and umbilical cord blood gases were compared between the groups.
Results: Physician intervention needed to maintain maternal hemodynamics within the target range and incidence of hypotension were lower in group P compared to group S [0 (0-6) vs 3 (0-9) and 8/40 (20%) vs 35/39 (89.74%) respectively, P< 0.001]. Group P was associated with higher incidence of hypertension compared with group S [6/40 (15%) vs 0/39 (0%) P=0.006]. Total dose of phenylephrine was greater in group P compared to group S (1532.50 ± 519.07 vs 428.21 ± 437.06, P< 0.001). There was no difference in the incidence of bradycardia or umbilical cord blood gases between the groups. In group S, 17/39 (43.5%) patients had nausea/vomiting compared to 4/40 (10%) in group P (P=0.001).
Conclusion: Combination of crystalloid coload with variable rate of prophylactic phenylephrine infusion is a reliable and safe method to ensure maternal hemodynamic stability during spinal anesthesia for cesarean delivery with the least physician interference.

11AP1-8

Total thoracic fluid volume in parturient patient for elective caesarean section

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Background and Goal of study: Plasma volume, total blood volume and total body fluids all increase during pregnancy. Total thoracic fluid volume (TFV) consists of an intrathoracic blood volume (ITBV), an intracellular and an extravascular lung water (EVLW). The pulmonary circulation is able to absorb high rates of flow without an increase in pressure. The venous pressure in the lower circulation rises for both mechanical and hydrodynamic reasons. Pulmonary resistance falls in early pregnancy.
Material and methods: The examined group consisted of 53 patients (32 to a normal cardiovascular system adaptation group and 21 to an abnormal without PIH/PPH cardiovascular adaptation group) classified to elective caesarean section in spinal (45 patients) or general (8 patients) anaesthesia. The ICON Electrical Cardiometry system was used to measure TFV. This method is based on the measurement of changes of the electrical resistivity of blood primarily in the aorta during the course of a cardiac cycle. The ICON measures thoracic electrical bioimpedance utilizing four adhesive surface ECG electrodes.
Results and Discussion: Groups which were studied did not differ statistically in respect of the descriptive characterization. In the examined a normal adaptation group CI was 3.8 (range 2.59 to 5.95, SD 0.72) and TFV was 21.68 (range 14 to 35, SD 5,59). In the examined an abnormal group CI was 3.69 (range 2.81 to 4.97, SD 0.63) and TFV was 24.42 (range 17 to 35, SD 5.01). Patients with an abnormal adaptation cardiovascular system was significant higher TFV (p< 0.05).
Conclusions: TFV is a measurement of chest fluid status. Along with cardiac index TFV can be very helpful to the clinician in pregnant patients. The ICON demonstrated increase TFV and decrease cardiac indices in labouring woman who have an abnormal adaptation of their cardiovascular system during pregnancy.
References:
1. Petersen JR, Jensen BV, Drabaek H i wsp. Electrical impedance measured changes in thoracic fluid content during thoracentesis. Clin Physiol 1994; 14(4): 459-66.
2. San-Frutos LM, Fernandez R, Almagro J i wsp. Measure of hemodynamic patterns by thoracic electrical bioimpedance in normal pregnancy and in preeclampsia. Eur J Obstet Gynecol Reprod Biol 2005; 121(2): 149-53.

11AP1-9

A randomized comparison of haemodynamic effects of combined spinal-epidural anesthesia with hyperbaric bupivacaine or levobupivacaine for elective cesarean section

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Background and Goal of Study: Hemodynamic changes during cesarean section with neuraxial anesthesia can lead to maternal hypotension, decreased uterine blood flow, and, potentially, fetal compromise. Hyperbaric bupivacaine is the most popular local anesthetic agent in obstetric anesthesia but its use is associated to great hemodynamic repercussions. Few data have studied levobupivacaine as an alternative. The aim of this study is to compare the hemodynamic effects of spinal block, via spinal-epidural technique, with same dose of hyperbaric bupivacaine or levobupivacaine for elective cesarean section.
Materials and Methods: This is a prospective randomised clinical trial. Pregnant women with >37 week of gestation, age between 18 and 40 years, proposed for elective cesarean section were included. The exclusion criteria were a height >150 cms, a weight >115 kgs, hypertension or < 100 mmHg of systolic blood pressure (SBP), cardiac, renal or thyroid disease and suspection of fetal distress. 42 pregnant women were randomly allocated to receive intratecal sufentanil 2,5 μg with 8 mg bupivacaine 0.5% - B Group, or 8 mg levobupivacaine with - L Group, both preformed by spinal-epidural technique. Heart rate, arterial pressure and oximetry were evaluated, every minute from the 2 minutes preblock until the administration of oxytocin. Hypotension was defined as SBP< 80% of the basal value or < 100 mmHg. The dose of ephedrine used, hypotension and other secondary effects were recorded. Using SPSS 19.0 version, Chi-squared, Fisher's exact and Mann-Whitney tests and Spearman's correlation were used for statistical analysis. Statistical significance was given by a *p* value < 0.10.
Results and Discussion: The study included 42 women, 19 in B group and 23 in L group. The incidence of hypotension was similar in both groups (78,9% in B group (CI 95%: 54,4%-94%) vs. 82,6% in L group (CI 95%: 61,2%-95,1%) (*p* 0.764)) such as the total dose of ephedrine (B group mean 11,1 mg± SD 8,1 (CI 95%: 7,2-15) vs. L group 14,3mg± SD 8 (CI 95% 10,9-17,8) (*p* 0.764). Both groups had the same profile of blood pressure variation from the 3rd minute until the 20th minute. The incidence of nausea, vomiting, tachycardia and dizziness was similar in both groups.
Conclusion(s): From our results hyperbaric bupivacaine and levobupivacaine have the same hemodynamic effects with similar incidence of secondary effects.

11AP1-10

Effect of intra-abdominal pressure of pregnancy for the development of spinal block for cesarean section

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Background and Goal of Study: It is known that increased intra-abdominal pressure (IAP) reduces the amount of cerebrospinal fluid (CSF) in the lumbar and lower thoracic parts and this contributes to a high spinal block [1]. These days, there is very little actual data on the level of IAP in pregnancy [2]
The aim of the study was to investigate the effect of IAP of pregnants for the development of spinal block.
Materials and Methods: The study included 82 pregnant women with gestational age of 38-40 weeks. All pregnants were divided into two groups, depending on the level of IAP. The first group consisted of 42 pregnants with IAP less than 22 cm H_2O. The second group included 40 pregnants with IAP greater than 22 cm H_2O. The average height of both groups was similar and was 163±3 cm. IAP measured through the bladder in the supine position before spinal anesthesia. For spinal anesthesia, used local anesthetic-0.5% Marcain Heavy. Dose of LA was similar to all patients and was 12.5 mg. 500 mL of HES was infused to all as a preload before spinal anesthesia.
The upper level of sensory block and incident of hypotension (systolic blood pressure < 90 mm Hg) were studied. Statistical comparisons were based on the t test.
Results and Discussion: Average level of sensory block in the first group was Th7±2 and in the second group - Th4±2 (p< 0.05). And, hypotension in the first group was recorded in 25%, and in the second group 75% (p< 0.05).
Conclusion(s): Abdominal hypertension greater than 22 cm H_2O in pregnant women contributes to the development of high spinal block and increases the incidence of hypotension.

References:
1. Onuki E, Higuchi H, Takagi S, Nishijima K et al. Gestation-related reduction in lumbar cerebrospinal fluid volume and dural sac surface area. Anesth Analg. 2010; 110 (1):148-53.
2. Chun R., Kirkpatrick A. Intra-abdominal pressure, intra-abdominal hypertension, and pregnancy: a review. Annals of Intensive Care 2012, 2(Suppl 1):S5.

11AP2-1

Does prolonged urinary catheterisation following labour epidural analgesia delay discharge?

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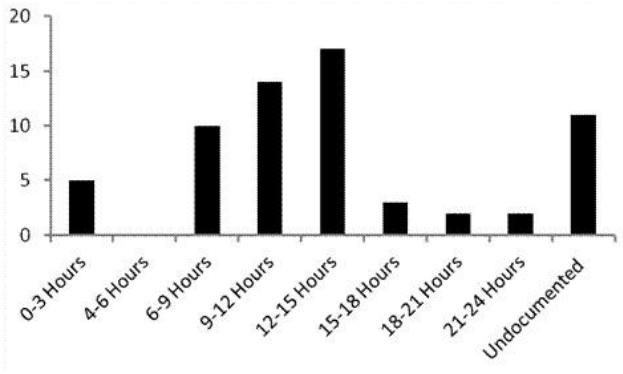
Background and Goal of Study: Women are at risk of urinary retention and ongoing urinary dysfunction following labour. There is no evidence-based consensus on the duration that women should continue to have indwelling urinary catheters following epidural analgesia for labour.
The protocol at our hospital states that women should remain catheterised for 12 hours post-delivery if they have an epidural sited for labour analgesia.The initial goals of the study were to ascertain:
1) Is the current protocol followed?
2) Is discharge being delayed by prolonged urinary catheterisation?
3) Is there evidence that women having epidural analgesia at our hospital are suffering post-delivery urinary-retention?
Materials and Methods: A retrospective audit of case notes was undertaken. Over the previous calendar year period, women who delivered by spontaneous vaginal delivery and had epidural analgesia were selected. Exclusion criteria included patients who underwent surgical interventions (manual removal of placenta, significant tear repairs etc.) and those who did not follow the standard epidural protocol. From the case notes, the following times were collected: epidural insertion, delivery, first mobilisation, epidural removal and discharge.
Results and Discussion: The case notes of 89 women were reviewed, 25 were excluded, and the results of 64 women were analysed.



[Figure 1. Time of indwelling catheter removal post-delivery]

Of note only 47% of women had their urinary catheter removed at 12 hours as specified by the protocol. There were no episodes of urinary retention post delivery or long term urinary complications in this patient group. Duration of inpatient stay post-delivery ranged from 8 hours to >48 hours, with the median time to discharge 25 hours.
Conclusions: Almost a quarter (15/64) of women had their catheter removed early; despite this there were no urinary complications in any patient. The Obstetric Department has agreed to reduce the length of time that women with epidural analgesia and a spontaneous vaginal delivery must remain catheterised. A re-audit is planned to determine whether this reduces time to discharge.

11AP2-2

Accidental dural puncture during labour epidural analgesia: incidence and management in a tertiary university hospital

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Background and Goal of Study: Maternity Units should audit their incidence of accidental dural puncture (ADP) and aim to maintain the rate below 1%.
We want to know the ADP rate in patients presenting for epidural analgesia during labour exclusively, and if leaving the epidural catheter intrathecally at the time of the ADP reduces the incidence of postdural puncture headache (PDPH) when compared with the resited epidural catheter in another lumbar space.
Materials and Methods: This is an epidemiological prospective study. From January1st 2010 until September 30th 2012 in tertiary Donostia University Hospital all patients who experienced an ADP with the Tuohy needle or in whom epidural catheter was found to be intrathecally and those who had PDPH without witnessed ADP, were identified. All the information was recorded in a database previously designed.
A descriptive analysis was carried out, based on absolute or relative frequencies as percentages for categorical variables. Relative risk (RR) is calculated with a 95% confidence interval (CI) with the statistical softwares SPSS v.20 and EPIDAT v.3.1.
Results and Discussion: 12033 pregnant women were attended to and 9364 epidural analgesia were carried out. Only 51 patients out of 9364 were identified with ADP (0.54%). From 51 ADP, 27 patients had a witnessed ADP (52.9%) and PDPH occurred in 21 women without witnessed ADP (41.1%). 3 patients (6%) were not included in the analysis because incomplete data. The overall incidence of PDPH after ADP was 64% (33 out of 51 ADP). Of 27 witnessed ADP, in 16 of them the epidural catheter was left intrathecally for at least 24 hours (59.3%) and 6 of them had PDPH. In the remaining 11 (40.7%), the catheter was resited epidurally in another lumbar space and 6 of them had PDPH. The RR of developing PDPH after ADP if the catheter is left intrathecally versus resited in another space is calculated (RR=0.68 with a CI of 95% 0.29-1.57). There are no statistically significant differences.Only 3 patients required an epidural blood patch. In 41% of patients with PDPH there had been no apparent ADP.
Conclusion(s): The results of our study are consistent with the results of other published studies and also confirm that many ADPs may go unnoticed at the time of the epidural catheter insertion.It has the limitation of being descriptive, and in order to compare the management options of ADP we should have done a randomized trial, but it wasn't possible.

11AP2-3

Epidural analgesia in obstetrics: a method to assess quality using maternal satisfaction

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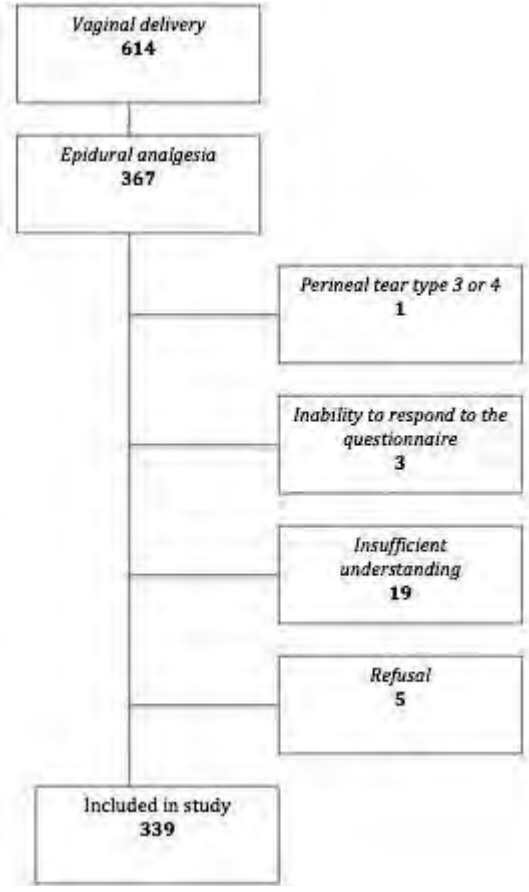
Background and Goal of Study: The best way to assess quality in epidural analgesia for obstetrics is currently maternal satisfaction. Several studies have shown significant criteria in maternal satisfaction. The aim of this study is to build an assessment tool for maternal satisfaction, using these criteria and validated assessment methods.
Materials and Methods: A literature review was conducted to establish the assessment toolkit. Data were collected as a prospective observational study, including every mother having a standardized epidural analgesia for a vaginal delivery and able to understand an auto-evaluation questionnaire within the 48h following delivery. This questionnaire concerned quantitative (using VAS = Visual Analogic Scales) and qualitative (using Likerts Scales) aspects of epidural analgesia. Every questionnaire was completed through a same caregiver following a manual (« how to answer ») previously defined. Every criterion was then statistically correlated to global maternal satisfaction by a Spearman non-parametric rho test to bring out significant criteria.

Results and Discussion: Inclusion/exclusion criteria and number of subjects can be find here:



[Flowchart]

Global satisfaction had a median of 9/10 (IQ : 7-10). The median reduction of pain with epidural on a 10 points VAS was 6 (IQ : 3,8-8). 93% of women were able to focus on the labor and had self-control after the epidural. Only 24% of women had no motor bloc. The more frequent side effect was paresthesia in the legs (51% of patients). Factors statistically correlated with maternal satisfaction:

Criterion	rho	p
Ability to focus and self-control after the epidural	0,26	<0,01
Pruritus	-1,00	<0,01
Paresthesia in the legs	-1,00	<0,01
Epidural during day (8:00AM - 07:59PM)	-0,11	0,049
Decrease of pain	0,35	<0,01

[Significant criteria]

Conclusion(s): This assessment method can now be validated in a larger population in order to be usable routinely. The next step is to see if the same criteria are significant in other populations. It also permit the establishment of an improvement plan in our hospital based on the results.

11AP2-4

A multidimensional questionnaire to evaluate maternal satisfaction after labor analgesia

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Background and Goal of Study: Maternal satisfaction during labor and delivery is influenced by four major categories: control and self-efficacy; involvement in the decision-making; maternal expectations and level of pain. The purpose of our study was to create and validate a questionnaire to assess maternal satisfaction with epidural analgesia.

Materials and Methods: The questionnaire was developed as follows: review of the international literature and open interviews to opinion leaders and mothers; postpartum audio-recorded interviews to a pilot sample of 50 mothers to determine qualitative assessment of the frequency analysis; construction of preliminary questionnaire including all the dimensions identified (103 items) and items operationalization; administration of the preliminary questionnaire and removal of less discriminating items; development of a 2nd questionnaire (76 items) given to 251 mothers and subjected to exploratory factor analysis and preliminary reliability assessment; removal of items with unacceptable factor saturation and construction of final questionnaire (36 items). This final version was administered to mothers and statistically validated by confirmatory factor, internal consistency, construct validity and internal consistency reliability analysis.
Results and Discussion: The final questionnaire included 36 items evaluated on a 5 point Likert scale which are reported in the Table. According to the statistical analysis we identified two macro-dimensions of maternal satisfaction. The first included questions related to the subjective positive experience of woman which were related to emotional and relational aspects but also to the experience of epidural analgesia, which contributed to the creation of satisfaction with childbirth. The second included items related to the relationship with the hospital staff.

1. Despite pain during labor, I had pleasant feelings
2. My birth was an experience that I would not change
3. My labor was an experience that I would not change
4. Epidural analgesia allowed me to live childbirth more deeply
5. Epidural analgesia allowed me to share the experience intensely with my partner
6. Despite pain during birth, I had pleasant feelings
7. During labor I felt that everything was under control
8. During birth I felt I could not go ahead due to too much pain
9. Even now I can't stop thinking about the childbirth' pain
10. I could not tolerate pain as I wanted
11. I am satisfied with pain management through the epidural analgesia
12. During labor, I was aware of what it would happen
13. I was able to choose the most comfortable position during birth with epidural analgesia
14. Although epidural analgesia I had moments of pain during childbirth
15. As soon as I request epidural analgesia, I received it
16. During childbirth, there were no fetal complications
17. During childbirth, there were no complications for me
18. After giving birth I had a hard jump back into my activities
19. The medical staff was attentive to my needs
20. The medical staff helped me to feel calm
21. I was constantly updated by the medical staff on the progress of labor
22. During labor and delivery the anesthetist understood my concerns
23. I am satisfied with the choices took by the medical staff during childbirth
24. During the epidural administration the anesthetist was kind and attentive
25. The anesthetist was professional and well trained
26. I have been involved in the choices related to my childbirth
27. During the antenatal consultation with the anesthetist, I felt reassured and relaxed
28. During the antenatal consultation with the anesthetist, I was able to ask question
29. My privacy was respected
30. The staff members were cooperative each others
31. I felt pain during epidural injection
32. In labor & delivery room everything was organized
33. I think I had adequate information about epidural analgesia
34. During labor and delivery I was able to talk and to share the experience with my partner
35. Labor & delivery room seemed to me cold and impersonal
36. Epidural analgesia made my pain much more bearable

[Table 1]

Conclusion: Satisfaction is multidimensional and therefore difficult to define, assess and measure. We built and validated a questionnaire to assess maternal satisfaction with epidural analgesia and we hope it will be an useful tool to evaluate properly maternal satisfaction.

11AP2-5

Intermittent epidural bolus versus continuous epidural infusion for labor analgesia

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Background and Goal of Study: Intermittent bolus administration of epidural anesthetic solution compared with continuous infusion results in decreased total local anesthetic consumption and increased patient satisfaction. In this study, we compared bupivacaine consumption and the incidence of maternal motor block during the maintenance of epidural labor analgesia.
Materials and Methods: We analyzed 56 patients, ASA physical status I, nulliparous women at term and cervical dilation < 4 cm admitted at our clinic for spontaneous labor. Patients were divided into two groups. Epidural analgesia was initiated with 10 ml 0.1% Bupivacain and maintained with solution of 0.625% Bupivacain and Fentanyl 2 μg/ml in both groups. The first group (30 patients) received intermittent epidural bolus 10 ml every hour beginning 45 minutes after the initial dose. The second group (26 patients) received continuous infusion 10 ml/h, beginning immediately after the initial dose.

Breakthrough pain was treated with manual boluses (0.1% Bupivacain) administered by the anesthesiologist if necessary. The primary outcome was total bupivacaine consumption per hour of labor and the secondary outcome was the degree of motor block using the Bromage score at regular intervals throughout labor.
Results and Discussion: We studied 56 patients. The median adjusted bupivacaine consumption per hour of delivery was 8.6 mg (6.9 - 10.2mg) in the first group and 10.4 mg (9.4 - 12.6mg) in the second group. There was significant difference between the two groups in the percentage of patients requesting manual bolus doses for breakthrough pain (38% intermittent epidural bolus vs 58% continuous epidural infusion) and in the need for multiple boluses (11% intermittent vs 18% continuous). Motor block was registered in only 2 patients (5.2%) in the second group (Bromage 1).
Conclusion(s): Maintenance of epidural analgesia with intermittent epidural boluses compared with continuous epidural infusion decreased bupivacaine consumption without decreasing patient comfort or satisfaction.
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11AP2-6

A comparison of the analgesic effectiveness of different CSE (combined spinal epidural) spinal dose regimes in labour analgesia

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Introduction: The original CSE (combined spinal epidural) technique described using a spinal dose of 2.5mg bupivacaine and 25mcg fentanyl. Over time in literature and clinical practice the dosing regime has varied with the use of other local anaesthetics and opiates. Recent research has tried to evaluate the optimal analgesic dose. Whitty et al concluded an ED95 of 1.75mg bupivacaine with 15mcg fentanyl, whilst Van de Velde et al describes an ED95 of 3.3mg bupivacaine with 1.5mg sufentanil.
We aim to audit the CSE spinal dose regimes used for labour analgesia in Birmingham Women's Hospital (BWH) and assess their analgesic effectiveness.
Method: This was a retrospective analysis of consecutive CSE cases for labour analgesia in BWH from April 2011-2012. Data was collated from anaesthetic records.
Cases were categorised into 3 groups based on the spinal mixture used for the CSE (1 - plain bupivacaine, 2 - low dose epidural mixture (LDM) (0.1% bupivacaine and 2mcg/ml fentanyl), 3 - bupivacaine and 25mcg fentanyl). Analgesia insufficiency with the spinal was identified by the need for an epidural bolus immediately after the spinal. Analgesia insufficiency was compared between the groups and furthermore, within each group quantified spinal doses were compared. Statistical analysis used Kruskal-Wallis and Mann-Whitney u testing.
Results: 204 CSEs were performed from April 2011-12 (Group 1 = 10.8%, 2 = 81.9%, 3 = 7.4%). The median spinal dose; for group 1 = 3.75mg bupivacaine (IQR 2.5 - 5), group 2 = 3ml LDM (=3mg bupivacaine+6mcg fentanyl) (IQR 2.5 - 3.5ml), group 3 = 2.5mg bupivacaine (IQR 2.5 - 2.5) and 25mcg fentanyl.
Comparing the groups, the percentage of cases needing an additional epidural bolus are significantly different; 68.2% (group 1), 35.9% (group 2) and 0% (group 3) (P=0.003).
Within group 1, we found no significant association with the different bupivacaine doses used and the need for an additional epidural bolus (P=0.06). Within group 2, we found LDM >/= 3ml compared to < 3ml, had a lower percentage of cases needing an epidural bolus, 16.3% v 68.3% (P=0.032). Within group 3, no cases required an epidural bolus (P=0.03).
Conclusion: The analgesic effectiveness varied significantly between CSE spinal regimes. High fentanyl dose (25mcg) mixtures were associated with not needing an additional epidural bolus. When using LDM we found a dose >/=3ml to be associated with less need for additional epidural bolus.

11AP2-7

Main determinants of maternal satisfaction after epidural analgesia for labour

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Background and Goal of Study: Differences in maternal satisfaction (MS) of epidural analgesia (EA) for labour have been linked to race, level of education, anesthesiologists' behavior, combined spinal-EA but not thoroughly enough to delivery type, cervical dilation (CD) at time of puncture, personnel performing the EA and complications. This cohort study aims to analyze factors that influence MS after EA for labour.
Materials and Methods: Data from a 2 year period was obtained from our obstetric anaesthesia database, including: demographic, antenatal and delivery data, information regarding EA and associated complications. MS was obtained 24 hours after delivery using a scale from 0 to 10 (highest value).
We use univariate and multivariate regression models to determine the association between MS and variables studied; p< 0,05 was considered significant.
Results and Discussion: We analyzed 10079 epidurals. Mean MS was 8,9±1,7, maternal age 30,7±5,6 years, BMI 22,6±3,3, duration of labour 270±177 min. Type of delivery included: vaginal delivery (VD) 71%, instrumental VD 11%, cesarean section (CS) 18%. Demographic data, parity and type of delivery were not related to MS. Residents performed 75% of EA (1st year =4%, 2nd year= 24%, 3rd year=33%, 4th year=14%) and consultants 25% with no difference in MS regarding the personnel performing the EA. CD at puncture didn't affect MS. Catheter sitting was achieved with one attempt in 75% of cases, number of attempts didn't affect MS. Duration of labour higher than 448min (mean+1SD) affected negatively MS (p=0,01).
Complications while performing the puncture didn't affect MS. Most complications of EA produced during delivery affected negatively MS (p=< 0,001); nausea or vomiting (p=0,01), patchy EA (p< 0,001), shivering (p=0,02), need for re-sitting (p< 0,001), ineffective EA (p< 0,001), pain during 2nd period (p< 0,001) and need of general anaesthesia when labor ended in CS (p< 0,001).
On complications during the first 24 hours after delivery, only back pain affected negatively MS (p=0,004); headache, pain at point of puncture, urinary retention and hypoesthesia in lower extremities had no influence.
Conclusions: MS after EA for labour was high in our population. MS was not affected by complications directly derived from the technique; however it was negatively affected if EA was ineffective or insufficient, or re-sitting was needed. EA performed by residents showed similar MS respect to EA performed by consultants.

11AP2-8

Pregnant womens' BMI at term conditioned duration of the first and second stage of labour in epidural analgesia

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Background and Goal of Study: Complications of labour and delivery occur more frequently among obese mothers than normal controls. Several studies have demonstrated a significant relationship between increasing maternal BMI and cesarean delivery, citing cephalopelvic disproportion and failure to progress as the primary cause of this association. Literature would suggest that this risk is increased two-threefold with a BMI greater than 30.
Materials and Methods: The research group consisted of 4922 patients (3871 with BMI < 30 and 1051 with BMI ≥30) who gave birth in epidural analgesia between January 1999 and December 2011. Epidural anaesthesia was started when cervical dilatation was evaluated 4 cm. In each group duration of the epidural anaesthesia time, duration of the first and second stage of labour and indications for cesarean delivery were analyzed.
Results and Discussion: The studied groups did not differ statistically in respect of the descriptive characterization. The epidural anaesthesia time was significantly longer in mothers with BMI ≥30 (p< 0.05). The duration of second stage of labour was the longest in mothers with BMI = 30.
Patients with BMI > 30 and < 30 had significantly shorter durations of the second stage. There was a significant (p< 0.05) relationship between maternal BMI and cesarean section rate (18% in the normal group vs 27% in the obese group).
Conclusion(s): The duration of the first and second stage of labour in epidural analgesia is dependent on the pregnant woman's BMI. There is a significant relationship between increasing maternal BMI and cesarean delivery.

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11AP2-9

Effect of epidural volume extension after subarachnoid administration of isobaric bupivacaine, ropivacaine and levo-bupivacaine with fentanyl in pregnant women undergoing C-section

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Background and Goal of Study: In obstetrics comparative data of intrathecal plain local anaesthetics have been published in the past using mostly hyperbaric solutions. The evaluation of modern local anaesthetics with the addition of fentanyl in obstetrics is limited. Finally, studies comparing all 3 isobaric local anaesthetics (bupivacaine, ropivacaine and levo-bupivacaine) with the addition of fentanyl and the concomitant use of epidural volume extension (EVE) with normal saline in obstetrics do not exist to date.
Materials and Methods: Parturients (n=120) scheduled for elective c-section were allocated to 6 groups (n=20 per group) to receive isobaric bupivacaine 10 mg plus 10 μg fentanyl (BF), ropivacaine 15mg plus 10 μg fentanyl (RF), levobupivacaine 10mg plus 10 μg fentanyl (LBF) or the same local anaesthetics-fentanyl combinations with epidural volume extension with 10 ml of normal saline (BF-S, RF-S and LBF-S), respectively. Sensory, motor changes, time to first post-op analgesia and side-effects were assessed. Statistics was with ANOVA and and Fisher's exact test as appropriate.
Results and Discussion: LBF - S group was superior regarding to establishment of Sensory and Motor Block and quality of intraoperative analgesia.

	BF n=20)	RF (n=20)	LBF (n=20)	BF-S (n=20)	RF-S (n=20)	LBF-S (n=20)
Time to max sensory block (min)	13.1 ± 5.1	14.1 ± 6	17.2 ± 4.8	10.7 ± 2.9 ***	10.2 ± 3.4 ***	9.9 ± 3.4 ***
Pts with max sens. block > T2 [no (%)]	2 (10 %) $	4 (20 %)	0 (0%)	10 (50 %) ***	5 (25 %) *	3 (15%)
Sens. regression to T10 (min)	100 ± 22.7	103.2 ± 37.7	96.4 ± 21.6	112.8 ± 21.2	111.8 ± 15.8	107.4 ± 19.9
Time to max Bromage-3 (min)	7.7 ± 2.7 $	7.2 ± 3.4	10.1 ± 3.7	4.4 ± 1.2 ***	6.3 ± 3 **	6.9 ± 4.1 *
Duration of max motor block (min)	95.2 ± 24.6 $$$	62.9 ± 20.4	62.7 ± 18.4	45.3 ± 11.9 ***	46.4 ± 12.6 **	42.1 ± 8.7 *
Time to complete MB regression (min)	138.8 ± 29.6 $$$	97 ± 25	102.8 ± 24	83.6 ± 16.8	85.3 ± 18.2	84.3 ± 16.9
Time to first request for suppl. analgesia (min)	159.8 ± 18.4 $$$	142.8 ± 20.9	129.5 ± 19	116.8 ± 21.1 $$$	117.5 ± 23.2 $$$	106.5 ± 23 * $$$

[Table]

Data are means ± SD or numbers (%).
*P< 0,05, **P< 0,01, ***P< 0.001 for comparison between groups LBF vs BF-S, RF-S, LBF-S .
$P< 0,05,$$$P< 0,001 for comparison between groups BF vs BF-S, RF-S and LBF-S, respectively.
Conclusions: The LBF group results in equal quality of intraoperative analgesia but in better consistency of cephalad block when compared to the BF and RF groups. The addition of 10 ml normal saline to this group by using the EVE technique (group LBF-S) produces a faster onset of sensory block compared to group LBF (P< 0.001) without increasing the maximum sensory block. Finally all 3 EVE groups (BF-S, RF-S and LBF-S) showed a faster motor block recovery compared to the 3 non EVE groups, which might have a significant impact on fast-track obstetric surgery.
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11AP2-10

Labor analgesia: immediate complications auditing in a hospital center

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Background and Goal: The epidural block (EB) is considered a Gold Standard technique for labor analgesia which complications if not recognized and treated in time, can result in serious morbidity.
The goal of this study is to document the incidence of immediate complications of EB for labor analgesia in our Hospital.
Materials and Methods: Retrospective study, including all pregnant women submitted to EB for labor analgesia from June 2009 to May 2012. The sample was divided into three periods: year 1 - June 2009 a May 2010; year 2 - June 2010 a May 2011; year 3 - June 2011 a May 2012. We reviewed the data of immediate complications occurred during block performance and/or until the birth to the newborn. Analgesia was performed according to the department guidelines.
Results and Discussion: In our study we included 2457 pregnant women. The most common complications were: vessel puncture (4.97%), unilateral analgesia (0.81%), incomplete analgesia (0.77%) and maternal hypotension (0.49%). There was a low number of accidental dural puncture (0.20%) and impossible performance of EB (0.08%). It's worth noting the increase of the annual incidence of immediate complications during the study period: 6.11% vs 8.36% vs 10.26%.
In literature, maternal hypotension is one of the most common side effects and its incidence has been reported from 4 to 28%[1]. Paraesthesiae during insertion of epidural catheters are common (20-56%)[1] and it seems to be related to the direction of the needle and the type of catheter. In our analysis we found a lower incidence of both these complications.
The incidence of inadequate or failed epidural analgesia ranges from 0.9 to 13.1% and the most frequent reason is the lateral positioning of the catheter and its migration[1]. Accidental puncture of the dura has an incidence of less than 1% and vessel puncture can occur 1-10% of cases[1]. In our study we found similar incidences.
Conclusions: In our Hospital, the incidence that we founded for several immediate complications occurring after EB for labor analgesia was similar with the values found in the literature. However, hypotension, paresthesia and pruritis, were less frequent than other reports. As main bias of this study, we highlight its retrospective character.
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11AP2-11

Impact of obesity and overweight on epidural labour analgesia's outcomes: a retrospective study about 3970 cases

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Background and Goal of Study: Obesity during pregnancy is associated with a higher incidence of anaesthetic difficulties and complications[1,2]. This retrospective study analyzed the complications related to labour epidural analgesia paying especial attention to Obese Patients (OP), as defined by a Body Mass Index (BMI) greater than 30 kg/m^2.
Materials and Methods: After approval of the local ethics committee, our labour epidural database was analyzed for 2010. Patients were included when data of weight and height were available, and 5 groups (G1 to G5) were constituted: G1 BMI=[< 25], G2 BMI=[25-30], G3 BMI=[30-35], G4 BMI=[35-40], G5 BMI=[>40]. We analyzed demographic data, factors related to the difficulty of puncture, complications and outcome of labour. X2 test was used for qualitative data and ANOVA for quantitative data. p< 0,05 was considered significant.
Results and Discussion: 3970 patients were considered, 995 (25,1%) in G1, 1656 (41,7%) in G2, 1051(26,5%) in G3, 206 (5,2%) in G4 and 62 (1,6%) in G5, with no difference of age between groups (p=0,11). Gestational age was higher in OP (p=0,042). Cardiovascular and endocrine disease were more frequent in G4 and G5 than in the three other groups (p< 0,001). The incidence of complications of puncture (hematic puncture, accidental spinal puncture, complete spinal block) was not different between groups (p= 0,280). However OP presented more lateralized blocks and frequently required a new puncture (p=0,001). Our local difficulty score (p< 0,001) and number of attempts (p< 0,001) were higher in OP. Instrumental deliveries and caesarean sections were more frequent in OP (p=0,001).

Conclusion: Obesity *per se*, as measured by current BMI, not necessarily represents a risk factor for complications related to epidural analgesia for labour. Nevertheless, the higher incidence of not properly working epidural catheters suggests that a special attention must be paid to the efficacy of the block in these patients, who are at higher risk of instrumental and surgical delivery.

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11AP3-2

Management of a parturient with mitochondrial myopathy for elective caesarean section: a tailored multidisciplinary approach

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Background: Mitochondrial myopathies are a heterogeneous group of disorders caused by defects in mitochondrial DNA. The patients may present with a spectrum of comorbidities involving major organs and pose a challenge during the perioperative period due to the risk of metabolic decompensation and lactic acidosis. We describe the management of a parturient with mitochondrial myopathy presenting for an elective caesarean section using spinal anaesthesia which to our knowledge is the first such case report.

Case report: Our patient was a 39 year old primigravida with progressive bilateral global opthalmoplegia and mitochondrial myopathy. She was reviewed in the anaesthetic antenatal clinic prior to elective caesarean section. Her past medical history included asthma, a repaired rectovaginal fistula and four miscarriages, with a limited exercise tolerance. Spinal anaesthesia was administered with a judicious dose of hyperbaric bupivacaine with diamorphine. Anaesthetic goals were aimed at improving uteroplacental perfusion whilst ameliorating maternal oxygen delivery and preventing perioperative lactic acidosis. This was achieved by effective fluid management (including avoiding fluids containing lactate), maintenance of normothermia with prevention of shivering etc. She had an uneventful perioperative period.

Discussion: Anaesthetic considerations for obstetric anaesthesia include those of general or regional anaesthesia. Mitochondrial myopathy patients may present to the obstetric theatre fairly asymptomatically, or with the full spectrum of mitochondrial disease comorbidities (epilepsy, cardiac disease, respiratory insufficiency etc.). The key to the anaesthetic management in these parturients is that of a tailored and judicious approach to either neuraxial or general anaesthesia, with methods employed to prevent metabolic decompensation.

References:

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Learning points: We suggest specialist, multidisciplinary care. With tailored anaesthetic management dependent upon clinical findings of disease manifestation. Neuraxial techniques (if no other contraindications) are well tolerated for labour analgesia [1] or operative anaesthesia, with spinal anaesthesia proving to be safe and effective in this group of patients.

11AP3-3

General anaesthesia for caesarean section in a patient with paroxysmal nocturnal haemoglobinuria

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Background: Paroxysmal Nocturnal Haemoglobinuria (PNH) is an acquired haemolytic anaemia caused by activation of the complement system resulting from loss of cell surface protein expression in haematopoietic stem cells. PNH is clinically associated with thrombotic complications, which can be the primary causes of morbidity and even mortality. Thrombosis of uterine vessels may lead to premature labour and fetal loss. Women with PNH are therefore less likely to be pregnant and to reach full-term delivery.

Report of a Case: A 31-year-old primigravid woman was admitted at 38 weeks gestation with a diagnosis of premature rupture of membrane. Diagnosis of aplastic anaemia and PNH was made when she was 7 years old. Her general condition has been stable for the past 10 years. On admission to a maternity ward, intravenous infusion of heparin at a rate of 10,000 U/24 h was commenced. Induction of vaginal labour was unsuccessful. Heparin infusion was discontinued and urgent caesarean section was requested. Preoperative platelets count was low as 60,000/μl. Regional anaesthesia was not indicated and general anaesthesia was induced with propofol and rocuronium in a rapid sequence fashion. Ten units of packed platelets were infused perioperatively. Anaesthesia was maintained with O_2/N_2O/sevoflurane. Mechanical ventilation was carefully adjusted to avoid acidosis and hypoxaemia, which can trigger haemolytic crisis. A healthy male infant was delivered 10 minutes after induction. After delivery, the lungs were ventilated with O_2/air/sevoflurane and fentanyl was given as a constant infusion. Tracheal extubation and recovery were uneventful in the Operating Theatre. Postoperative anticoagulation therapy (heparin 12,000 U/24h and warfarin 3 mg/day) was started on postoperative day 1 (POD 1). On POD 12, the patient and her baby were discharged home without any major complications.

Discussion: PNH is characterised by intravascular haemolysis, cytopenia and an increased frequency of systemic thrombotic events. Prevention and management of these complications are of utmost importance in pregnant mothers. Several issues of PNH pertinent to obstetric anaesthesia will be discussed with literature review.

11AP3-4

Management of a parturient with prior back surgery for spontaneous intracranial hypotension: a case report and review of the literature

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Background: Spontaneous intracranial hypotension (SIH) is a rare condition associated with low cerebrospinal fluid (CSF) pressure. Management of a delivery in a parturient with prior SIH treated with back surgery has not been reported or discussed.

Case report: A healthy 28-year-old woman at 37 weeks of gestation presented with a history of previous SIH. Surgical L1-2 removal of a meningeal diverticulum with surgical blood patch was undertaken 17 months before delivery. The symptoms of SIH resolved completely following surgery.

The current pregnancy was uneventful. In order to avoid pushing efforts during labor and the possible recurrence of the SIH due to a novel CSF leak, a C-section was decided as delivery mode. Spinal anesthesia was easily performed with a 27 G Withacre needle. Anesthesia and surgery proceeded without any complications. In the postpartum period, the parturient did not develop any symptoms of postdural puncture headache (PDPH). She was discharged from the hospital 5 days later.

Discussion: SIH develops secondary to meningeal tears and CSF leakage without a history of spinal intervention. Many patients with CSF leak improve spontaneously or with conservative methods. However, in some patients symptoms persist and require treatment with epidural blood patch, percutaneous fibrin sealant placement and/or surgical repair of the underlying CSF leak.

Probably generalized connective tissue weakness plays a role in the development of spontaneous spinal CSF leaks. Cases of parturients developing SIH without spinal intervention after delivery and rupture of the arachnoid membrane during labor have been reported.

In patients with previously surgically treated SIH we face two challenges. First the raise in the CSF pressure during labor may cause a new dural tear. We therefore opted for a C-section although vaginal delivery might be relatively safe one year after surgery if the postoperative MRI is free of residual anomaly. Second, the choice of the anesthesia technique is difficult. Epidural techniques are unreliable due to previous back surgery, surgical blood patch and potential remodeling of the epidural space prenventing harmonious diffusion of the anesthetics. The risk of PDPH after spinal anesthesia may be increased due to the underlying meningeal “weakness”. Finally endotracheal intubation and cervical extension have been associated with secondary SIH in such patient, leaving spinal anesthesia as an option.

11AP3-5

A deceptive case of seizure in pregnancy

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Background: Women of childbearing years account for 25% of all people with epilepsy and most of these women will require long-term treatment with anti-epileptic drugs. Approximately 3-4 pregnancies in every 1,000 occur to women with epilepsy and 1,800-2,400 infants are born in the UK every year to women with epilepsy. Managing fitting epileptic pregnant women during perinatal period can be challenging.

Case report: We report a case of 36 years-old primigravida at 34 weeks of gestation with known temporal lobe epilepsy, who was brought in by ambulance with tonic clonic seizure of more than 30 minutes duration. In view of her high blood pressure and seizure we decided to treat her as eclampsia and performed emergency caesarean section, as she was seizure free for the past 11 years. The women received treatment according to our hospital guideline for eclampsia to lower her blood pressure and underwent emergency operation under general anaesthetic. She was transferred to ITU, extubated the same day with no adverse outcome and the baby admitted to special care unit.
Discussion: Well controlled epilepsy may improve or even deteriorate during pregnancy(1). Usually women with poorly controlled epilepsy can get worse during pregnancy. Differentiation between seizures caused by epilepsy or due to eclampsia is important as the management differs for both. In such situations patients should be treated as eclampsia unless otherwise proved(2). But uncontrolled seizures caused by either are detrimental to baby and will need delivering. In our patient as she had status like seizure on presentation with high blood pressure we had to treat her as eclampsia and treat accordingly. When her blood results were available, she had normal LFT's and platelets which is one of the diagnostic feature against eclampsia.
References:
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Learning points: Differentiation between seizures caused by epilepsy or due to eclampsia in an acute situation is difficult. It is important to differntiate between these conditions, as the management differs for both. In such situations patients should be treated as eclampsia unless otherwise proved.

11AP3-6

Acute respiratory failure in immediate postpartum

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Background: The percentage of pregnancies that are complicated by acute pulmonary edema has been estimated to be 0.08%.[1]
Case report: A 37-year-old caucasian woman, ASA I, that had uneventful pregnancy with eutocic birth delivery, needed surgical intervention for retained placenta. As anesthesic technique was used epidural catheter and was made a sedation with propofol. It was administrated intravenous ocytocin (10U) and 600 mcg of sublingual misoprostol. As she was entering Postanesthesia Care Unit, develops a supra ventricular tachycardia. The blood test result showed hemoglobin 4g/dl and platelets count 66 000/ul. She started a transfusion of 1U of packed red blood cells(RBC). Meanwhile the patient developed an acute pulmonary edema with respiratory failure (type I), with hyperthermia (between 39,7-40.1ºC),hemodynamically stable, sustained diuresis, peripheral vasodilation and scarce vaginal losses. In 3 hours that was in the operating room has made 1760 ml/h of fluids (crystalloids: 4300 ml, colloids 1000ml), 6U of RBC and 1 pool of platelets. She was transferred to the ICU due to respiratory failure and started noninvasive ventilation. Transthoracic echocardiography didn't show signs of right overload and chest X-ray with bilateral diffuse consolidation. On the 2nd day as the respiratory function worsened orotracheal intubation was made as well as a prone position, on the 3rd day left the prone position and on the 4th day she was extubated. She was discharged after 10 days, hemodynamically stable, with SatO2 98% and analytically whitin normal.
Discussion: The cardiogenic cause for pulmonary edema was excluded by echocardiogram and within the noncardiogenic causes possible amniotic fluid embolism was also excluded. All the fluid excess and politransfusions made as an attempt to correct sudden fall of hemoglobine postpartum can have contributed to this sudden acute respiratory failure, associated with a pulmonary edema. However, all the strategies of compensation have occurred after the complication had already happened. So, the possibility of the vasodilator effect of uterotonic agents such as misoprostol and oxytocin, the latter also have an antidiuretic effect[2], must be considered.
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Learning points: It is important to be aware and alert to the adverse effects of the use of uterotonic agents such as oxytocin and misoprostol used in obstetrics empirically.

11AP3-7

Spinal anaesthesia for emergency caesarean section in a parturient with acute subarachnoid haemorrhage

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Background: Subarachoid hemorrhage during pregnancy is rare, estimated to be 0.014%.(1) We describe the anaesthetic management of emergency caesarean section in a patient with acute subarachnoid haemorrhage under spinal anaesthesia.
Case report: F, a 29 year-old healthy parturient, presented at 37 week gestation with severe headache. She was Glascow Coma Scale (GCS) 15 without neurological deficit. Computed tomography revealed subarachoid haemorrhage, without raised intracranial pressure. After a dose of paracetamol for analgesia, patient refused all medications due to the fear of maternal-fetal drug transfer. A multidisciplinary team conferred and after informed consent, planned on an emergency caesarean section prior to further interventional neuroradiological procedures.
Spinal anaesthesia for the caesarean section was chosen for the following advantages: avoidance of hypertensive response during intubation and airway manipulation; avoidance of airway management and possible aspiration; and excellent analgesia. Regional anaesthesia allowed continuous monitoring of patient's GCS perioperatively.
Spinal anaesthesia was performed uneventfully with hyperbaric bupivacaine 0.5%, 2.3ml and fentanyl 15 mcg. Caesarean section proceeded and patient experienced no discomfort throughout procedure. Preoperative blood pressure and heart rate ranged between 123/68-140/68 mmHg and 78-89 per minute. Intraoperative blood pressure and heart rate were maintained between 105/54-128/64 mmHg and 87-96 per minute.
Satisfaction for anaesthesia was high due to good blood pressure control and fetal outcome.
Discussion: General anaesthetic management of caesarean section in a parturient with intracranial haemorrhage has been described. However, due to the rarity of the condition, no consensus has been reached with regards to optimal anaesthetic care. Despite the numerous advantages which spinal anaesthesia can offer, the authors did not find any precedent report in literature. In addition to the known risks of spinal anaesthesia, post dural puncture headache (PDPH) may be difficult to diagnose in a patient with existing headache. Worsening headache due to PDPH may confound the evaluation of rebleed in intracranial aneurysm. Our patient did not experience this problem, fortunately.
Learning points: In a patient with recent subarachnoid haemorrhage, minimal neurological deficit undergoing emergency caesarean section, spinal anaesthesia offers good haemodynamic control.

11AP3-8

A pregnant with Churg-Strauss syndrome undergoing elective caesarean section

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Background: Churg-Strauss syndrome (CSS) is characterized by asthma, eosinophilia and systemic small and medium-sized vasculitis. The clinical picture comprises allergic rhinitis, predisposing to pulmonary infiltration, peripheral neuropathy and potentially life-threatening cardiac failure.
Case report: A 38-year old female, gravida 2, para 1 with CSS and a history of asthma and heart failure, was admitted at 36 weeks of pregnancy for elective caesarean section. On admission she was hemodynamic stable (NYHA II) with a pulse rate of 110 beats/minute and a blood pressure of 130/80 mmHg. Echocardiogram showed generalized left ventricle hypokinesis, decreased ejection fraction (EF) of 37%. On admission to theatre she was tachycardic (HR-140/min), blood pressure of 140/85 mmHg, cardiac output of 8.21 l/min, cardiac index of 4.2 and stroke volume variation of 29%. Caesarean section was performed in general anaesthesia. The ICON Electrical Cardiometry system was used to measure cardiac output (CO), cardiac index (CI), stroke volume (SV), stroke volume variation (SVV), systemic vascular resistance (SVR), mean arterial pressure (MAP) and heart rate (HR). Four minutes after induction, an infant with an Apgar score of 9 was delivered. CO, CI, SV, SVV was decreased but SVR was increased after the delivery of baby and administrated oxytocin. The patient's clinical condition and hemodynamic parameters normalized after the caesarean section.
Conclusions: The ICON, a method for measuring hemodynamics non-invasively, demonstrated decreased stroke and cardiac indices, suggesting a diagnosis of acute left ventricular failure. ICON is a monitoring technique ideally suited for use during caesarean section.

References:
1. Ito Y, Endo Y, Kojima A, Sato M, Horinouchi T, Kato M: A case of Churg-Strauss syndrome undergoing cesarean section. Masui. The Japanese journal of anesthesiology 05/2004; 53(4):420-1.
2. Corradi D, Maestri R, Facchetti F: Postpartum Churg-Strauss syndrome with severe cardiac involvement: Description of a case and review of the literature. Clinical Rheumatology, June 2009, Volume 28, Issue 6, pp 739-743
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11AP3-9

Making way to an EXIT - a rare case report

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Background: EXIT (Ex Utero Intrapartum Treatment) surgery is a rare procedure performed on fetuses with birth defects that interfere with airway patency. Cesarean section (CS) with partial extraction of the fetus and maintenance of maternal-fetal circulation increases the survival rate of these infants. The success depends on the involvement of a multidisciplinary team and careful planning. We present an EXIT procedure secondary to a cervical tumor.
Case report: Healthy, 25 years old, gravida 2 para 0, prenatal diagnosis of a fetal cervical lymphangioma with tracheal deviation and mediastinal infiltration. Elective CS at 38 weeks. Multidisciplinary approach by 6 different specialitys. Carefull anaesthesia planning. An arterial line and two peripheral intravenous lines (16G) were placed before induction. Intravenous nitroglycerin and intramuscular anaesthesia for the fetus were prepared. Halogenated general anaesthesia and pre-induction with fentanyl. Fluid therapy with crystalloids and colloids. After partial fetus extraction amnioinfusion was started. Fetal direct laryngoscopy and tracheal intubation were uneventful. EXIT time was 4 minutes and 46 seconds. The mother remained hemodynamically stable all surgery. Intravenous postoperative analgesia.
Discussion: CS with EXIT requires a totally different anesthetic approach within a multidisciplinary context and a precise coordination. We chose halogenated anesthesia rather than a regional technique as a way to maintain fetus anaesthesia and uterine hypotonicity, ensuring conservation of placental circulation. Although having been prepared as a first-line tocolytic, nitroglycerin wasn`t necessary, probably given the EXIT`s duration. Maternal blood pressure also determines uteroplacental flow and should remain within 10% of baseline, justifying invasive blood monitoring. Optimization of fluid therapy avoided vasopressores. After birth, pharmacological reversal of iatrogenic uterine hypotonia was imperative. Given the possibility of a uterine atony, hypovolemic shock and coagulopathy, postoperative intravenous analgesia was used instead of neuraxial analgesia.
References:
Journal of Clinical Anesthesia 13:387-391, 2001; *AANA Journal*, Vol. 79, No. 6, December 2011.
Learning points: Anaesthetic team should focus on leadership and anticipation of possible problems. Preparatory meetings with distribution of precise tasks to all participants and intraoperative simulation should be made.

11AP3-10

Caeserean section in a patient with Addison's disease - a case report

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Background: Chronic primary adrenal insufficiency, described by Addison in 1855 is a potentially lethal endocrinopathy, with a prevalence of 39-110 cases per million. It is due to destruction of the adrenal cortex and presents as glico- and mineralocorticoid insufficiency. Women have low fertility rates and increased risk of caesarean section and premature labour. Despite this, when treated, they present no greater risk of complications both to the pregnant woman or the fetus.
Case report: 30 year-old primiparous female, ASA II, 36 weeks of gestation, with history of Addison's disease, on prednisolone 15mg daily, presented for grade 3 caesarean section.
Hydrocortisone 100mg IV was given preoperatively. The patient refused regional anesthesia. A rapid sequence induction general anesthesia with pentothal 500mg and suxamethonium 100mg, rocuronium 50mg and maintained with sevoflurane on oxygen/air mix. After extraction of the fetus, fentanyl 100μg, oxytocin 10UI and cefoxitin 2g were given. Analgesia was managed with paracetamol 1g, metamizole 2g and tramadol 200mg. Neuromuscular blockade reversal was achieved with sugammadex 200mg.
The perioperative period was uneventful. On the 39th day post-cesarean section, the patient was admitted to ICU with an addisonian crisis, with hemodynamic instability. She was discharged 7 days later.
Discussion: We report the case of a caesarean section grade 3 on a woman with treated Addison's disease who refused regional anaesthesia. Literature is scarce on the adequate anaesthetic technique for this situation. It is known that labour, caesarean section and puerperium may trigger and addisonian crisis. In this case, the addisonian crisis at the 39th post-operative day may have occurred due to the hormonal changes of the puerperium. The authors discuss the advantages of the different anaesthetic techniques, highlighting the importance of the multidisciplinary approach to the perioperative period.
References:
BJORNDOTTIR, S et al. *Addison's Disease in Women Is a Risk Factor for an Adverse Pregnancy Outcome*. J Clin Endocrinol Metab. December 2010, 95(12): 5249-57
Learning points: General anaesthesia is an adequate anaesthetic technique for a caesarean section on a pregnant patient with treated Addison's disease. The perioperative period and the puerperium are moments of increased physiological stress and must be approached by a multidisciplinary team.

11AP3-11

ARDS due to sepsis in a pregnant women: a clinical challenge

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Background: In developed countries maternal mortality in obstetrics has declined, constituting about 1%. Frequent causes of death are hemorrhage, complications of abortion, pregnancy-induced hypertension and infection/sepsis.
Case report: Twenty year old female, 20 weeks pregnant, ASA I. Resorted to the hospital with lower back pain and fever. Obstetric ultrasound showed a single live fetus with facial teratoma. She was diagnosed with pyelonephritis, initiating antibiotics and misoprostol. Laboratory values showed a systemic inflammatory response. Twelve hours after the ultrasound showed a dead fetus. Thirty hours after, she presented a sudden onset of tachypnea with a peripheral saturation of 82% (FiO2 21%). Blood gas analysis (FiO2 70%) showed pO2 48.9 mm Hg and pCO2 36.2 mm Hg. Mechanical ventilation support in addition to emergency cesarean section was performed. In the operating room tachypnea and hypoxia were present, bibasilar crackles, decreased breath sounds and overall intolerance to supine position. General anesthesia with rapid sequence induction in sitting position was performed. Abundant clear pink liquid in the orotracheal tube and elevated airway pressure prevented connection to the ventilator, so manual ventilation was maintained. Chest radiograph showed images compatible with ARDS.
At the end of the surgery severe hypoxemia and difficulties in ventilation remained. Transthoracic echocardiogram was performed revealing no abnormalities, during which the patient went into cardiopulmonary arrest (CPA) with asystole. Advanced life support (ALS) was initiated and successful. Continuous infusion of norepinephrine was initiated due to hemodynamic instability. Twenty minutes later new CPA took place and prolonged unsuccessful ALS was ceased.
Discussion: Diagnostic hypotheses are ARDS due to sepsis or thromboembolism. Hypothesis of amniotic fluid embolism is supported by the presence of a dead fetus with prolonged expulsion period and a rapid fulminating evolution. However, transthoracic echocardiogram showed no abnormalities. Supporting the diagnostic hypotheses of ARDS due to sepsis is the preexisting source of infection with systemic inflammatory response and posterior lung injury with subsequent dysfunction/failure. The ratio PaO2/FiO2 < 200 and presence of SIRS criteria are also in favor. Autopsy report showed findings consistent with ARDS.
References:
Harman, EM, Pinsky MR. Acute Respiratory Distress Syndrome, Medscape, March 2012;

11AP4-1

A prospective study of correlation between multi-orifice epidural catheter deviation and unilateral block in post-cesarean analgesia

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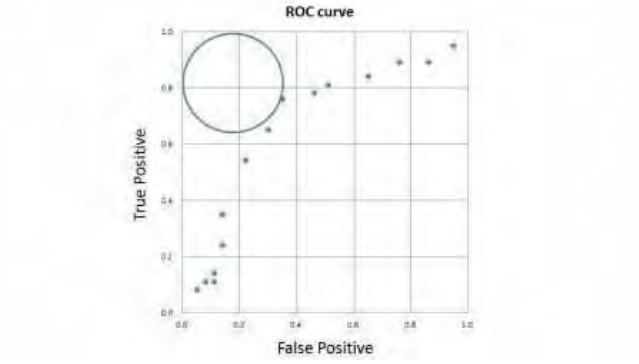
Background and Goal of Study: Epidural catheter deviation is one of the causes of unilateral block in postoperative epidural analgesia for cesarean delivery. We examined the effect of the magnitude of epidural catheter deviation on unilateral block by prospectively reviewing cases in which epidural analgesia was used for post-cesarean pain relief.
Materials and Methods: A prospective study on cesarean delivery cases followed up by anesthesiologists from March 2012 to July 2012 in Seirei Hamamatsu General Hospital. Position of the catheter tip was confirmed with post-operative X-ray films. Combined spinal-epidural anesthesia was performed in all cases. Multi-orifice catheter was placed through Th11-12 or Th12-L1 to 5 cm cepharad direction. Eight mg hyperbaric bupivacaine and 20 μg fentanyl were injected into spinal subarachnoid space through L3-4. After surgery 0.2% ropivacaine was started with 3 ml/h dosing rate using PCEA pump. We noted the distance of tip of the catheter from right or left of the midline of spine. We evaluated analgesic effect by using cold test. Unilateral block was defined as a negative cold test on only the same side as the catheter deviation. Different anesthesiologist evaluated X-ray film and analgesic effect. We used ROC curve to study cut-off value and accuracy. Catheter placement on lumber area, catheter tip not recognized in an X-ray film and no analgesic evaluation after surgery was excluded from the study.
Results and Discussion: There were 151 cesarean sections in this period and 74 cases were included in this study. There were 37 unilateral blocks. We described ROC curve. Cut-off value was 7 mm and AUC was 0.7.



[ROC curve]

Conclusion(s): In our study over 7 mm epidural catheter deviation correlated to unilateral block, but accuracy was not high. There may be other predictors of unilateral block in post-cesarean analgesia.

11AP4-2

Effect of a new algorithm on blood transfusion during postpartum hemorrhage (PPH)

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Background and Goal of Study: Recent knowledge suggests the pivotal role of fibrinogen and fibrinolysis in the severity in PPH. Our local protocol implemented the use of fibrinogen and antifibrinolytics (Tranexamic acic) as a second step after the use of sulprostone and before uterine embolization in the therapeutic algorithm.
The aim of this study was to evaluate the effect of this new protocol [2009-2011 period] on blood products transfusion as compared to the [2000-2004 period] when uterine artery embolization was introduced.
Materials and Methods: This retrospective case-study collected data from computer files of patients.Severe PPH was defined as blood transfusion ≥4 units or uterine artery embolization or hysterectomy. Coagulopathy was defined by PT< 50% or APTT> 1.5 or platelet count < 100 G/L or + dDimers or fibrinogène < 2g/L, Data between the 2 periods were compared by exact Fischer tests or ANOVA; results are expressed as mean ± Se with a p< 0.05 as statistical threshold.
Results and Discussion: The incidence of PPH increased from 2.12% (183/8664) to 3.47% (289/8318), p< 0.01 and severe forms were reduced from 32.3% to 26,0% of PPH (p = 0.02). Among women requiring transfusion, red blood cell units transfusion decreased from 5.17 ± 4.48 U to 3.58 ± 2.69 U (p< 0.01). Coagulopathy was observed in less PPH (31.0% and 26.3%of PPH, p< 0.01) . calculated blood loss In transfused patients decreased from 4435 ± 2402 mL to 3359 ± 1590 mL (p< 0.01).
Fresh frozen plasma and platelet transfusion did not vary (not shown) Sulprostone use was increased (49.2% vs 54.0% of PPH, p< 0.01).) as was those of fibrinogen concentrates (7.1% 30,45% of PPH, p< 0.01) and Tranexamic acid (0% to 21.8% of PPH, p< 0.01). Uterine embolization was necessary in respectively 40 (21.9%) and 60 (20.75%) cases then Hysterectomy in respectively 4 and 2 women.
This therapeutic algorithm led to an increased sulprostone, tranexamic acid and fibrinogen administration but less severe PPH and erythrocytes concentrates use. The absence of effect on fresh frozen plasma use may be explained by clinical habit to order immediately this blood product.
Conclusion(s): This retrospective study adds a new milestone on the potential role of fibrinolysis and fibrinogen in the severity of PPH.

11AP4-3

A case of postpartum haemorrhage after emergency caesarean section in which bleeding was controlled with tranexamic acid administration on the basis of ROTEM™ thromboelastometry

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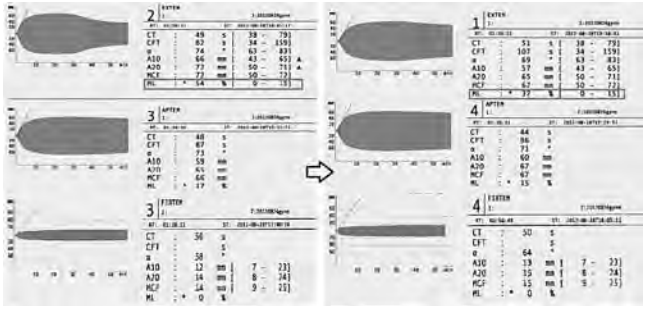
Background: Haemorrhage following caesarean section (CS) often causes disseminated intravascular coagulation (DIC). Hyperfibrionlysis DIC is usually diagnosed by estimating the levels of thrombin antithrombin complex, plasmin-α2-plasmin inhibitor complex, and D-dimer. ROTEM provides point-of-care patient assessment of the entire coagulatory system within 30 min. We report a case of postpartum haemorrhage after emergency CS in which bleeding was controlled after tranexamic acid (TA) injection and diagnosis of hyperfibrinolysis on the basis of ROTEM.
Case report: A 37-year-old pregnant female presented with premature separation of the placenta at 29 weeks and 5 days of gestation. Emergency CS was performed because of foetal distress. Postpartum haemorrhage persisted despite administration of anti-thrombin III (500 U) and fresh frozen plasma (FFP, 2 U). Subsequently, ROTEM was performed.
The maximum lysis (ML) of extrinsic ROTEM (tissue coagulation activator, ExTEM) was prolonged and that of aprotinin ROTEM (ApTEM) and fibrinogen ROTEM (FibTEM) was within the normal range. We administered 2 g TA; ML of ExTEM decreased from 54 to 37%, as indicated in Figure 1. We administered 4 U of red blood cell concentrate because the haemoglobin level was 7.1 g/dl and blood loss was 2090 g.



[Figure]

Discussion: Several randomized controlled studies[1,2] have proven the efficacy of intravenous TA for decreasing bleeding after elective CS. However, the TA doses in these studies were not determined by real-time measurements of hyperfibrinolysis, such as ROTEM. Levrat et.al[3] recommended TA dose adjustment on the basis of the severity of hyperfibrinolysis judged according to ML of ExTEM in cases of post-traumatic bleeding. Therefore, we hypothesised 'Learning points' on the basis of our experience with the case.
References:
1. Int J Gynaecol Obstet 2011;115:224-6
2. Eur J Obstet Gynecol Reprod Biol. 2004;112:154-7
3. Br J Anaesth;100:792-7,2008

Learning points:
1. The TA dose should be decided on the basis of ML of ExTEM.
2. Some CS cases with hyperfibrinolysis do not show decrease in MCF of FibTEM; therefore, bleeding can be controlled in such patients by administering TA alone.

11AP4-4

Thromboelastometer (monoTEM-A) in pregnancy: reference values during labor and after delivery

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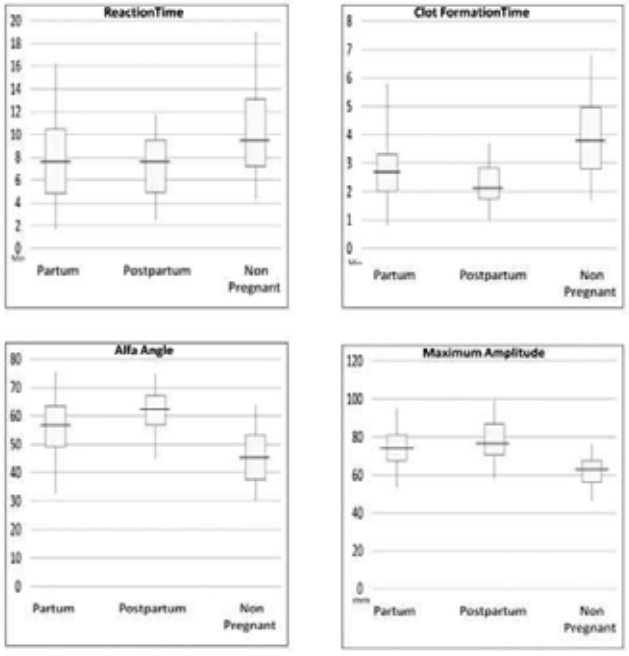
Background and Goal of Study: Pregnancy is associated with a state of hypercoagulability. Thromboelastography has been used in pregnant woman, however the normal values in labor and after delivery have not been established yet. The study aim was to determine the reference ranges for the thromboelastometer in healthy pregnant women during labor and after delivery.
Material and methods: After institutional approval, informed consent to collect blood samples for analysis was obtained from 95 healthy laboring women and 40 non pregnant women volunteers. A 360 μL sample from 1 mL of whole native blood was tested using thromboelastometry (monoTEM-A, Framar Hemologix) and analyzed within 4 min. The entire procedure was performed at 37 °C. The following parameters were recorded: R = time to initial fibrin formation; K = the time to initial of clot formation; Alfa Angle = the acceleration of clot formation and MA = the strength of the blood clot. MonoTEM-A® device was calibrated and tested daily.
Results and Discussion: Results are presented in the Graphs. We observed a state of hypercoagulability in laboring women which increased after delivery when compared with control.



[Figure 1: The bottom and top of the box represent the 25th and 75th percentile. The band inside the box shows the median. The ends of the whiskers represent the minimum and maximum of all the data.]

Conclusions: MonoTEM-A thromboelastometry confirms the hypercoagulability of pregnancy and puerperium. This study established formal reference ranges for monoTEM-A that may be useful in laboring women, 24 h after delivery and in childbearing age women.

11AP4-5

Efficiency of temporary balloon occlusion of iliac arteries in patients at high hemorrhagic risk undergoing cesarean section

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Background and Goal of Study: Obstetric hemorrhage is a leading cause of maternal death(1). Temporary balloon occlusion (TBO) of the internal iliac arteries for bleeding control in parturients at high hemorrhagic risk can be associated with a reduced estimated blood loss (EBL) and fewer massive transfusions (2), but clinical data are controversial (3). The goal of this prospective study is to compare the TBO technique to a routine technique for bleeding control and short-term outcomes in high hemorrhagic risk parturients scheduled for caesarean section.
Materials and Methods: After informed consent we included 16 patients with either placenta prævia, placenta accreta or polymyomatous uterus and allocated them randomly into two groups. Group 1 (Gr1) having and Group 2 (Gr2) not having a bilateral TBO catheter placed befors the CS. A neuraxial anesthesia technique was performed in both groups. TBO catheters were inflated immediately after umbilical cord clamping and deflated after placental extraction and surgical haemostatic control.
Fluid replacement volume, EBL, transfusion requirements and total hospital stay were compared between the two groups.
Results were analysed using: Bartelett's test, T-test, Fisher's Exact test and Chi-Squared test ($p < 0.05$ significant).
Results and Discussion: Age, ethnicity, BMI and gestational age were similar between groups. Patient's parity was higher in Gr 1 (1,75 vs 0,625 p=0,0027). The EBL in Gr 1 was 1687 ml vs 1925 ml in Gr 2 (p=0,63) but this difference did not reach statistical significance. No differences were observed between groups for crystalloid (Gr 1= 1242 ml vs Gr 2= 1375 ml p=0.64) and colloid administration (Gr 1= 500 ml vs Gr 2= 812 ml p=0.124). 3 patients in each group needed transfusion and a total of 8 units of packed red blood cells were necessary respectively in each group. Total hospital stay was higher in Gr 1 (18.75 days vs 7.625 p=0.026) probably due to higher observational preprocedure hospitalization.
Conclusion(s): EBL and transfusion requirements were not lower in the group with TBO.
References:
1. World Health Report. World Health Organisation 2005
2. Ballas J. et al. Am J Obstet Gynecol 2012 ; 207 :216.e1-5.
3. Bodner LJ et al. Cardiovasc Intervent Radiol 2006;29:354-61.

11AP4-6

Relationship between NICE classification for caesarean section and type of anaesthesia. Nine months audit in a teaching hospital

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Background and Goal of Study: National Institute for Clinical Excellence (NICE) standardized scheme about emergency Caesarean Section (CS) is widely used in our hospital in order to aid clear communication among healthcare professionals. Our goal was to describe the relationship between NICE classification and the employed anaesthetic thechnique.
Materials and Methods: We conducted an audit of our anaesthetic practice considering all patients undergoing CS between January 1st September 30th of 2010. All the medical records of the patients were reviewed. The following variables were recorded :age,NICE score and reason for CS, type of anaesthesia and the reason for general anaesthesia (GA),when in case,presence of epidural analgesia for labour. Anova was eployed for quantitative variables and Chi-2 for qualitative variables. A p value < 0,05 was considered significant.Odds Ratio (OR) is presented as number (IC).
Results and Discussion: 1432 patients had a CS during the considered period. According to the NICE classification,category I CS was recorded in 202 (14,1%) cases,II in 379 (26,5%) cases,III in 467 (32,6%) cases,and IV in 365 (25,5%) cases. In 19 patients (1,3%) NICE score was not reported. Patients presenting epidural catheter for labour analgesia were 615 (42,9%) and 520 of them (84,5%) underwent epidural top-up for CS. In the remaining 812 patients (56,7%),anaesthesia technique for CS resulted as:epidural block in 40 patients (4,9%); Combined Spinal Epidural (CSE) in 635 patients (78,2%); spinal Anaesthesia (SA) in 81 patients (9,9%);GA in 151 patients (18,6%).No data regarding anaesthetic technique were available for 5 patients (0.4%). A NICE I classification resulted as a determinant risk factor for GA,with an OR

of 14,22(9,71-20.81),p< 0.0001. On the other hand,epidural analgesia for labour acted as a protective factor against GA,with an OR of 0,37 (0,25-0,55),p< 0,0001. Considering only NICE I classified patients,the protective role of the epidural catheter appeared to be stronger,with an OR of 0,052(0,025-0,109),p< 0,0001.
Conclusion: According to the present data,NICE grade I is mainly associated with GA and epidural catheter use appeared to be a protective factor against GA,especially when an immediate threat to life for woman or fetus was present. CSE is used in NICE 2 and 3 as general use in our hospital.with good results.

11AP4-7

Obstetric anaesthesia and analgesia month attributes in Czech Republic 2011 - prospective national observational survey

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Background and Goal of Study: At present, the anaesthesia team became an integral part of the multispecialized team caring for woman in the peripartum period. The aim of this study is to describe anaesthesia practice in the peripartum period in the Czech Republic (CZ).
Materials and Methods: OBstetric Anaesthesia nad Analgesia Month Attributes in CZech (OBAAMA-CZ) was held on anaesthetic departments throughout the CZ. With Ethical Committee Approval we aimed to enroll all 97 obstetric departments in CZ and to monitor every case of anaesthetic care in peripartum period during November 2011. Data were recorded to Case Report Form with two parts (Demography 2010 and Case Report) into db-Trial database (Yale University, USA). The data were described descriptively (mean, median, SD). Fisher exact and Kruskall Wallis tests were used in case of categorical variables (Statistica 10, CZ).
Results and Discussion: During the study period, we enrolled 49 participating centers and 1940 cases. Non-stop anaesthetic service for delivery room was provided in 41 sites (83.7%). Induced labour was recorded in 22.8% cases, Caesarean Section (CS) rate was 24.3%. The most preferred type of anaesthesia for CS was neuraxial anaesthesia (52.4%; spinal in 76.0%). In case of General Anaesthesia (47.6%) for CS, the predominant reason was urgency (46.8%). Postoperative analgesia after CS was provided mostly with opioid or non-opioid analgesics (66.3%; 61.0%) solely or in combination. There was no significant difference (p>0.05) in epidural analgesia rate (12.1% overall) between large (>2000 deliveries per year; 14.7%), intermediate (1000-2000; 7.5%) and small (up to 1000; 6.2%) centers. Labour analgesia administration was significantly more frequent in primiparas if compared to multiparas (p< 0.001), in parturients with BMI< 30 if compared to BMI>30 (p=0.03) and in term births if compared to pre-term births (p< 0.001); equally frequent for induced labour if compared to non-induced (p=0.99), for newborns with weight more than 4000 grams if compared to newborns under 4000 grams (p=0.76) and for parturients older than 30 years if compared to younger than 30 years (p=0.99).
Conclusion: Compare to previously published national data, there is a positive trend in preference of neuraxial anaesthesia for CS, but simultaneously there is no progress in general availability of epidural analgesia for parturients in Czech Republic.
Acknowledgement: *Financial support Internal Grant Agency: NT 13906-4/2012.*

11AP4-8

Obstetrical histerectomy for postpartum haemorrhage: a prospective observational descriptive study of anatomopathological risk factors

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Background and Goal of Study: Emergency Obstetrical Histerectomy (EOH) is usually performed in case of postpartum hemorrhage (PPH) as an ultimate measure when the conservative treatment has failed. It is considered a good indicator of severe PPH. In the last years, the number of parturients with classically described risk factors for EOH, placentation anomalies and uterine atony (REF), has increased. They are associated with a history of previous cesarean section (PCS). This retrospective study aimed to audit our EOH causes after severe PPH, based in uterine anathomopathological reports.
Materials and Methods: After local ethic committee approval, the medical records of all parturients who suffered an EOH for PPH between 2008 and 2012 were analyzed. We recorded obstetrical notes of the patients, and, in the anatomopathological report, the type of placentation and other additional pathology data. We determined the prevalence of the anomalies. Qualitative data were analyzed with chi-2 test. P< 0.05 was considered significant.
Results and Discussion: 70 patients with PPH had an EOH between 2008 and 2012. 30(42,8%) presented placentation defects: 2(2,8%) had placenta previa, 14(20%) placental accretism and 14(20%) decidual, intrauterine hemorrhage, which can be due to placental abruption. EOH was performed in 12(17%) patients with uterine atony, 5(7,14%) had an uterine rupture, 3(4,28%), and 14(20%) from other etiologies. 15(21,4%) parturients had a PCS as a risk factor. 12 (80%) of them presented a placentation anomaly or uterine atony, versus 28(50.9%) in patients with no uterus scare (OR: 3.86 [0.98;9.70]). 52 (74.2%) women received 5 or more units of red blood packed cells, 62 (88.6%) needed two or more fresh frozen plasma units, and the same number received 2 or more grams of fibrinogen. 7 (1%) patients had selective arterial embolization before or after the EOH. Postoperative complications: acute pulmonary oedema in 6 (8.5%) patients, acute renal failure in 11 (15.7%) patients and transient myocardial ischemia in 10 (14.3%) women.
Conclusion(s): EOH is often associated to a massive PPH with a high impact in maternal perioperative morbidity. OEH was associated with a high prevalence of placentacion defects, especially in patients with a PCS. An accurate pre-delivery patient's high risk factors evaluation is important to try to decrease the rate of EOH.
References:
Gutiérrez M.C., et al. IJOA. March 2012.

11AP5-1

Defining roles in the initial phase of the emergency caesarean section: can we do better?

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Background and Goal of Study: A seminal publication by the US Institute of Medicine, "To Err is Human" remarks that deaths due to medical error exceed those attributable to motor vehicle accidents. A Congressional investigation identified communication as the commonest cause of medical error. This is particularly relevant in an emergency caesarean section (ECS), which commands a well-organised, cohesive team to expedite delivery. Delays from decision to arrival in theatre can have a negative effect on outcome. We surveyed healthcare workers perceptions of their roles in this acute situation to identify mechanisms to reduce delay.
Materials and Methods: Maternity professionals at St Thomas' and Medway Maritime hospitals were surveyed using a standardised pro forma. Participants highlighted what they perceived to be the greatest causes of delay (maximum two answers per response). Subjects then identified the individual responsibilities of the maternity team in the pre-theatre stage. Answers were voided if multiple choices were selected for these single best option questions.
Results and Discussion: 147 maternity based professionals were surveyed. Perceptions surrounding delay in ECS fell into three main categories: mobilising the theatre team (24%), transferring the patient to theatre (23%) and communication (20%). Collectively these accounted for 167/252 of responses. Opinion was divided regarding who was responsible for informing the anaesthetist in an ECS. 58 (45%) of 130 people (17 voids) believed it was the obstetrician's duty, whilst 57 (44%) deemed the midwife in charge (MWC) accountable. Comparatively the majority (93/137 (10 voids)) of professionals indicated it was the MWC's responsibility to inform theatres. However 12/28 (42%) obstetricians, 9/30 (30%) anaesthetists, 7/55 (13%) midwives and 2/24 (8%) anaesthetic nurses believed the obstetrician was responsible. With respect to alerting the anaesthetic nurse 88/139 (63%) participants (8 voids) considered this to be the MWC's role rather than the anaesthetist (27%), obstetrician (5%) or midwife looking after the patient (2%), and the remainder were unsure (3%).
Conclusion: Mobilising the theatre team; arguably a component of communication was identified as the greatest cause of delay in ECS. Confusion over roles may contribute to tasks being overlooked or duplicated. The authors propose a cardiac arrest style algorithm for ECS. Protocolising ECS would potentially reduce delay and latent error.

11AP5-2

General anesthesia for breast cancer surgery during pregnancy: a retrospective review at a breast cancer center in Tokyo between 1999 - 2011

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Objective: To find out if general anesthesia (GA) during pregnancy has a harmful effect on pregnancy, the wellbeing of the fetus, or cancer growth.
Methods: After obtaining IRB approval, we conducted a retrospective review of medical records at St. Luke's International Hospital in Tokyo.
Results: Out of approximately 13,000 deliveries at our hospital between 1999 - 2011, we identified 29 parturients diagnosed with breast cancer (Stage1-3) and 17 of 29 underwent surgery under GA when they were 17-32 weeks of gestation. The remaining 12 patients did not receive surgery before delivery, but received chemotherapy and thus excluded from this analysis. 13 of 17 patients went on to deliver at our hospital, while 4 patients delivered at other institutions, of which 2 patients were lost from our follow-up tracing. The mean number of weeks of gestation at the time of the surgery was 23.4 ± 5.2. 5 patients underwent cesarean section (CS) due to maternal reasons and 10 had uneventful normal vaginal deliveries. The remaining two cases are unknown as they were delivered at other hospitals. Apgar scores at 5 minutes of 13 newborn infants born at our hospital were over 8 in all cases and body weight was 2996.7 ± 496.3 grams. There were no cases of threatened premature, preterm, or post-term deliveries. No immediately apparent malformation of delivered infant or exaggeration of cancers was identified. Rate of CS (5/15; 33%) appeared similar (28%) to the recent (2011) CS rate at our hospital.
Discussion: We found rather high incidence of breast cancer during pregnancy (BCDP) (29/13,000) in our series in Japan. No standardized therapeutic strategies have been established but such interventions as chemotherapy , aborting pregnancy, and surgery are performed. Situations are often encountered when plans for surgery under GA are not even considered and surgery is either scheduled under regional/local anesthesia or deferred due to the general belief that GA is harmful to the fetus. Avoiding GA in BCDP is not necessarily beneficial to the patients because of increased surgical complexity and adding further stress on the already stressed mother and fetus.
Conclusion: In our limited number series, we found no adverse effect of general anesthesia on BCDP from either the fetal or maternal perspectives. The long term effect of anesthesia on cancer growth remains to be studied, but the employment of GA for BCDP, at least after 17th week of gestation, appeared to be justified.

11AP5-3

Perioperative pain management for caesarean section in the mother with severe acute on chronic pain and opioid dependence

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Background: There is scarce literature on acute on chronic pain management during pregnancy in women with chronic therapeutic opioid use. In the National Birth Defect Prevention Study 2.6% of women were using therapeutic opioids and this is increasing. It is associated with cardiac, neurological and gastrointestinal birth defects, and neonatal abstinence syndrome.[1] Opioid requirements and pain scores of patients with prior opioid use is significantly increased post-operatively.[2] There are however no reports on the peri-partum pain management of women requiring opioids for severe acute on chronic pain.
Case report: A 22-year-old woman with Crohn's disease and chronic pain was admitted at 26 weeks gestation with severe acute on chronic abdominal pain secondary to subacute bowel obstruction and pregnancy-related hydronephrosis. She was usually under a pain management team, taking Morphine Sulphate (MST) 20mg bd and Oxynorm 50mg 2-4 hourly. A multi-disciplinary team (MDT) was involved in her care including neonatologists, obstetric anaesthetists, obstetricians, urologists, gastroenterologists, pain specialists and pharmacists. It was agreed that intravenous patient controlled analgesia (PCA) would enable pain control and an estimation of daily requirements. Her pain was controlled on approximately 250mg Morphine every 24 hours (3mg/hour background, 2mg bolus), until delivery at 34 weeks. Fetal tracheo-oesophageal fistula and renal abnormalities were suspected. The Caesarean section was performed under general anaesthesia. Multi-modal intraoperative analgesia included Ketamine, Clonidine, and transversus abdominis plane block. In recovery the patient was in excruciating pain. It was eventually controlled by a Ketamine infusion and high dose Morphine PCA (10mg/hour background, 5mg bolus). Neonatal abstinence syndrome developed, a Morphine infusion was commenced on Day 6 and weaned over 6 days. A renal cyst was confirmed.
Discussion: Safe pain relief during pregnancy in opioid dependent women is challenging and not well reviewed. Limitations on drug licensing during pregnancy pose additional problems. A MDT approach is essential for mother and baby, particularly due to potential neonatal complications.
References:
1. Rapp SE et al. 1995 Pain 61 (2):195-201
2. Broussard CS et al. 2011 Am J Obstet Gynecol 204 (4) 314. e1-11
Learning points: Collaboration of pain specialists with the MDT is important in managing acute on chronic pain in opioid dependent pregnant women.

11AP5-4

Comparison of general and spinal anaesthesia on haemodynamic parameters in severe preeclamptic pregnancy undergoing caesarean section

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Background and Goal of Study: Spinal anaesthesia (SA) is generally preferred for cesarean section (CS), however, there are conditions when general anaesthesia (GA) is required. The aim of our study was to compare the haemodynamic parameters of pregnant women with severe preeclampsia undergoing CS under different methods of anaesthesia.
Materials and Methods: After local Ethics Committee approval and informed consent, 60 pregnant women with severe preeclampsia were randomized into two groups: GA (n=30) and SA (n=30). GA was induced with thiopental and maintained with 2% sevoflurane in 50% oxygen. 12,5mg of hyperbaric bupivacaine was used for SA with the block at $T_{4\text{-}5}$. Both groups were similar in relation to age, physical status (ASA II), surgery duration and maternal baseline haemodynamic measurements. Heart rate (HR), mean blood pressure (BP), cardiac index (CI) and systemic vascular resistance (SVR) were measured by noninvasive bioimpedans technology. Data were recorded before induction (baseline), after induction of anaesthesia (prenatal), after delivery (postnatal) and at the end of operation.
Results and Discussion: Results are presented as mean±SD, Student's *t*-test was used for statistical analysis, *p< 0.05 was considered as statistically significant GA vs SA groups. HR was significantly higher in GA group at all stages of the operation. BP and SVR were significantly higher in GA group vs SA group at the prenatal stage, whereas CI was significantly higher at the prenatal stage in SA group.

Variable	Group	Baseline	Prenatal	Postnatal	End of operation
HR	SA	71.3 ±14.2	76.9 ±16.9*	76.6 ±16.8*	69.0 ±13.8*
HR	GA	69.3 ±16.2	108.6 ±15.8	95.7 ±10.9	88.8 ±12.9
BP	SA	115.9 ±8.4	111.6 ±12.6*	105.7 ±11.6	106.4 ±13.4
BP	GA	115.7 ±10.6	127.1 ±14.3	100.9 ±11.6	102.6 ±17.3
CI	SA	2.7 ±0.4	3.1 ±0.7*	3.2 ±0.7	2.9 ±0.6
CI	GA	2.6 ±0.5	2.7 ±0.5	3.0 ±0.7	3.0 ±0.6
SVR	SA	1923.0 ±423.5	1690.5 ±445.8*	1549.1 ±454.3	1619.9 ±508.9
SVR	GA	2006.2 ±462.4	2032.1 ±473.2	1533.1 ±398.0	1506.0 ±358.3

[Table 1]

Conclusion(s): This study demonstrated better haemodynamic stability if SA is used during caesarean section in pregnant women with severe preeclampsia compared to GA with sevoflurane.

11AP5-5

Comparison of bilateral ultrasound-guided transversus abdominis plane block versus continuous wound infusion for pain relief after caesarean delivery

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Background and Goal of Study: Ultrasound-guided tranversus abdominis plane (TAP) block and continuous wound infusion through incisional catheters (KT) are current regional anesthetic techniques for providing postoperative analgesia and recovery after cesarean delivery [1-2]. This open randomized trial compared effectiveness of these techniques.
Materials and Methods: After written consent, every parturient undergoing elective cesarean delivery received a morphine-free spinal anesthetic with sufentanil-bupivacaïne. At the end of surgery, regional analgesia was randomized between bilateral TAP block with levobupivacaïne (150mg) in a single shot versus continuous infusion with levobupivacaïne during 48 hours (150mg/24h) in addition to routine postoperative analgesia. Then visual analog scale pain scores at rest and during mobilization and request in oral morphine sulfate were recorded every 12 hours during 48 hours. Assessment of neuropathic pain was performed at one month.
Results and Discussion: This study planned recruitment of 120 women but was prematurely stopped related to the occurrence of seizures requiring intubation in the TAP arm for one patient. This severe undesirable event led to an intermediary per-protocol analysis. 29 KT and 36 TAP were included and no significant difference in both arms was demonstrated. At rest, area under curve (AUC) of pain scores were 85±78 in KT and 69±59 in TAP (p = 0.4) and respectively 177±92 and 191±74 at mobilization (p = 0.5). Occurrence of neuropathic pain was similar (p=0.21). No difference in pain-controled between groups was detected. Occurrence of chronic pain was low in both groups.
Conclusion(s): In case of morphine-free spinal anesthesia for cesarean, no regional technique can really be suggested for analgesia. TAP block may induce seizure in this situation, and wound infusion was often discontinued for various reasons.
References:
1. Abdallah FW et al. Reg Anesth Pain Med 2012;37:193-209
2. Mishriky BM et al. Can J Anaesth 2012;59:766-78

11AP5-6

From decision to delivery - how fast we are with anaesthesia in different urgency categories for caesarean section

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Background and Goal of Study: Regional anaesthesia (RA) is preferred in obstetrics as it is safer alternative to general anaesthesia (GA), for urgent caesarean section (CS) in particular. However, in CS category-1 setting GA is traditionally used expecting shorter induction time. Our primary objective was to examine timing differences between GA and SA in different CS urgency categories.
Materials and Methods: After approval of institutional ethics committee a prospective analysis of CSs in the Department of Obstetrics of a teaching hospital during February-August of 2010 was performed. We compared CSs distribution according to urgency and method of anaesthesia in respect to mean induction time of different types of anaesthesia as well as the duration of operating theatre admission-to-delivery and decision-to-delivery intervals. GA and SA were compared.
Results and Discussion: 303 CSs were carried out during study period.Timing of GA and SA in different CS urgency categories is presented in Table 1.

Urgency category	Anaesthesia	Induction of anaesthesia	Admission-to-delivery interval	Decision-to-delivery interval
Category-1 (N=20)	General	7.44 ± 3.8*	12.56 (3.9)	27.67 (13.7)
	Spinal	11.27 ± 3.1*	15.45 (3.3)	42.11 (16.7)
Category-2 (N=37)	General	8.4 (2.7)	10 (5.0)	30 (8.8)
	Spinal	9.5 (4.2)	14.94 (5.2)	44.72 (24.3)
Category-3 (N=90)	General	10.9 (5.0)	15.7 (4.6)	51.22 (8.6)
	Spinal	10.69 (3.9)	15.24 (4.6)	53.77 (28.9)
Category-4 (N=112)	General	13.33 (6.2)	17.89 (6.7)	63.5 (9.2)
	Spinal	12.1 (5.6)	17.29 (6.0)	69.78 (55.0)

[Table 1. Timing of GA and SA in different urgency]
*- Statistically significant difference between GA and SA. Results are given as mean (SD) in minutes.

Mean induction time of GA in category-1 was significantly shorter as compared with SA (p=0.02), whereas in categories-2, 3 and 4 there was no such difference (p=0.08, p=0.77, p=0.53 respectively).There were no significant differences between mean operating theatre admission-to-delivery nor mean decision-to-delivery intervals for general and spinal anaesthesia in all CS categories.
Conclusion(s): The only significant timing difference between GA and SA is detectable in category-1 CS regarding the time of anaesthesia induction. We conclude that SA does not affect neonatal delivery time even in urgent cases.

11AP5-7

Evoked mechanical temporal summation, but not inefficient diffuse noxious inhibitory control, is a predictor of persistent post-caesarean section pain

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Background and Goal of study: Caesarean delivery rate is rising; some 10-15% of women suffer from persistent pain following caesarean section. If these women could be identified prior to surgery, targeted analgesic care could be delivered. We hypothesize that pre-operative testing of mechanical temporal summation (mTS) and diffuse noxious inhibitory control (DNIC), which are indicative of the susceptibility of central sensitization, are predictive of persistent post-caesarean section pain lasting at least 8 weeks (PPCSP8).
Materials and Methods: In this prospective study, women of American Society of Anesthesiologists category I scheduled for elective cesarean delivery under spinal anaesthesia were consented and subjected to pre-operative mTS testing (repeated pinpricks with von Frey's filament) and DNIC testing (heat stimulants with thermode and water bath). MTS was considered evoked when the pain score of the 11th pinprick was higher than that of the first. DNIC was considered inefficient when the pain score of the conditioned stimulant was greater than that of the initial stimulant. A phone survey was conducted at 8 weeks post-surgery and the presence/absence of persistent post-operative pain was recorded.
Results and Discussion: A total of 89 women aged 20-45 years (mean age: 33) were enrolled. Evoked mTS was present in 20 women (22%). Inefficient DNIC was present in 28 women (31%). Women with an evoked mTS response were at higher risk of PPCSP8 than those without (OR=27, 95% CI: 5-144, p< 0.0001). Sensitivity and specificity of evoked mTS were 81.8% (9/11) and 85.9% (67/78), respectively. Positive predictive value was 45% (9/20) and negative predictive value was 97.1% (67/69). Prevalence of PPCSP8 was 12.4% (11/89). Area under the ROC curve for evoked mTS as a predictor of PPSCP8 was 0.84 (95% CI: 0.71-0.96). Inefficient DNIC as a predictor of PPCSP8 was not statistically significant (p=0.292); however, the study might be underpowered for detecting such association.
Conclusion: Evoked mTS has clinical potential for identifying women at high risk of PPCSP8. Pre-operative mTS testing would allow selective targeting of high risk women with pharmacological agents without exposing those at a lower risk to the adverse effects of these agents.

11AP5-8

Use of rocuronium and active reversal of neuromuscular blockade with sugammadex does not shorten operating time during caesarean section in compare to suxamethonium, rocuronium and neostigmine: prospective randomised interventional multicentric trial

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Background and Goal of Study: Use of a combination of rocuronium and sugammadex for Caesarean Section (CS) in General Anaesthesia (GA) can be an alternative to suxamethonium for neuromuscular-blocking agent during induction of GA for CS. Active selective reversal of neuromuscular blockade induced with rocuronium for CS is described in some case report series, is potentially beneficial and safe for both mother and newborn. Aim of the study is to compare this new method with traditional one.
Materials and Methods: With Ethical Committee approval we enrolled 42 parturients in the period 9/2012-11/2012 who underwent CS in GA. In interventional group (ROCSUG, N=20) was muscle relaxation inducted with rocuronium 1 mg kg^{-1} and in the end active reversal was achieved with sugammadex 2-4 mg kg^{-1}. In the control group (SUCNEO, N=22) was used

suxamethonium 1mg kg^{-1} for induction, rocuronium 0.3mg kg^{-1} for maintaining and neostigmine 0.3mg kg^{-1} for reversal of neuromuscular blockade. Data were acquired from Case Report Form (time from induction to first $etCO_2$ wave ($etCO_2$), time from induction to TOF 0.9 (TOF 0.9), intubation conditions (vocal cords position, laryngoscopy resistance, intubation trial response)) and patient medical records (age, BMI, gestational age, ASA score, Mallampati score, CS indication). Depth of muscle relaxation was monitored with TOF Watch SX (Organon, NL). The characteristics of women in labour were summarised using mean and standard deviation. Differences in continuous variables were assessed using Mann-Whitney U test. In case of categorical variables Fisher exact and Pearson chi-square tests were used.

Results and Discussion: No statistically significant differences were found between both groups in age (p=0.681), BMI (p=0.215), gestational age (p=0.477), ASA (p=0.984) and CS indication (p=0.758). There were also no statistically significant differences between ROCSUG and SUCNEO group in time $etCO_2$ (91+-29s vs. 80+-23s, p=0.288), TOF 0.9 (43+-7min vs. 46+-11min, p=0.832) and in intubation conditions; vocal cords position (p=0.114), laryngoscopy resistance (p=1.0) and intubation trial response (p=0.308).

Conclusion: Use of rocuronium and active reversal of neuromuscular blockade with sugammadex does not shorten operating time during Caesarean Section if compared to suxametonium, rocuronium and neostigmine.

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11AP5-9

General anaesthesia for caesarean section & difficult/failed intubation. Do we have a problem?

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Background and Goal of Study: Difficult tracheal intubation (DTI) in connection with general anaesthesia (GA) for caesarean section (CS) was previously associated with a high maternal mortality rate. That caused a change in anaesthesia technique to a widespread use of regional anaesthesia (RA) for CS. GA is still used at emergency grade 1 CS if there is no time for a RA or in case of an insufficient RA.

The purpose of the study is to determine 1) the prevalence of RA and GA for CS in Denmark. 2) the prevalence of DTI and failed intubation at GA for CS. 3) Anaesthesiologists ability to anticipate DTI among CS patients registered in the Danish Anaesthesia Database (DAD).

Materials and Methods: The Ethic Committee for Biomedical Research, Capital region of Denmark approved the study. A cohort of 20.507 CS patients was drawn from the DAD from June 2008 to June 2011. Data for the preoperative anticipated DTI and the associated airway management plan were compared with the actual airway management. Diagnostic precision for anticipated DTI was determined as sensitivity, specificity, positive- and negative predictive value, positive- and negative likelihood ratio and diagnostic odds ratio.

Results: The prevalence of GA for CS was 9.6 %, 95% CI (9,3-10), the prevalence of DTI was 1.8 %, 95% CI (1.3-2.5) of which 93% was unanticipated DTI. The prevalence of failed intubation was 1 per 130 general anaesthetics. Anaesthesiologists' diagnostic precision for anticipation of DTI had a sensitivity of 0.07, specificity of 0.99, positive predictive value of 0.25, negative predictive value of 0.98, positive- and negative likelihood ratio 0.25 and 18.4, respectively. Diagnostic odds ratio was 19.6.

Discussion: The prevalence of GA for CS in Denmark was twice to three times as high compared with the UK, USA and Canada, respectively. The prevalence of DTI was similar to the prevalence of DTI amongst a mixed surgical population registered in the DAD. The prevalence of failed intubation was 1 per 130 general anaesthetics. Some authors see a high prevalence of GA for CS advantageous since it secures Anesthesiologists' airway management skills. It is mandatory in Denmark to have a consultant in Anaesthesia's present at CS, but this had no effect on the rate of failed intubation that was 50 to 100 % higher than in previous studies.

11AP5-10

Nonintubated video-assisted thoracoscopic surgery (VATS) for recurrent spontaneous pneumothorax in a pregnant woman

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Background: Spontaneous pneumothorax in pregnancy is a rare condition, and surgical treatment may be needed.[1] We reported our anesthetic experience in a pregnant woman undergoing VATS for pneumothorax, using thoracic epidural anesthesia without tracheal intubation, which has not been reported previously.

Case report: A 34-year-old woman presented with right-sided pneumothorax at the 22 weeks of her first pregnancy. She had medical history of recurrent spontaneous pneumothorax of her right lung and underwent VATS pleurodesis before. A pigtail was first placed for drainage. Because of persistent air leak for 2 weeks, she gave consent to perform a nonintubated VATS.[2] Thoracic epidural anesthesia was titrated to achieve a sensory block (T2-T9) by infusion of 2% lidocaine. She was then moderately sedated with target controlled infusion of propofol, while spontaneous breathing was maintained with oxygen supplement via a facemask. Intrathoracic vagal blockade was produced by infiltration of 0.25% bupivacaine thoracoscopically to inhibit coughing.[2] VATS bullectomy and pleural abrasion was performed within 60 minutes. There were no episodes of hypotension or hypoxemia during the operation. She was discharged on the fourth postoperative day. She gave a vaginal birth to a healthy boy at full term. There was no sign of recurrence of pneumothorax during next six-month follow-up.

Discussion: There are some special considerations for nonintubated VATS in pregnant patients. First, a thoroughly prepared plan of conversion to intubation should be executed when it is necessary. Second, risks of persistent hypoxemia and hypercapnia during one-lung ventilation are increased, especially when oxygen consumption increases and functional residual capacity decreases as pregnancy advances. Third, the risk of aspiration may be increased because of sedation, reduced lower esophageal tone, and an increase of abdominal pressure from a gravid uterus. Eligibility for pregnant women undergoing nonintubated VATS should be carefully evaluated, including airway, cardiopulmonary reserve, gestational age, fetal condition, and surgical complexity.

References:

1. Lal A et al. Chest 2007;132:1044-8.
2. Chen JS et al. Ann Surg 2011;254:1038-43.

Learning points: Nonintubated VATS for spontaneous pneumothorax in pregnant women can be an alternative anesthetic technique, using combination of thoracic epidural anesthesia, intrathoracic vagal block and appropriate sedation.

Intensive Care Medicine

12AP1-1

Comparative analysis of relative regional lung perfusion using 68Ga-labeled and fluorescent-labeled microspheres in experimental lung injury

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Background: Systematical sampling of lung volume elements previously labeled with fluorescent-microspheres is a well-established method to study distribution of pulmonary blood flow (PBF) in experimental acute respiratory distress syndrome (ARDS). However, resolution and therefore validity of this time-consuming method to measure regional differences in lung perfusion are limited. We compared the distribution of PBF using radioactive 68Ga-labeled with fluorescent-labeled microspheres in an experimental model of ARDS. We hypothesized that 68Ga-labeled microspheres improve resolution of PBF distribution assessment and waive labor-intensive tissue processing.
Method: Details of the experimental protocol are given in an accompanying abstract (Güldner et al.). Briefly, lung injury was induced by saline lavage in 12 pigs. All animals underwent mechanical ventilation superposed with 4 different levels of spontaneous breathing (SB). After injury and at the end of each period of mechanical ventilation, fluorescent-labeled microspheres and 68Ga-labeled microspheres were injected intravenously. At the end of each time interval distribution of 68Ga-labeled microspheres was detected by positron emission tomography (PET) scanning and lung weight was determined by computed tomography (CT). The distribution of fluorescent-labeled microspheres was analyzed post mortem by cutting the air-dried lungs into cubes and measuring fluorescence intensities. We normalized PBF of each piece to its weight and to the whole lung activity and calculated the center of pulmonary perfusion (C_PBF) as well as the slope of linear regression of the PBF distribution along the dorsoventral and caudocranial axes.
Results: Both methods demonstrated that C_PBF was located in the dorsal lung part at all timepoints. An increased level of SB caused a movement of C_PBF towards dorsal and caudal lung regions and thereby a decrease of the slope along both axes. However, the radioactive measurements showed clearer trends, less variation of absolute values between timepoints and fewer outliers. This is likely caused by the much higher resolution of the 68Ga-labeled microsphere technique, but we cannot rule out scattering effects.
Conclusion: The 68Ga-labeled microsphere technique is a valuable tool to investigate changes in PBF distributions in severely injured lungs. In addition PET and CT measurements can be obtained almost simultaneously, allowing assessment of aeration-perfusion-relationships in ARDS.

12AP1-2

A comparison of epinephrine and arginine vasopressin on the respiratory system response in a rat model of lethal anaphylactic shock

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Background and Goal of Study: Bronchospasm may be the single or one of clinical pattern of the worse forms of anaphylactic shock (AS). Despites a well conducted treatment based on the use of epinephrine (EPI) and infusion of vascular loading, AS remains associated to morbidity and mortality. Some studies have suggested that arginine vasopressin (AVP) may be an alternative or be associated to EPI in the cases of refractory AS to EPI. To date there are no data available on the effects of AVP on bronchial airway after bronchospasm during AS. Using a model of lethal AS in rats, we compared the effects of EPI to AVP on the bronchial airway after bronchospasm during AS.
Materials and Methods: Sensitized rats to ovalbumine (OVA) were randomly allocated in 4 groups. In group CON, they received only vehicle while AS was induced by injection of OVA in others groups. In group EPI, rats received 2.5μg of i.v. EPI at T1 (1min) followed by a continuous i.v. infusion 10μg.kg^{-1}.min^{-1} of EPI, and a second bolus of EPI at T3 (3min). In AVP, rats received 0.03UI of AVP at T1 followed by a continuous i.v. infusion of 0.08UI.kg^{-1}.min^{-1} of AVP, and a bolus of physiologic saline at T3. In group OVA they received no EPI nor AVP. All rats suffering AS received 20ml.kg^{-1} of hydroxyethyl starch (HES) at T1, followed by a continuous infusion at the rate of 1ml.min^{-1} throughout experiment (up to 60 min). Mean arterial blood pressure (MAP), respiratory resistance (Rrs) and respiratory elastance (Ers=-2πfXrs) (forced oscillation technique) and microvascular leakage (diffusion of Evans blue) in bronchial airway were measured.
Results and Discussion: AS induced a dramatic decrease in MAP leading to death within 15 min of rats in group OVA, whereas those receiving EPI or AVP had a significant increased in MAP and survived up to the end of experiment. AS induced bronchospasm with important increase in Rrs and Ers in groups EPI, AVP and OVA($p < 0.05$ vs CON)(fig.1 and 2). While AVP had no effect on the airway obstruction, EPI significantly reduced the increasing in Rrs and Ers (fig.1 and 2). EPI significantly decreased the microvascular leakage in bronchi and intra-pulmonary airway ($p < 0.05$), whereas AVP tended to increase the microvascular leakage in bronchi ($p=0.056$ vs OVA)(fig. 3).
Conclusion(s): In this model of AS, while EPI allowed an alleviation of bronchospasm, AVP had no effect on Rrs or Ers and tended to increase microvascular leakage in airway.

12AP1-3

Methylarginine metabolism is different in acute and chronic hypoxia

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Background and Goal of Study: L-arginine derivatives, like asymmetric and symmetric dimethylarginines (ADMA and SDMA, respectively) are markers of endothelial dysfunction. ADMA inhibits directly eNOS which is responsible for the immediate response to hypoxia. In addition, protein arginine methylation is increased due to hypoxia. We aimed to compare the serum level of L-arginine, ADMA and SDMA in patients with acute hypoxia (acute lung injury=ALI) and chronic hypoxia (chronic obstructive pulmonary disease=COPD).
Materials and Methods: A total of 63 patients (19 with ALI due to sepsis, 44 with COPD) were recruited into this prospective pilot study. Venous blood was taken on admission (as baseline) and 4 consecutive days for evaluation of biomarkers (L-arginine, ADMA, SDMA, in umol/l). All markers were compared with age-matched normal controls (NC, n=64). Beside, SAPS, PaO2/FiO2 and hsCRP were recorded. Patients with COPD were selected further based on presence of acute exacerbation (COPD-E, n=12). Statistical analysis: ANOVA test, chi-square test and Spearman correlation were used.
Results and Discussion: Basal L-arginine was significantly higher in COPD-E compared to ALI group (mean: 126.8, 95%CI: 104.2-149.3 vs. 90.1, 72.1-108.0, p=0.002). Basal ADMA was significantly higher in COPD-E compared to COPD group (mean: 0.81, 95%CI: 0.70-0.91 vs 0.64, 0.59- 0.68, p=0.03). Basal SDMA was significantly higher in ALI compared to COPD group (mean: 0.88, 95%CI: 0.54-1.22 vs. 0.49, 0.42-0.54, p=0.003). All markers except for basal L-arginine in ALI were significantly higher in all patient groups compared to NC. In ALI group, SDMA was significantly higher in the first three consecutive days in non-survival patients. There was a significant positive correlation between serum creatinine and SDMA ($p < 0.001$) and significant negative correlation between basal ADMA and PaO2/FiO2 (p=0.02). However, there was no significant correlation between L-arginine derivatives and hsCRP.
Conclusion(s): Chronic hypoxia is associated with elevated basal L-arginine level. While the depth of hypoxia is proportional to ADMA production, SDMA reflecting severity of renal failure is rather an indicator of mortality due to ALI.

12AP1-4

Non-invasive mechanical ventilation after the successful weaning: a comparison with the venturi mask

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Background and Goal of Study: This study compared the rates of acute respiratory failure, reentubation, length of ıntensive care stay and mortality in the patients in whom the non-invasive mechanical ventilation (NIMV) applied instead of the routine venturi face mask (VM) application after a successful weaning.
Materials and Methods: Following the approval of the hospital ethics committee, 62 patients who were under mechanical ventilation for at least 48 hours were scheduled for this study. 12 patients were excluded because of the weaning failure during T-tube trial. The patients who had optimum weaning criteria after the T-tube trial of 30 min. were extubated. The patients were kept on VM for 1 hour to observe the haemodynamic and respiratory stability. The ones who do not fullfill the criteria were mechanically supported (NIMV or

IMV) and excluded from the study (n=12). The group of 50 patients who were successful to wean (GCS>13; RR< 25/min; HR>50; < 140/min; SAP>70, < 180mmHg; SaO2>90%) randomly allocated to have either VM (n=25, 4L/min O_2) or NIV (n=25, oro-nasal or face mask, IPAP: 13-15cmH_2O and EPAP:35cmH_2O, FiO_2: 0.4). Sistolic arterial pressure (SAP), heart rate (HR), respiratory rate (RR), PaO_2, PCO_2, pH values were recorded before and 30th min. after the T-trial and 1st, 2nd, 3rd, 4th, 5th, 6th, 12th, 24th, 48th hour after the extubation. Patients who develop respiratory failure, who need reentubation were recorded. The lenght of stay and mortality rates were also noted. SPSS 20.0 were used for statistical analysis.

Results and Discussion: The demographic data of the groups were similar. The number of the patients who developed respiratory failure in the NIV group were significantly less than VM group of patients (3 reentubation vs. 14 NIV+5 reentubation in the VM group; P=0.000). The lenght of stay in the ICU was also significantly shorter in NIV group (5.2 ± 4.9 day vs. 16.7 ± 7.7 day, p=0.000). The difference in the mortality rates was not statistically significant (8 % in group NIV; 16 % in group VM, p= 0.304).

Conclusion(s): The ratio of the respiratory failure and the lenght of stay in the ICU were less when non-invasive mechanical ventilation was used after extubation even if the patient is regarded as 'successfully weaned'. We recommend the use of NIMV in such patients to avoid unexpected ventilatory failure.

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12AP1-5

Setting up the ventilator: don't default! A quality improvement project looking at initial ventilation on the intensive care unit

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Background: We aimed to see if patients were being set up on the ventilator appropriately, with a tailored ventilation strategy including evidence based tidal volumes (1).

Methods: A quality improvement project of patients receiving mechanical ventilation (MV) on the ICU over a 6 month period. Patients admitted for organ donation and those ventilated for less than 1 hour were excluded. Using patient records, the following information was recorded on all eligible patients; ideal body weight (IBW) calculation from ulnar length, ventilator mode, tidal volume, positive end expiratory pressure (PEEP) and ventilator rate all at 1 hour of initition of MV. The primary outcome measure was 'yes' or 'no' as to whether the patient had at least 2 of these parameters changed from the default settings by 1 hour. This was agreed to represent some form of tailored ventilation strategy. The default settings on the unit ventilators are as follows: pressure-regulated volume control (PRVC), 500mls tidal volume, 5cmH_20 PEEP, rate 15/min.

Results: One hundred and seventy six (176) patients were eligible for data collection. Of these 10 were excluded.Of the 166 included patients, 30% (n=49) had not had at least 2 settings modified on the ventilator by 1 hour (figure 1). Furthermore 27% (n=45) were still receiving the default 500mls tidal volume at 1 hour (figure 2). We also found that only 32% of patients being ventilated had ideal body weights calculated in the notes (n=53). From those who did, we calculated an average IBW of 64.7kg, which equates to recommended(1) tidal volume of 388mls (6mls/kg). The largest patient who had a calculation had an IBW of 82kg (equating to 492mls tidal volume).

Conclusion(s): Given the large number of patients remained on largely default settings and those still receiving 500mls tidal volume after 1 hour of ventilation, we conclude that too often patients on the unit aren't receiving a tailored, evidence based(1) ventilation strategy. Furthermore, given that the recommended tidal volume for the average patient in our study was 388mls, and for the largest was 492mls, we conclude that the default setting of 500mls is too high, and recommend this be reduced accordingly to comply with the evidence(1).

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12AP1-6

Repeated obstructive pneumonia and difficult weaning from ventilator caused by hidden aspirated teeth after endotracheal intubation and tracheostomy

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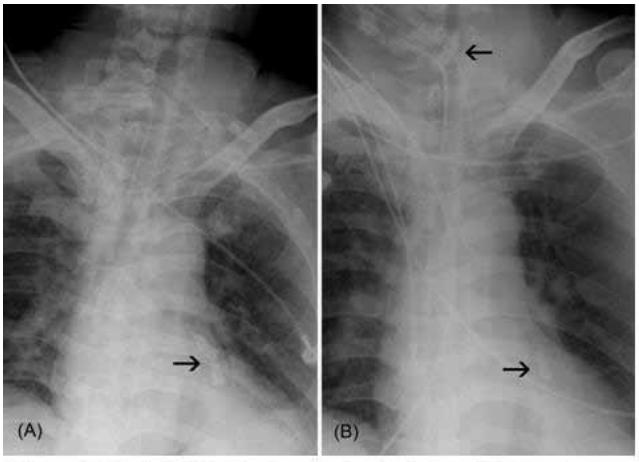
Background: Aspiration of tooth after tracheal intubation is a rare but well-known complication. It can be undetected for a long time, even to the point of autopsy findings, especially in unresponsive and critical care patients.[1, 2]

Case report: A 46-year-old man who had suffered from intracranial hemorrhage underwent craniotomy for decompression after intubation in the emergency department and was admitted to intensive care unit after surgery. However, repeated episodes of left-sided pneumonia caused him ventilator-dependent. Meanwhile a tracheostomy was created 10 days later. A chest film 8 weeks later showed two radiopaque teeth-like densities on left lower lobe bronchus (Fig. 1A). Two lost incisors from his upper denture were confirmed and successfully extracted via rigid bronchoscopy (Fig. 2). His pneumonia improved soon and he weaned off from ventilator. Reviewing on his previous chest films, these two incisors were aspirated following endotracheal intubation and tracheostomy, respectively (Fig. 1B). Nevertheless, they were obscure and misinterpreted, even by the radiologists and chest physicians.



[Figure 1 (A) Teeth-like shadows in the left lower lobe bronchus (arrow). (B) One tooth-like shadow impinged between vocal cord and a tracheostomy tube (arrow leftward), the other in the left lower bronchus (arrow rightward).]

[Figure 2 (A) Bronchoscopic finding of teeth in the orifice of left lower lobe bronchus. (B-C) Two incisors extracted were compatible with the lost upper teeth of this patient.]

Discussion: Tooth aspiration is commonly undetected and misdiagnosed in adults without acute clinical manifestations and may lead to severe complications.[1] In comparison with computed tomography, chest radiography is obviously not sensitive enough to detect endobronchial foreign bodies due to the overlap of mediastinal shadows and medical equipment (breathing tubes, EKG, etc.) in the intensive care setting.[1] Doctors should always keep this diagnosis in mind, especially when they encounter unresponsive patients with unexplained pulmonary findings, and the medical history, clinical presentations as well as radiological findings should be thoroughly reviewed.

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Learning points: This case highlights that only vigilance to detect this complication can prompt early diagnosis, by monitoring the dental status of intubated patients and thoroughly reviewing chest radiography as well as responding to unexplained pulmonary courses, particularly in unresponsive patients.

12AP1-7

The volatile anesthetic sevoflurane attenuates ventilator-induced lung injury through inhibition of ERK1/2 and Akt signal transduction

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Background and Goal of Study: Mechanical ventilator support still causes a high rate of morbidity and mortality in intensive care unit and operative room because of ventilator-induced lung injury (VILI). It is characterized by a pulmonary inflammation response appears to be mediated by proinflammatory cytokines.
This study investigates whether the volatile anesthetic sevoflurane with anti-inflammatory effect attenuates ventilator-induced lung injury.
Materials and Methods: Twelve male rabbits were anesthetized and were mechanically ventilated with 50% oxygen, peak inspiratory pressure (PIP); 10 cmH_2O, I:E ratio; 1:4, PEEP; 5 cmH_2O.
All animals were randomly assigned to one of three groups: ventilated with 10 cmH2O of PIP (Sham group, n=4); ventilated with 30 cmH_2O of PIP (Control group, n=4); ventilated with 30 cmH_2O of PIP and 0.8 vol% sevoflurane (Sevoflurane group, n=4) during the 5h.
After the protocol, the wet/dry weight (W/D) ratio and histopathology of the lung, concentration of IL-8 in bronchoalveolar lavage fluid (BALF), and activation of extracellular signal-regulated kinases (ERK) 1/2, p38 and Akt in lung tissue were measured.
Results and Discussion: In histopathology, the sevoflurane group showed more less inflammatory cells and architectural changes than control group. The W/D ratio [(5.36 ± 0.13) vs. (6.61 ± 0.20)], expression of IL-8 [(144.08 ± 14.61) vs. (228.56 ± 15.13) pg/ml] and phosphorylation of ERK 1/2 and Akt were decreased significantly in the sevoflurane group compared with the control group.
Conclusion(s): Sevoflurane attenuates the VILI in rabbits mainly by inhibiting expression of IL-8 and phosphorylation of ERK 1/2 and Akt might be possible pathway in protection.

12AP1-8

Incidence and clinical outcome of ventilator-associated pneumonia among transplanted patients

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Background and Goal of Study: Intrahospital acquired infections are widely recognized as risk factors for prolonged ICU stay and mortality. Special form of nosocomial pneumonia, ventilator associated pneumonia (VAP), develops in patients (pts) after prolonged (> 48 hour) mechanical ventilation, with the incidence of 8-28 %[1]. The aim of this study was to compare the VAP incidence and clinical outcome among pts undergone transplantation.
Materials and Methods: We included pts with an ICU stay > 4 days who had undergone surgery and were mechanically ventilated for > 48 hours in the study. Pts were subdivided into a transplant group (Tx) and non-transplant group (non-Tx). Diagnosis of VAP was based on combination of radiological signs (X-ray infiltrate), clinical signs (fever of >38.3°C, leukocytes of >12 × 10^9/ml), and/or microbiological data (positive culture from tracheal aspiration >10^5 or bronchoalveolar lavate >10^4 colonies/ml).
Quantitative data were calculated as mean values +/- standard deviations; qualitative analysis was reported in terms of percentages. Comparison between the 2 groups was performed by proportion t-test and Chi-square test when indicated; $P \leq 0,05$ was considered statistically significant.
Results and Discussion: In this 1- year retrospective study 157 pts were involved: 62 Tx and 95 non-Tx pts. VAP was diagnosed in 44 pts (28,0%). The incidence of VAP was higher among non-Tx pts (non-Tx 20,38% vs. Tx 7,64%) and there was no difference in sex, age, length of stay or outcome.
However, the main statistically relevant factor was mean severity score on admission (SAPS II) which was higher among non-Tx pts (non-Tx 42 +/- 16 vs. Tx 31 +/- 9).
Despite the increased risk factors related to transplantation, namely, immunosupresion and underlying organ failure, the incidence of VAP was surprisingly lower in the Tx pts. High percentage of pts who had undergone major abdominal surgery due to cancer and major vascular surgery may explain this finding, since they had higher SAPS II score.
Conclusion(s): VAP is frequent complication among surgical ICU pts, especially pts with a high SAPS II score on admission. Transplantation per se does not increase VAP incidence or its negative outcome.

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12AP1-9

Monitoring recruitment of atelectases: comparison of vibration response imaging (VRI) with computed tomography (CT)

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Background and Goal of Study: Bedside assessment of regional lung function has the potential to optimize mechanical ventilator settings to the individual needs. Recently, Vibration Response Imaging (VRI) has been proposed as a method to dynamically monitor recruitment and derecruitment of atelectases based on the spectral characteristics of lung sound vibrations. However, VRI technology has not yet been validated against any established method like computed tomography (CT).
Materials and Methods: With IRB approval N=6 piglets (30±2 kg) were anesthetized and mechanically ventilated (PCV: RR 6 min^{-1}; P_{mean} 30mbar; I:E 1:2, PEEP according to protocol). Lung sound recordings by VRI device (VRI_{XV}™, Deep Breeze Ltd., Or-Akiva, Israel) were performed simultaneously to 4-dCT scans (Brilliance iCT, Philips, 256 slices) in healthy and ARDS lungs (surfactant depletion model) at different PEEP-levels (randomized to 0,5,10,15 mbar). Raw data (20 s each) were analyzed as follows: VRI sound patterns were analyzed using a fast Fourier transform (FFT) of the waves. To compute a crackle-index (CI), the frequency was cut-off below 500 and above 1000 Hz while amplitudes below -100 dB were excluded. The CI resembles the area under the curve. 3-dCT images were analyzed YACTA based semiautomatically (120kVp; 150mAs; 0.4s rotation time; 64x1.25mm; DLP~6900mGy*cm) over a longitudinal coverage of 8 cm to obtain the volume (cm^3) of atelectatic (non-aerated; attenuation interval: -100/+100 HU) lung tissue. Descriptive Statistics: Linear regression.
Results and Discussion: Preliminary results demonstrate minor changes in lung volume (dCT) and crackle sounds (VRI) between the different PEEP-levels under healthy conditions. Saline lavage (moderate ARDS) led to an increase in atelectatic lung volume (5.76cm^3 vs. 17.83cm^3). The increase of PEEP was followed equally by VRI and dCT. The amount of atelectatic lung volume decreased from 17.83cm^3 (PEEP 0mbar) to 8.29cm^3 (PEEP 15mbar) while CI detected by VRI showed values from 3.67*10^4 (PEEP 0mbar) to 0.78*10^4 (PEEP 15mbar). Linear regression yielded a R^2 of 0.95.
Conclusion(s): VRI bedside analysis of crackle sounds is suitable for the detection of recruitment of atelectases as verified by computed tomography.
Acknowledgements: Experiments were performed at the Department of Anaesthesiology, University Medical Centre of the Johannes Gutenberg University Mainz, Mainz, Germany and supported by DFG PAK-415.

12AP1-10

Spontaneous breathing improves lung function but may worsen lung injury during ultraprotective ventilation in experimental acute lung injury

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In ARDS, ultraprotective mechanical ventilation with tidal volumes (V_T) < 4 mL/kg and extracorporeal CO2 removal may improve lung protection but can result in atelectasis. Spontaneous breathing could attenuate such effects. We compared the impact of controlled ultraprotective ventilation (ULTRAcon), ultraprotective ventilation superimposed with spontaneous breathing (ULTRAspon), continuous positive airway pressure combined with pressure support (CPAP+PS) and ventilation according to the ARDS network (ARDSnet), on lung function and injury in an experimental model of ARDS.
ARDS was induced in 28 pigs by lung saline lavage followed by high V_T, and animals were randomly assigned to one of the ventilation modes. In ULTRAcon, ULTRAspon and CPAP+PS, pumpless extracorporeal CO_2 removal was performed (ILA). In ULTRAspon and CPAP+PS, spontaneous breathing was resumed. Ventilatory settings were: ARDSnet -PCV with V_T=6mL/kg, PEEP=16cmH_2O, respiratory rate (RR) to pH>7.30; ULTRAcon and ULTRAspon - PCV with PEEP=16cmH_2O, V_T=3mL/kg, RR=15/min, I:E ratio to maintain mean airway pressure (Pmean) comparable to ARDSnet. In ULTRAspon, unassisted spontaneous breathing was possible throughout

the whole ventilatory cycle; CPAP+PS - CPAP level was titrated to maintain Pmean comparable to ARDSnet and PS to achieve V_T=3mL/kg. The ILA sweep-gas flow was titrated to pH=7.30. Lung function was assessed during 6 hours. At the end, lungs were extracted for analysis of diffuse alveolar damage and inflammation.
ULTRAspon and CPAP+PS improved oxygenation compared to ULTRAcon and ULTRAspon compared to ARDSnet. Ultraprotective ventilation groups had lower $PaCO_2$ compared to ARDSnet. ULTRAspon and CPAP+PS redistributed ventilation from central to dorsal lung areas compared to ARDSnet and ULTRAcon. In ultraprotective ventilation groups, peak airway (Ppeak) and transpulmonary pressures (Ppeak trans) were lower compared to ARDSnet, whereby ULTRAspon further decreased Ppeak compared to CPAP+PS. ULTRAspon and CPAP+PS reduced Pmean compared to ARDSnet and ULTRAspon compared to ULTRAcon. CPAP+PS increased the protein levels of TNFa and IL8 while ULTRAcon reduced cumulative DAD Score in dorsal lung regions compared to all other groups.
In this model of ALI spontaneous breathing during ultraprotective mechanical ventilation improved lung function compared to controlled ventilation. However, CPAP combined with PS worsened lung injury, while ULTRAcon showed the greatest benefit in protecting the lungs.

12AP1-11

Nebulized hypertonic saline solution followed by chest physiotherapy improves spirometry after lung resection

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Background and Goal of Study: Hypertonic saline solution (HSS) has been shown to improve mucociliary clearance, lung function and also have an impact on the pulmonary inflammatory response (1) (2); but adverse effects including marked airway narrowing, cough and saltiness cause intolerance (3). The aim of our study was to evaluate the safety and tolerability of 7% HSS followed by chest physiotherapy (CP) in patients after lung resection and its effect upon lung function.
Materials and Methods: Observational, prospective study in adult patients scheduled for lung resection. FVC, FEV1, FEV1 and FEF 25-75% were assessed by portable spirometry (Spirobank II®) performed just before surgery (T0), before and after HSS + CP (T1 and T2 respectively). Tolerability was assessed in terms of irritation, taste and cough in a 4-point ordinal scale (0 = absent and 4 = severe) and overall feeling in a 5-point ordinal scale (1 = very unpleasant to 5 = very pleasant). Results in mean ±SD, significance $p< 0.05$
Results and Discussion: Most patients (81%) had lung resection performed through thoracotomy and received regional postoperative analgesia. No differences in pain scale were found pre and post inhalation. Both FVC and FEV1 increased from preinhalation to postinhalation ($p=0,01$ and $p=0,04$, respectively). Cough occurred immediately after inhalation in 30% of patients. Throat irritation and salty taste occurred in 80 and 90% of patients, respectively. The rating of pleasantness was pleasant or moderate pleasent only in 5% of patients. Bronchospasm was not seen in any patients after inhalation.
Conclusion(s): HHS and CP improve lung function measured by spirometry after lung resection. Previous data report more incidence of cough after HS inhalation.
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12AP2-1

Anti-LAG-3 antibody improves prognosis and reverses T cells dysfunction in mice with experimental sepsis

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Background and Goal of Study: To investigate the role of lymphocyte activation gene-3 (LAG-3) in mice with experimental sepsis.Sepsis is still the leading cause in intensive care unit. Immunosuppression plays pivotal roles in sepsis induced mortality. LAG-3, an inhibitory receptors on immune cells, exerts inhibitory function by regulating the balance among T cell activation, tolerance, and immunopathology. The role of LAG-3 in polymicrobial sepsis is still unclear.
Materials and Methods: Cecal ligation and puncture (CLP) was induced in male mice. 3 hrs after CLP, murine anti-LAG-3 antibody or isotype antibody was given intraperitoneally.
Results and Discussion: This study demonstrates expression of LAG-3 on blood $CD4^+$ T, $CD8^+$ T, $CD19^+$ B cells, natural killer cells, spleen $CD4^+$ $CD25^+$ Treg cells, and dendritic cells were significantly elevated 24 h after CLP. Intraperitoneal administration of anti-LAG-3 to mice after CLP led to significantly prolonged survival. After treated with anti-LAG-3 antibody, CLP mice showed lower lungs wet-to-dry ratio, bacterial burden (blood and peritoneal lavage fluid) and cytokines level (TNF-α, IL-6 and IL-10). T cells apoptosis was also decreased in both flow cytometry (blood, spleen cell count and thymus cells annexin V positive ratio) and TUNEL assays (spleen and thymus). In vitro study showed anti-LAG-3 treatment decreased anti-CD3/anti-CD28 induced T cells apoptosis, increased T lymphocytes IFN-γ production and cells proliferation.
Conclusion(s): Anti-LAG-3-treated mice are highly protected from abdominal sepsis via reduced T cells apoptosis and restored T cell function. The study indicated that anti-LAG-3 is effective when given via a therapeutic approach. Thus, this study suggests a therapeutic potential for anti-LAG-3 in human sepsis, which should be addressed in future trials.
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12AP2-2

Results of a program to reduce catheter-related bloodstream infection in the intensive care unit

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Background and Goal of Study: Central venous catheter bacteremia (CRB) is associated with significant morbidity and mortality rates and costs. Studies (1) have proved that the application of preventive interventions can help to reduce and control this type of infections. The main goal is to determine whether the implementation of a new agreement protocol on the manipulation and maintenance of the central venous catheter (CVC) can reduce CRB at an intensive care unit (ICU).
Materials and Methods: Descriptive longitudinal and prospective study. All the patients admitted at the ICU with a stay longer than 48 hours, regardless the reason and cause, were included. The study period started on Jan. 2010 until Dec. 2011. On 2011, the deployment of a new improvement program took place (barrier analysis, establishment of a work group, protocols review and implementation of a new educative program and verification list) as well as a set of steps to reduce BRC during CVC insertion and maintenance based on Provonost et al. 's model (2). Data was analyzed with Epidat. BRC incidence density and CVC usage relation in 2010 and 2011 were calculated. Incidence usage was compared by means of the quota rate using a Chi-squared distribution with a significant study result.
Results and Discussion: 269 patients were included in total. The patient/day with CVC percentage was 93.13%. 29 bacteremia cases were detected, with an accumulated incidence of 10.78%. Central venous catheter bacteremia Incidence Density (ID) was 1.41 for 100 patients/day with CVC. We compared 2010 and 2011 IDs with 100 patients/day with the following results (table 1).

	2010	2011	2011/2010 quota rate confidence interval and value of p
CATHETER-RELATED BLOODSTREAM INFECTION	3,35	1,41	0,42 (0,35-0,51) p<0,05*

[Average annual incidence density comparison of CRB]

Conclusion(s): The program was very effective. We are ready to start with the Holistic Security Plan at the ICU based on education and surveillance.
It is worth noticing the importance of the Nosocomial Infection Surveillance Program performed by the Preventive Health Service of our hospital.
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12AP2-3

Invitro antibacterial activity of commonly used adrenergic agonists

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Background and Goal of Study: Bacterial contamination during preparation of infusion drugs was higher in intensive care units (1). Aim of this study was to investigate invitro antibacterial properties of commonly used adrenergic agonists.
Materials and Methods: Growth of the microorganisms Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, Pseudomonas aeroginosa and Candida albicans in saline dilutions of adrenaline at one, 10 and 100 μg.mL^{-1}, noradrenaline at one, 10, and 100 μg.mL^{-1}, dopamine at 100 μg.mL^{-1}, one mg.mL^{-1}, 10 mg.mL^{-1} concentrations was investigated. Samples were taken immediately after inoculation of 5x10^{6} colony-forming units (CFUs) at 0, 2, 12, 24 and 48 hours. Sabouraud broth and saline were used as control for C. albicans. Brain heart infusion (BHI) broth and saline were used as control for the others. Statistical analyses were performed using Wilcoxon Sign Rank test for paired samples and Mann-Whitney U test.
Results and Discussion: Time dependent decrease on bacterial count from initial value was observed with S. aureus in saline dilutions of adrenaline at 100 μg.mL^{-1}, noradrenaline at one, 10, 100 μg.mL^{-1}, and dopamine at one, and 10 mg.mL^{-1} concentrations. The inhibition of bacterial growth was also determined with S. epidermidis and C. albicans in saline dilutions of adrenaline at one, 10, 100 μg.mL^{-1}, noradrenaline at 10, 100 μg.mL^{-1}, and dopamine at 100 μg.mL^{-1}, one and 10 mg.mL^{-1} concentrations. Growth inhibition of the microorganisms E. coli and P. auroginosa was observed in saline dilutions of adrenaline at 100 μg.mL^{-1}, noradrenaline at 100 μg.mL^{-1}, and dopamine 10 mg.mL^{-1} concentrations (p=0.029). While BHI and Sabouraud broths increased colonization, saline gradually decreased bacterial growth in a time dependent manner.
Conclusion(s): Dopamine, and to a lesser extend noradrenaline and adrenaline at higher concentrations used in the study have antimicrobial activity. Bacterial growth inhibition was more prominent with S. aureus, S. epidermidis, and C. albicans. In order to decrease contamination-related infections, adrenergic agonists should be prepared at higher concentrations for infusion.
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12AP2-4

Does IL-8 predicts mortality in postsurgical septic shock?

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Background and **Objective:** Recent studies on cytokine profiling in patients with sepsis have shown that an initially level of circulating IL-8 predicts a high mortality in sepsis. Our main objective was to evaluate the prognostic role of cytokine determination in a cohort of patients with post-surgical septic shock.
Materials and Methods: Patients were prospectively recruited from our ICU from January to December 2011. An EDTA tube was collected in the 24 first hours following diagnosis of Septic Shock. There were 12 cardiac surgery and 26 abdominal surgery patients. 16 healthy volunteers of similar age were recruited as controls. We used a multiplex cytokine kit. This kit included IL-1b, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL- 12, IL-13, IL-17, interferon-c, granulocyte colony-stimulating factor, granulocyte macrophage colony-stimulating factor, MCP-1, MIP-1b and TNF-a. Logarithmic concentrations of the cytokines were employed in the regression analysis to satisfy the linearity assumption.
Results and Discussion: 15 patients died during hospitalization at the ICU. A positive bacterial or fungal infection was found in 27 patients. Six cases had an infection by gram-positive bacteria; 10 cases had an infection by gram-negative bacteria; a fungal infection was found in one patient; 6 patients had a combined infection by gram-positive + gram-negative bacteria; 2 patients had a combined infection by gram-negative bacteria + fungi; 3 patients had a combined infection by grampositive, gram-negative bacteria and fungi. Mann-Whitney U-test evidenced that patients with septic shock had higher plasma levels of IL-6, IL-8, IL-10, IL-13, MCP-1 and MIP-1b than controls, independently of their final outcome. Patients who died had significant higher levels of IL-8 and MCP-1 at the moment of diagnosis than those who survived. Patients who died were older and presented at the ICU with higher APACHE II scores. Multivariate Cox regression analysis adjusted by age and APACHE II score showed that IL-8 was the only cytokine associated with increased risk of mortality at 28 days following diagnosis of septic shock. ROC curve analysis evidenced that IL-8 showed a good association with mortality, with an area under the curve of 0.72 (p = 0.022).
Conclusion: We confirm the predictive role of IL-8 in the most severe scenario of sepsis, septic shock, supporting its important implication in the pathophysiology of this disease.

12AP2-5

Endogenous immunoglobulin subclasses and isotypes in septic shock patients in the postoperative period

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Background and Goal of Study: There is increasing evidence on the relationship between endogenously produced immunoglobulins and clinical outcome in septic shock (SS) (1,2). However, nowadays, replacement therapy results with intravenous immunoglobulins in sepsis are controversial, probably due to a lack of information on endogenous immunoglobulin isotypes levels before treatment and because of this, a non directed therapy (3,4,5). The goals of our study were 1) to look for association between levels in plasma of IgG subclasses, IgA and IgM with severity of SS at diagnosis (measured by APACHE II score), and with clinical outcome (mortality at 28 days) and, 2) to compare plasma levels of IgG subclasses, IgA and IgM between patients with and without SS in the postoperative period.
Materials and Methods: We have conducted a prospective cohort study, in which 78 patients (42 with SS and 36 without SS) who had undergone a cardiac or abdominal surgery, were included. Endogenous levels of IgG1, IgG2, IgG3, IgG4, IgA, IgM and IgE were measured in the first 24 hours following diagnosis. Immunoglobulin subclasses and isotypes were explored looking for a univariate and multivariate association with the severity of SS at diagnosis and with the prognosis.
Results and Discussion: Eighteen patients with SS died in the 28 days following surgery. Patients with SS who died showed the lowest levels of total IgG and IgG1.Total IgG, IgG1, IgG2, IgG3, IgG4 and IgA correlated inversely with severity of SS at diagnosis. Multivariate analysis showed that total IgG, IgG1, IgM and IgA behaved as independent protective factors against mortality (hazard ratio, p): 0.23, 0.026; 0.16,0.028; 0.11,0.042;0.05, 0.010, respectively.
Conclusion(s): Our study evidenced that, in addition to IgG1, other isotypes and subclasses of major endogenous immunoglobulins play a role in septic shock
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12AP2-6

Complications risk assessment using biomarkers copeptin, troponin and EURO SCORE in patients following CABG surgery (multivariate analysis)

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Background: Every surgical cardio-surgical procedures,are accompanied with a certain percentage of complications. The goal of this research is to study the relation of copeptin and troponin and EURO score on complications after miocardial revascularisation procedure.
Materials and Methodes: We have enrolled 98 patients (76 male and 22 female) undergoing isolated CABG in a prospective observational study. We measured the value of copeptin and troponin in the time period preoperative, postoperative,and in ICYafter 8 hours In the same time period we estimated parameters of heart function as well as EKC time. Patients were divided into two groups. Group1 patients without complications and group 2 patients with complications. Multiple variance analysis of the relation between observed

variables and the occurance of complications has been analyzed with the use of Jrip algorithm within the Weka analytical system.
Results and Discusion: The average age of were 63,5±8,59. The average preoperative value of serum determined copeptin amounts to 0,91±0.42 ng/ml, postoperative amounts to1.45±o.64 ng/ml in JIL 0.49±0.34.Troponin preoperative amounts to 0.05±0.13, postoperative amounts to 0.64±1.19, in JIL 1.18±1.24. Group 1 patients without complications 89 patients, and group 2 patients with complications 9 patients 9.18% . Diabetes mellitus was present 32%. Patients with complications had a statistically significant value of RWSVI lesser than 5,7 g.m/m ($p < 0.04$) , troponin 2.1 ng/ml ($p< 0.01$), duration of mechanical ventilation 20.7 hours, ($p< 0.02$), ICU stay 5.2 days ($p < 0.01$). Patients with complications were subjected to multivariate analysis where the risks are allocated by priority in Class 1. The criteria was EURO SCORE lesser than 3.32, LWSVI eight hours per operation lesser than 28.2 gm/m and duration of cardiopulmonary bypass more than 93 minutes. There were 5 patients in this class. In class 2 the criteria was RWSVI postoperative lesser than 2,7 and the presence of diabetes , there were 2 patients in this class. In class 3 the criteria was copeptin in JIL lesser than 0,17 and troponin preoperative greater than 0.06, in this class there were 2 patients.
Conclusions: Our study showed that using copeptin, troponin and EURO SCORE is a useful method for prediction of complications in patients undergoing CABG
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12AP2-7

Ghrelin inhibits proinflammatory responses and prevents long-term cognitive impairment in septic rats

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Background and Goal of Study: The brain is one of the first affected organs during sepsis, including acute brain dysfunction and long-term cognitive impairment. Wu et al have found that ghrelin decreased proinflammatory cytokines, attenuated organ injury and improved survival rate in sepsis-induced acute lung injury. However, the effects of ghrelin on proinflammatory cytokines and cognitive impairment in septic brain have not yet been investigated. Our study was conducted to test the hypothesis that early treatment with ghrelin may inhibit proinflammatory responses, attenuate neuronal apoptosis and subsequently reverse long-term cognitive impairment in sepsis associated encephalopathy.
Materials and Methods: Sepsis was induced by cecal ligation and puncture (CLP). SD rats were randomly divided into four groups: sham, sham + ghrelin, CLP and CLP + ghrelin. Ghrelin (80 μg/kg) was administrated intraperitoneally 4 and 16 h after surgery in sham + ghrelin group and CLP + ghrelin group. The levels of proinflammatory cytokines in hippocampus were measured by ELISA and cleaved caspase-3 was detected by western blot 24 h after surgery. Neuronal apoptosis was determined by TUNEL staining 48 h after surgery. Additional animals were monitored to record survival and body weight changes for 10 days after surgery. Survival animals underwent behavioral tasks 10 days after surgery: open-field, novel object recognition and continuous multiple-trials step-down inhibitory avoidance task.
Results and Discussion: Ghrelin significantly decreased the levels of proinflammatory cytokines and inhibited the activation of caspase-3 after CLP. The density of TUNEL-(+) neurons was significantly lowered by ghrelin. In addition, ghrelin improved the survival rates after CLP. There were no differences in the distance and move time between groups in open-field task. However, the survivors after CLP were unable to recognize the novel object and required more training trials to reach the acquisition criterion. All these long-term impairments were prevented by ghrelin.
Conclusion(s): Ghrelin inhibited proinflammatory responses, improved the survival rates and prevented long-term cognitive impairment in septic rats.
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Acknowledgements: This study was founded by National Natural Science Foundation of China (No.30901409).

12AP2-8

Possible role of epigenetic modifications in the pathology of sepsis

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Background and Goal of Study: Epigenetic programming, dynamically regulated by histone acetylation, may play a key role in the pathophysiology of sepsis. We thus investigated the effect of treatment with the novel HDAC inhibitor CG200745 and Valproic Acid on lung inflammation and apoptosis during sepsis.
Materials and Methods: Polymicrobial sepsis was induced by cecal ligation and puncture (CLP) in BALB/c mice and the animals received intraperitoneal injection CG200745 (10 mg/kg) or Valproic Acid (300 mg/kg) at 3 hours before surgery.
Results and Discussion: HDAC1, HDAC2, and HDAC3 protein levels were decreased in lungs after CLP. Furthermore, CLP-induced sepsis increased both histone H3 and H4 acetylation levels in lungs. CG200745 and Valproic Acid treatment was without effect on inflammatory features in mice with CLP-induced sepsis. However, we found that CG200745 strongly prevented sepsis-induced cell apoptosis in lungs as well as spleen despite the report that CG200745 induces apoptotic cell death in RKO colorectal cancer cells by promoting acetylation of p53. The sepsis-associated increases in activated caspase-3 and cleaved PARP, another signature of apoptosis, in lungs were greatly inhibited by CG200745 treatment. This anti-apoptotic effect of CG200745 was not accompanied by up-regulation of anti-apoptotic and down-regulation of pro-apoptotic Bcl-2 family member proteins. These results suggest that imbalance in histone acetylation may play a contributory role in expression or repression of genes involved in septic cell apoptosis.
Conclusion(s): Histone acetylation may play a contributory role in expression or repression of genes involved in septic cell apoptosis, and CG200745 is a unique agent to prevent cell apoptosis without affecting inflammation in sepsis. These findings imply that septic inflammation and apoptosis may not necessarily be essential for one another's existence. This study provides new evidence that HDAC inhibition has potential as a new therapeutic strategy for sepsis.

12AP2-9

KPC-producing *Klebsiella pneumoniae* resistant to colistin: epidemiology and risk factors for colonization during intensive care unit stay

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Background and Goal of Study: Colistin remains one of the last treatment options against carbapenemases-producing Gram negative bacteria. The emergence of colistin resistance poses a serious threat. Therefore, the objective of the present study was to document risk factors for colonization by KPC-producing *Klebsiella pneumoniae* resistant to colistin (CR-Kp) of Intensive Care Unit (ICU) patients.
Materials and Methods: During a 2-year period, rectal samples were taken from each patient upon ICU admission and once a week after. Rectal swabs were inoculated in chromogenic agar and *K. pneumoniae* isolates were identified by standards methods (Enterotube II, BD, BBL). Antibiotic susceptibility test was performed by the agar disk diffusion method according to CLSI guidelines. MIC to colistin was determined by Etest (AB Biodisk). The presence of *bla*KPC gene was confirmed by PCR. Epidemiologic data were collected from the ICU computerized database and patient's chart reviews. Univariate and muiltivariate statistical analysis was performed using SPSS ver. 19.0 as appropriate.
Results and Discussion: Among 254, of more than 6 days hospitalized patients, 126 (49.6%) became colonized by KPC-producing *K. pneumoniae* susceptible to colistin, while, 62 (24.4%) by CR-Kp and the rest 66 (26.0%) were not colonized by KPC-producing *Klebsiella pneumoniae*. During the study period 305 strains of KPC-producing *K. pneumoniae* were isolated from all ICU patients. Resistance rate among standard antibiotics was 100%, while 197 (64.6%) were resistant to imipenem, 117 (38.4%) to gentamicin, 103 (33.8%) to colistin and 88 (28.9%) to tigecycline. Multivariate analysis identified administration of colistin ($p< 0.001$) or corticosteroids ($p=0.014$) during ICU stay, and the presence of colonized patients in nearby beds ($p< 0.001$) as important risk factors for CR-Kp colonization.
Conclusion: There exists a high percentage of CR-Kp colonization. As it was expected, administration of colistin predisposes to colonization. The presence

of colonized patients in nearby beds also constitutes a risk factor, indicating the importance of patient-patient transmission via the staff.

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12AP2-10

Risk factors and predictors of mortality for KPC-producing *Klebsiella pneumoniae* bactereamia during intensive care unit stay

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Background and Goal of Study: KPC-producing *Klebsiella pneumoniae* (KPC-Kp) provokes serious infections especially in critically ill patients, with high mortality. The objective was therefore to study the epidemiology, the associated risk factors and the outcome of KPC-Kp bactereamic Intensive Care Unit (ICU) hospitalized patients.
Materials and Methods: During a 2-year period, KPC-Kp isolates, from bactereamic ICU patients (one per patient), at a university hospital, were studied. Antibiotic susceptibility test was performed by the agar disk diffusion method according to CLSI guidelines. MIC was determined by the Etest (AB Biodisk). Isolates were tested by meropenem-boronic acid synergy disk test for the production of KPC. The presence of *bla*KPC gene was confirmed by PCR. Molecular typing was performed by PFGE of X*bal* restricted genomic DNA. Epidemiologic data were collected from the ICU computerized database and patient's chart reviews. Statistical analysis was performed by SPSS ver. 19.0.
Results and Discussion: Among 273 ICU hospitalized patients, 48 (17.6%) developed KPC-Kp bactereamia. All KPC-Kp isolates (100%) were resistant to all antibiotics (carbapenems included), 28 (52.8%) were resistant to gentamicin, 29 (54.7%) to colistin and 18 (34%) to tigecycline. blaKPC-2 gene was found in all KPC-Kp isolates while the majority belonged to pulsotype A (n=34, 64.2%).
Multivariate analysis identified tracheostomy, number of invasive catheters and administration of aminoglycoside as risk factors of KPC-Kp bactereamia. The 30-day mortality among bactereamic patients was 43.4%. Age, septic shock, SAPS II score at onset of infection, and resistance to gentamicin, colistin or tigecycline were independently associated with mortality, while treatment with two appropriate antibiotics was a predictor of survival.
Conclusions: There was a high percentage of KPC-Kp bactereamia, with increased 30-day mortality. Administration of aminoglycosides and invasive devises predispose to the induction of bactereamia. The mortality was influenced by the severity of infection and by the treatment with two appropriate antibiotics.

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12AP2-11

Linezolid-resistant coagulase-negative staphylococci: epidemiology and risk factors for colonization during hospitalization in the intensive care unit

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Background and Goal of Study: Linezolid is one of the newest antibiotics against multidrug-resistant gram positive cocci. The emergence of linezolid resistance poses a main threat in the treatment of severe infections. The aim of the present study is to investigate the epidemiology and to detect the risk factors for colonization by linezolid-resistant coagulase-negative staphylococci (LR-CNS) during Intensive Care Unit (ICU) hospitalization.
Materials and Methods: CNS isolated from clinical samples (blood, catheter tips, wounds, nares) of ICU patients in the University Hospital of Patras were tested by Etest for linezolid resistance. MICs of vancomycin, daptomycin and tigecycline were determined by Etest among LR-CNS. Mutations in the 23S rDNA genes were investigated. Clones were characterized by PFGE of *Sma*I DNA digests and MLST.
Results and Discussion: In total, 33 LR-CNS (29 *S. epidermidis* and 4 *S. capitis*) were identified among 312 CNS recovered from 234 patients. Four strains (12.1%) expressed intermediate resistance to vancomycin (MIC:4 mg/L), while all remained susceptible to daptomycin and tigecycline. All linezolid-resistant *S. epidermidis* carried C2534T, while 14 carried additionally the T2504A mutations; all belonged to ST22. Those carrying both mutations showed MIC of linezolid >256 mg/L, while strains carrying only C2534T had linezolid MICs 2-4 mg/L. All *S. capitis* carried the C2576T mutation showing linezolid MIC:32 mg/L and belonging to the same PFGE type. Presence of invasive catheters ($p=0.028$), SOFA Score at admission ($p=0.013$), days until colonization ($p=0.034$), mean antibiotic usage per day ($p=0.002$), the administration of linezolid ($p< 0.001$) and the mean number of LR-CNS in nearby beds ($p=0.006$) were identified as important risk factors for LR-CNS colonization by multivariate analysis.
Conclusions: Colonization by LR-CNS is influenced by the administration of antibiotics and especially linezolid. The fact that the presence of nearby colonized patients and that most strains belonged to single clones underlines the importance of patient to patient transmission of these strains via the staff.

12AP3-1

Biological markers of nutritional status in surgical intensive care units

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Background and Goal of Study: It is established that malnutrition is an independent factor of morbidity and mortality in patients at ICU. The prognostic inflammatory and nutritional index (PINI) is frequently used as a marker of malnutrition but this scoring system was not studied in surgical intensive care units.
Aim of the Study: Assessment of nutritional status with biomarkers and search for a correlation between biological markers and prognosis, using the PINI.
Materials and Methods: An open prospective study was performed in the intensive care unit, started in July 2010. Twenty surgical patients aged from 18 to 80 years, spent at least seven days at the ICU were enrolled. An early nutritional care was given (first 24 hours). The patients were evaluated each week clinically (weight, BMI, MODS ratio…) and biologically (Albumin, Prealbumin, Orosomucoid, CRP measurements) in order to establish the prognostic inflammatory and nutritional index (PINI = CRP*oroso/ALB*preALB).
Results and Discussion: The average age was 56+/-11 years, IGS II score was 48+/-7, APACHE II score was 25+/-12 and MODS ratio was 6+/-4. The mean duration of stay was 40+/-25 days; the mortality rate was 35%. The average calorie intake was 2300+/- 600 kcal. There was a weight gain and an increase of the BMI either in surviving and dead patients.
There was an initial increase of the CRP and the orosomucoid rate during the acute phase of aggression followed by a progressive decrease. The nutritional proteins (albumin,prealbumin,RBP) were always low ,despite a progressive increase.
The PINI was initially high and decreased progressively but remained high (> 20).
The Albumin and Prealbumin rate were correlated with the MODS ratio respectively ($p= 0.012$; $r= -0.822$), ($p=0.045$; $r= -0.465$).
There was a correlation between the orosomucoid rate and the organ failure ($p=0.043$; $r= 0.681$).
The PINI was correlated to the MODS ratio and to the IGS II with respectively ($p=0.001$; $r= 0.681$); ($p=0.045$; $r= 0.677$) but not with mortality.
Conclusion(s): The malnutrition in surgical patients at ICU has an early onset and is always severe. Biological markers and IPNI are correlated with organ failure but not mortality.

12AP3-2

Nutrition in the critically ill-need for standardised protocols?

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Background and Goal of Study: Adequate nutrition is essential in reducing morbidity and mortality in critically ill patients. The ASPEN and ESPEN guidelines are available to guide adequate nutritional support for the critically ill. Each days delay in establishing feed enterally results in 3-5 days of nutritional depletion due to 3- gms of + Nitrogen balance[1].
In critically ill patients the gastric emptying may be reduced causing intolerance to enteral feeding. The gastric residual volumes(GRV) have been used

as a surrogate marker for tolerance to enteral feeding. Controversies regarding the cut off for GRV of 200mls or 500 mls continue due to conflicting results in different studies. Mentec et al showed that higher volumes resulted in lower mean caloric intake, however Pinilla and Taylor et al suggested that higher GRV mean a higher intake of nutrition and better outcome. The Regane[2] study confirmed this and current guidelines suggest no difference in smaller/ larger GRV with regards to the GI complications.
The goal of our survey was to assess the nutritional protocols and any variations in practice amongst different ICUs in London.
Materials and Methods: An online questionnaire was sent to the Nutritional teams and results analysed.
Results and Discussion: 23 ICUs responded. 95% had a protocol for enteral nutrition(EN). 7 followed 30 mls/hr as the starting rate for EN, 2 had 20 mls/hr and 2 had 25 mls./hr.
11 units use a GRV cutoff of 200mls, 6 use 250 mls,4 use 300mls and 2 use 500mls.
4 units had no specialised feeds. Others had nepropeptamen, jevity plus, structokabiven, oxepa, pulmocare etc.
3 units use 20-25kcal/kg/day as daily caloric requirements,6 use 25kcal/kg/day and others use clinical state of the patient. Oxford and PENN equations are also used.
15 units use actual body weight, 3 ideal body weight and others use either or depending on the BMI for calculations.
8 ICUs weigh their patients, 13 use preadmission weights and 3 use MUST score.
In 5 units dieticians decide on initiating the enteral/parenteral feed and in 18 the decision is multidisciplinary.
Conclusion(s): Our results show considerable discrepancy in nutrition protocols in London hospitals. In particular the GRV are different and there is no consensus on the limit. It was not clear whether ASPEN/ESPEN guidelines are used in hospital protocols. A common protocol therefore needs to be developed.

12AP3-3

Dexmedetomidine maintains cognitive function in volunteers

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Background and Goal of Study: Delirium is a common symptom in patients admitted to the intensive care unit (ICU) and is closely related to undesirable patient outcomes. Dexmedetomidine is more effective than midazolam in reducing the prevalence of delirium [1]. We hypothesized that dexmedetomidine reduces the prevalence of delirium because it does not disturb cognitive function. Therefore, we investigated the effect of dexmedetomidine on cognitive function in healthy volunteers.
Materials and Methods: Six healthy volunteers participated in this study. After infusion of a 6-mcg/kg/h loading dose of dexmedetomidine for 10 min, a maintenance infusion of 0.4 mcg/kg/h was administered for 4 h. Cognitive function was evaluated before infusion (baseline) and 2 h, 4 h, 6 h, and 8 h after infusion of dexmedetomidine. As cognitive function, response speed, accuracy, and consistency measured by CogHealth Japanese edition (Health Solution Inc., Tokyo, Japan) were recorded. CogHealth is one of the reliable cognitive function tests [2]. Depth of sedation was evaluated at 1-h intervals by evaluating the bispectral index (BIS) (BIS Covidien; Boulder, Colorado, USA). Data of cognitive function were presented as change from the baseline. Statistical analysis was performed, and P values less than 0.05 were considered statistically significant.
Results and Discussion: Subject age was 29 ± 2 years (mean ± SD), and body mass index was 22 ± 2 kg/m^2. The BIS value from 1 h to 5 h after infusion was significantly lower than that before infusion. The minimum BIS value was 62 ± 11 at 3 h after infusion. Response speed at 2 h and 4 h after infusion was significantly lower than that before infusion (92% ± 4%, 93% ± 3%, $P < 0.01$). Consistency at 2 h and 4 h after infusion was significantly lower than that before infusion (96% ± 3%, 96% ± 3%, $P < 0.01$). At all points during infusion, the accuracy of responses did not change in comparison with that before infusion. Although dexmedetomidine reduced response speed and consistency, these measures decreased by only 4-8%. Therefore, we considered that dexmedetomidine does not affect the cognitive function of patients.
Conclusion: Dexmedetomidine reduced response speed and consistency slightly and did not affect response accuracy. Therefore, dexmedetomidine maintains cognitive function well in healthy individuals.
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12AP3-4

Should we withhold parenteral nutrition during a week after emergency abdominal surgery?

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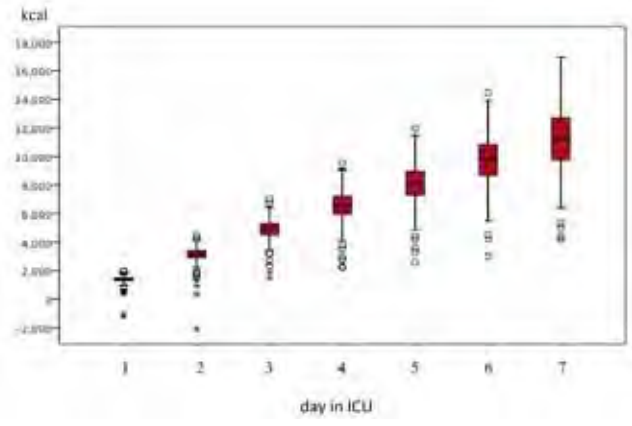
Background and Goal of Study: Cumulative caloric deficit is related to adverse outcome (1). On the other hand, recent findings suggest that delaying parenteral nutrition (PN) for a week is associated with better outcome (2). We aimed to study possible caloric deficit with EN only during the first week in ICU in patients after emergency abdominal surgery.
Materials and Methods: Patients admitted to general ICU of university hospital after emergency abdominal surgery over 8 years were retrospectively studied during their first week of ICU stay. Caloric needs were calculated as 20 kcal/kg/day for the first, and 25 kcal/kg/day for following days for ideal body weight (height (cm) - 100)).
Results and Discussion: 334 patients were studied for 1616 ICU days. Most of the patients (61.4%) were operated due to peritonitis, 17.5% due to GI or intra-abdominal hemorrhage, 8.1% with ileus, 6.9% due to pancreatitis and 6.0% with abscessus, cholangitis or other intra-abdominal septic conditions. Median age of the patients was 74 (range 35-88). On admission, most of the patients (96%) were on mechanical ventilation and vasopressor and/or inotropic support. Median APACHE II score was 14 (10-23), SOFA score on admission day 6 (IQR 4-10) points. Median ICU stay was 6 (3-12) days, ICU mortality 25.1%.
Only 34.7% of patients received EN during their first week of ICU stay, while PN was given to 82.3% of patients. In ten patients PN was withheld for 3-5 days, whereas PN was started earlier in other cases of insufficient EN. Median caloric deficit during the first week in ICU was 77 (IQR -440 to 524) kcal/day. Without PN it would have been 1625 (1400-1800) kcal/day. Hypothetical cumulative caloric deficit with only enterally given calories counted is presented on Figure 1.



[Figure 1 Hypothetical cumulative caloric deficit with EN]

Conclusion(s): With current feeding strategies after emergency abdominal surgery the patients would develop severe caloric deficit if PN would be withhold during the first week in ICU. Current strategies of EN need a revision, if delayed PN is considered in this group of patients.
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12AP3-5

Negative energy balance correlates with increased risk of mortality, infectious complications and longer ICU stay

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Background and Goal of Study: Patients in intensive care units (ICU) often do not receive enough calories to meet prescribed targets. We examined associations between the energy balance and clinical outcomes in ICU patients.
Materials and Methods: We prospectively studied 432 patients ≥ 18 years that stayed more than 4 days in the ICU of University Hospital Center of Tirana “Mother Theresa” between 2010-2012. Variables used for analysis included total caloric intake, age, gender, Acute Physiology and Chronic Health Evaluation (APACHE) II score, length of ventilator stay, length of ICU stay,

infections complications and ICU mortality. Energy balance was calculated as energy delivery minus target. Data in means ± SD, logistic regressions between energy balance and outcome variables.
Results and Discussion: 432 patients aged 60.96 ± 16.20 years were investigated. APACHE II score was 17.07 ± 5.54, mechanical ventilation lasted 2.17 ± 4.34 days, ICU stay was 9.34 ± 8.23 days, and ICU mortality was 28.7%. Time to feeding was 2.9 ± 3.6 days. Incidence of infectious complications was 33.1%. Cumulated energy balance was between - 10 220 ± 7070 kcal and correlated with infectious complications: odds ratio (OR) 2.54; 95% confidence interval (CI): 1.98-3.26; p = 0.0000. The correlations were also strong with the length of mechanical ventilation (F = 72.07, P < 0.001), the length of ICU stay (F = 580.09, P < 0.001) and mortality (OR = 1.29; 95% CI: 1.05 - 1.58; p = 0.01). Multiple regression analysis adjusted for confounders identified cumulated energy deficits as being independently associated with infectious complications (F = 85.59, P < 0.001), mortality (F = 6.14, P = 0.014), ventilator stay (F = 53.8, P < 0.001) and ICU stay (F = 334.5, P < 0.001).
Conclusion(s): In this study was found a significant association between energy deficit and greater risk of ICU mortality, infectious complications, longer ventilator stay and ICU stay. Energy deficit may serve as an independent nutrition indicator to predict ICU mortality and clinical outcome in critically ill patients. Negative energy balances are very frequent during severe critical illness and suggest the need for implementation of quality improvement measures by the healthcare team to enhance the provision of nutrition support to the patients of the ICU.

12AP3-6

Malnutrition affects negatively the outcome of intensive care unit (ICU) patients

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Background and Goal of Study: The prevalence of malnutrition is a common problem in critically ill patients. Malnutrition has been identified as affecting patient outcome. The purpose of this study was to correlate the nutritional status of ICU patients with their morbidity, mortality, length of ventilator stay and length of ICU stay.
Materials and Methods: We prospectively studied 432 patients ≥ 18 years that stayed more than 4 days in the ICU of University Hospital Center of Tirana, between 2010 and 2012. The patients were characterized by scoring the components "undernutrition" and "severity of disease" , using Nutritional Risk Screening-2002. The patient could have a score of 0-3 for each component (undernutrition and severity of disease), and any patient with a total score ≥ 3 was considered at nutritional risk, or with malnutrition. Undernutrition was evaluated by any of the 3 variables (BMI, recent weight loss, recent food intake).
Univariate and multivariate logistic regression analysis were used to identify the relation between malnutrition and outcome.
Results and Discussion: 432 patients aged 60.96 ± 16.20 years with 56.3% being male. The prevalence of malnutrition in ICU admission was 63.6%. The incidence of complications in the malnourished was 68.3% vs. 28.6% in the well nourished patients [Odds ratio (OR): 5.3, 95% confidence interval (CI): 3.501 - 8.261; p = 0.0000]. The incidence of infectious complications in the malnourished was 39.2% vs. 22.2% in the well nourished patients, OR = 2.2, 95% CI: 1.44 - 3.52; p = 0.0003.
Mortality in the malnourished patients was 33.0% vs. 21.0% in the well nourished (OR = 1.8, 95% CI: 1.17 - 2.94; p = 0.008). Malnourished patients stayed in the mechanical ventilation 2.49 ± 4.48 days vs. 1.6 ± 4.05 days in the well nourished patients. Malnourished patients stayed in the ICU for 10.55 ± 9.35 days vs. 7.31 ± 5.23 days in the well nourished.
Malnutrition, as analyzed by a multivariate logistic regression model, is an independent risk factor on higher complications: F = 73.96, P < 0.001, higher infectious complications: F = 13.35, P < 0.001, increased mortality: F = 7.2, P = 0.008, longer stay in the ventilator F=4.03, P = 0.04 and longer ICU stay F = 15.52, P < 0.001.
Conclusion(s): Malnutrition affects negatively the outcome of ICU patients. Nutritional assessment is mandatory, in order to recognize malnutrition early and initiate timely nutritional therapy.

12AP3-9

Delirium in the ICU setting - a subjective and theoretical survey before the implementation of the Confusion Assessment Method for the ICU in an unit

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Background and Goal of Study: The current definition of *delirium* comprises acute change or fluctuation in mental status and inattention, accompanied by either altered level of consciousness or disorganized thinking. It is a frequent condition in the ICU and it is associated with longer hospital stay, increase in mortality at 6 months and long-term cognitive impairment, but remains under diagnosed. The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) has been validated and implemented in many ICUs and its use is recommended by the Society of Critical Care Medicine. It is our purpose to evaluate the individual perspective and the objective knowledge of our staff about *delirium* before the implementation of the CAM-ICU.
Materials and Methods: Anonymous survey to our ICU clinical staff which contained subjective and 'true or false' questions. Data was analised with the software SPSS version 17.0. The Wilcoxon test was used to compare auto-perception of knowledge about delirium and the content of answers regarding its definiton.
Results: Forty two questionnaires were returned (participation rate of 73%), 11 from physicians and 31 from nurses. Overall, 61,9% of inquiries think they can give a definition for *delirium* in the ICU and 50% claim to be able to evaluate *delirium*. 28,6% of the respondents - 63,6% of the physicians and 16,1% of the nurses - know the CAM-ICU. From these only a quarter has received education on this method, 75% think it's easy to apply and 66% don't see its use as an increase in the daily workload. We found a high rate of wrong and 'I don't know' answers to questions about operationalization, diagnosis and outcome. The subjects' auto-perception on their knowledge about *delirium* [Likert scale] was compared to their ability to answer questions related to its definiton - 'attention deficit is essencial for diagnosis' [true], Wilcoxon test Z=-4,699 (p< 0,001); 'disorganized thinking is essential for diagnosis' [false], Wilcoxon test Z=-4,437 (p< 0,001).
Conclusions: The respondents' auto perception of knowledge about *delirium* doesn't translate in the ability of giving an appropriate definition and making an adequate evaluation. Most of the inquiries don't know the CAM-ICU, but those who do believe it's easy to apply and its use won't increase the workload. We performed educational sessions about *delirium* and the CAM-ICU in our unit to encourage our clinical staff to deal properly with this hazardous condition.

12AP3-10

Efficacy of dexmedetomidine and propofol on shivering during mild hypothermia after cardiovascular surgery

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Background and Goal of Study: Hypothermia may be beneficial in stroke victims, even though under operative and postoperative periods. However, it provokes vigorous shivering which is potentially harmful in fragile patients. Dexmedetomidine, a centrally acting alpha (2)-adrenergic agonist, has been used as a sedative agent and is known to reduce the shivering threshold. Therefore, the aim of this study was to evaluate the efficacy of dexmedetomidine in preventing shivering during therapeutic mild hypothermia after cardiovascular surgery.
Materials and Methods: Twenty-four patients (36 to 83 years), suffering from hemodynamic collapse during surgery, were induced mild hypothermia after cardiovascular surgery, such as thoracic aortic surgery (n = 22), and coronary artery bypass grafting (n = 2). On arrival in the ICU, patients received 0.2~0.7 mg/kg/hr of dexmedetomidine (Dex group; n = 14), or 1~3 mg/kg/hr of propofol (Prop group, n = 10), intravenously. Mean arterial pressure, cardiac output, mixed venous oxygen saturation (SVO2), central blood temperature (Temp-C), and peripheral skin temperature (Temp-P) were measured. During therapeutic mild hypothermia, the incidence of shivering was recorded. All results are expressed as mean ± SD, with statistical evaluation by an unpaired-t test and Fisher's exact probability test. A P value less than 0.05 was considered statistically significant.
Results and Discussion: No differences were found in SvO2 (Dex: 71.3 ± 8.1%, Prop: 73.9 ± 4.4%, P = 0.118) and Temp-C (Dex: 35.3 ± 0.7°C, Prop: 35.1 ± 0.6°C, P = 0.515) during therapeutic hypothermia among the two groups. However, Temp-P in Dex group (33.5 ± 1.7°C) was significantly higher

than that in Prop group (30.1 ± 2.9°C, P = 0.001). Also, the incidence of shivering during mild hypothermia was seen in 3/10 (30%) patients in the Prop group, but in 0/14 (0%) patients in the Dex group (P = 0.028).
Conclusion(s): The incidence of shivering during therapeutic mild hypothermia was effectively reduced by dexmedetomidine, but was not done by propofol.

12AP3-11

Continuous bilateral BIS-EEG monitoring in patients treated with mild hypothermia after cardiac arrest

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Background and Goal of Study: Patients admitted after cardiac arrest (CA) are currently treated with 24hrs of therapeutic hypothermia. During this period of TH, any neurological prognosis is very uncertain. In this study, we analyzed whether the use of bilateral BIS-EEG monitoring might be a valuable prognostic tool.
Materials and Methods: After IRB approval, BIS data were prospectively collected from 23 post-CA pts treated with therapeutic hypothermia (33°C) for 24 hours. Cold saline (30 ml/kg) was administered as soon as possible after hospital admission. TH was induced by endovascular or surface cooling and maintained for 24 hours. All patients were sedated (propofol/remifentanil) for duration of hypothermia. Student's *t*-test were used to compare BIS values between survivors and non-survivors at each of the time points during TH. BIS values are represented as mean ± SD.
Results and Discussion: Of 23 pts, 8 pts did not survive until hospital discharge due to post-ischemic brain damage, 15 pts survived (10 without neurological impairment - CPC 1-2). Mean BIS values between left and right hemisphere were not significantly different. Mean BIS values at the start of TH were not significantly different between survivors (46±25) and non-survivors (34±17)(p=0.227). During maintenance of TH (33°C), mean BIS values were significantly different between survivors and non-survivors: 4 hours after start TH: survivors 58±18 and non-survivors 32±36 (p=0.034), 12 hours after start TH: survivors 62±21 and non-survivors 32±33 (p=0.018), 24 hours after start TH: survivors 60±21 and non-survivors 36 ±21 (p = 0.026). In 6 pts a BIS of zero was observed during at least one time point. Of these pts, 5 pts died in hospital, while 1 pt survived with CPC-score 3. Of those 17 pts without mean BIS value of zero during TH, 15 survived.
Conclusion(s): In a post-CA population, we found no significant difference between right and left mean BIS values. Although we found no differences in BIS values for survivors vs non-survivors at the start of TH (values were low in both groups), there was a significant increase in BIS values in survivors during the following hours of TH. Especially, a BIS value of O may help to predict bad neurological outcome after CA, already during the early hours of TH.

12AP4-1

Use of capnography on the intensive care unit: are we keeping up?

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Background and Goal of Study: Capnography is accepted as the gold standard to confirm correct artificial airway placement. The Fourth National Audit Project (NAP4) found that failure to use capnography contributed to 74% of death or persistent neurological injury cases in Intensive Care Unit (ICU) related to airway complications.[1] The Intensive Care Society (ICS) recommends the use of capnography for all intubations, transfers and ventilated patients.[2] Current evidence suggests it is used for only a quarter of such patients. The aim of this audit was to look at the use, availability and understanding of capnography on the ICU and identify ways to improve patient safety.
Materials and Methods: We interviewed nurses and trainee doctors working on our 70-bedded ICU. Using a questionnaire, we asked about the use of capnography in clinical practice, reasons for not using it and whether they received teaching on its use. We also asked them to interpret different waveforms related to airway complications.
Results and Discussion: A total of 87 nurses and 37 trainee doctors were interviewed. On average, capnography was used in fewer than 25% of intubations and 10% of ventilated patients. 70% of patients had capnography monitored during transfers. The main reasons for not using capnography were that it was not thought of as part of emergency intubation, the equipment was not freely available and a lack of peer consensus. The majority (84%) was able to identify a normal waveform but there was difficulty in interpreting other waveforms among non-anaesthetic trainees and nurses, who had not received formal teaching.
Conclusion(s): Results suggest that we do not fully comply with the ICS recommendations. This project has helped to increase the awareness of capnography among the staff. To improve our standard of care and patient safety, we plan to introduce an intubation and transfer checklist that includes capnography. We will ensure the availability of capnography at all bed spaces and on the intubation trolley. We will focus on educating all ICU staff on the use of capnography.
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12AP4-2

Is there a correlation between the neutrophil-to-lymphocyte ratio and immediate postoperative complications?

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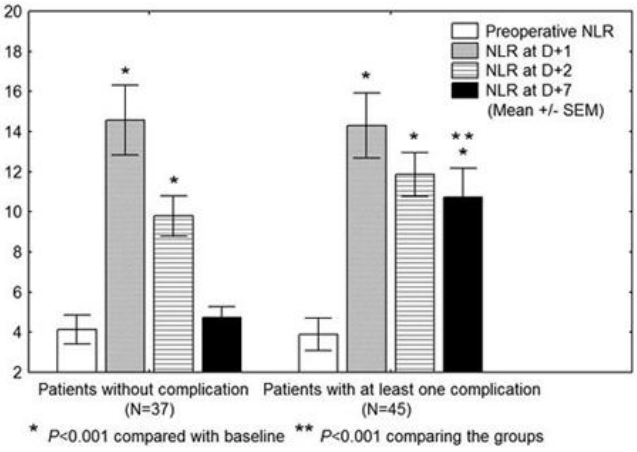
Background and Goal of Study: The Neutrophil-to-Lymphocyte Ratio (NLR) is an inflammatory marker that has proven usefulness for predicting late complications [1,2]. In this study, we attempted to correlate the NLR with immediate postoperative complications.
Materials and Methods: This was a retrospective study based on a prospective database[3] of 82 consecutive patients (age 60 ± 13 years, female/male 32/50) who had undergone major abdominal surgeries. For each patient, we recorded preoperative characteristics, the NLR and C-Reactive Protein (CRP) values, and postoperative complications (between D+8 and D+30) such as infections (29), cardiovascular complications (12) and other complications (28). We performed uni- and multivariate analyses. We compared patients with and without postoperative complications using χ^2 for categorical variables and student-t test for continuous ones. Then we performed multivariate analyses using regression models with stepwise backward regression. $P < 0.05$ was considered statistically significant.
Results and Discussion: Patients with complications did not present a higher preoperative NLR than those without, but did display a higher ratio at D+7 ($P < 0.001$).



[Perioperative NLR Values]

In the univariate analysis, the preoperative value of NLR was not predictive of immediate complications, unlike the NLR at D+7 ($P < 0.001$).
At D+7, in the multivariate analysis, an increased NLR was associated with more complications ($P < 0.001$), whereas none of the other factors, including CRP, showed any correlation.
Using linear regression models, we identified a correlation between the NLR and CRP ($P < 0.05$). They differed in their time of maximum level (respectively D+1 and D+2).
Conclusion: The NLR is a simple biological parameter. The preoperative NLR was not significantly associated with early postoperative complications. On

the contrary, the NLR at D+7 could help in the early identification of patients at risk of complications.

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12AP4-3

Post-operative patient outcomes in cardiopulmonary exercise tested patients: a retrospective review

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Background and Goal of Study: This review analyses the correlation between cardiopulmonary exercise testing (CPET) and post-operative patient outcomes of elective surgical patients at Princess Alexandra Hospital (PAH), using patient's anaerobic threshold (AT) as a determinant. Patient outcomes are measured by the number of post-operative complications, using the post-operative morbidity survey, total length of stay in hospital and length of stay in ITU/HDU.
Materials and Methods: Patient data was retrieved from the PAH database and patient notes. 130 patients underwent CPET testing in 2011. 94 patients had time scheduled surgery at review commencement, 18 were not admitted, leaving 75 patients for regression analysis using Microsoft Excel. AT was categorised into < 6ml/kg/min, 6-8ml/kg/min, 8-11ml/kg/min, >11ml/kg/min, following closely to data by Waserman et al1, and Weber et al2. AT was analysed against outcomes for all surgeries and groups of major surgeries (aneurysm repairs, other vascular operations, colorectal surgery) following studies by Snowden et al3 and Wilson et al4. The Lee's Revised Cardiac Risk Index5 was calculated and regressed against morbidity.
Results and Discussion: For all operations, the correlation between AT and post-operative outcome is 12%. AT was able to predict patient outcomes of aortic aneurysm repairs by 33%, other vascular surgeries by 38% and major colorectal surgeries by 31%. Morbidity is an important predictor of outcomes for aortic aneurysm repairs (significant t-stat value -2.88, 95% confidence interval). Morbidity and length of hospital stay are greater influencing factors than length of ITU stay for other vascular surgeries (t-stat value 1.64, -1.92, 0.25 respectively). Length of hospital stay has most influence for patients major colorectal surgery (t-stat 1.80).
The Lee revised Cardiac Index and AT are 77% and 1.44% correlated with post-operative complications. At AT < 11ml/kg/min, we found a 0.94% correlation with post-operative morbidity.
Conclusion(s): Using AT to predict patient outcomes post-surgery is dependent operation type, with an average of 34% correlation for major surgeries. AT is unable to determine the length of stay in ITU/HDU. This is due to other factors influencing patient outcomes such as age and co-morbidities. The Lee Revised Cardiac Risk Index is better able to predict post-operative morbidity than the AT values alone.

12AP4-4

Embolization for controlling traumatic pelvic hemorrhage: analysis of the pelvic fracture database in a trauma center

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Background and Goal of Study: Patients with severe pelvic fractures and hemodynamically unstable are difficult to manage and his prognosis is determined by the complexity and severity of pelvic trauma and associated injuries. The goal of study was to know the incidence and results obtained in the management of politraumatic patients with severe pelvic fractures who underwent arterial embolization in a trauma center.
Materials and Methods: Prospective study of patients included in our traumatic database between January 2009 and August 2012. Demographic and clinical data were studied: age, gender, injury mechanism, hemodynamic status and trauma scores. Mortality and complications post embolization were statistically analized.
Results and Discussion: Out of 827 patients with severe trauma admitted during the study period, 61 (7.4%) had pelvic fracture. 63% were men. The average was 44.1 (±19) years. Injury mechanism: 38.3% fell down, 43.3% had a traffic accident, 10.0% were run over and 1.7% were by a firearm. Out of 61 pelvic fractures, 17 (31%) were hemodynamic unstable at admision and 15 (24.6%) underwent angiography, with 11 (73.3%) embolizations, and gluteus ischaemia was observed in 2 patients. Mean Injury Severity Score (ISS) of patients with pelvic fractures was 19.64 and initial Revised Trauma Score (RTS) 7.11. An external noninvasive pelvic device was used in 100% of patients with unstable pelvis and 4.9% of pelvic fractures underwent external orthopedic fixation. Global mortality of pelvic fractures was 12.9%.
Conclusion(s): Hemorrhage associated with pelvic fractures is the major cause of morbidity and mortality in traumátic patients .Venous and arterial bleeding are responsible for such hemorrhage. The key of patient management is based on mechanical treatment that closes the pelvic ring, controlling venous bleeding and artery embolization.

12AP4-5

The postoperative neutrophil-to-lymphocyte ratio (NLR) is a major prognostic factor of outcome and mortality after surgery for hip fracture

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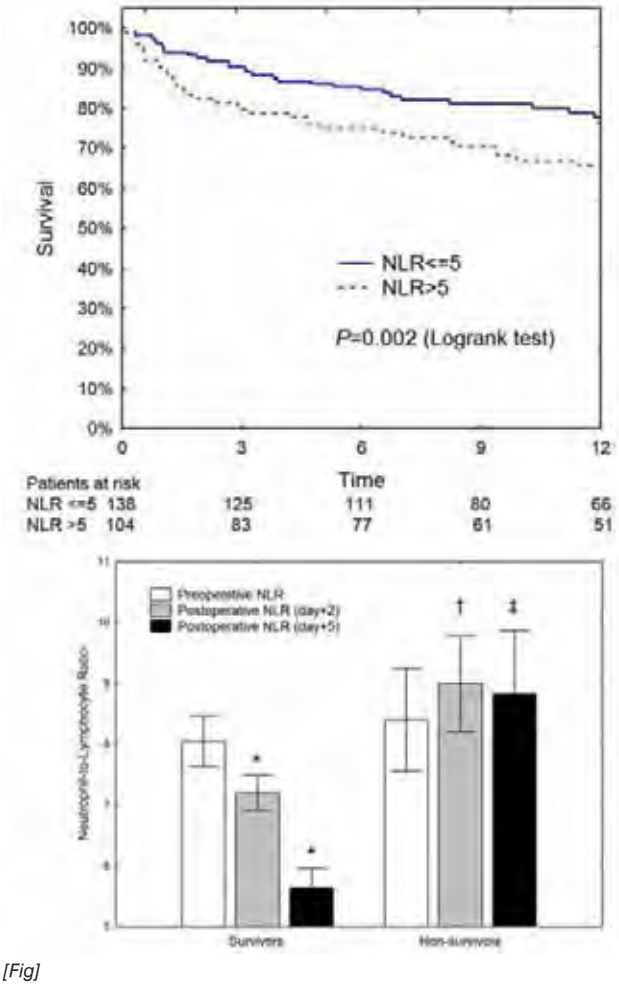
Background and Goal of Study: The neutrophil-to-lymphocyte ratio (NLR) is a cheap inflammatory biomarker and a strong independent prognostic factor for outcome and survival in cardiology, oncology and digestive surgery. We investigated the prognostic value of NLR on mortality after emergency surgery for hip fracture.
Materials and Methods: Retrospective analysis of a prospective cohort of 247 consecutive patients, >65 years, operated for hip fracture between October 2010 and February 2012 in our teaching hospital. Demographics characteristics, preoperative comorbidities, postoperative complications were registred, as well as mortality. Complete blood count (CBC) was obtained upon admission, and on day 2 and 5 after surgery. We calculated the neutrophil-to-lymphocyte ratio (NLR) on the basis of recorded absolute total neutrophil and lymphocyte counts.



[Fig]

Results and Discussion: After hip surgery in the 247 patients (women71%, median age 85 yrs, range: 66-102), the mortality was 27.2% [95%CI: 21.4-33.0] at 12 months. Univariate analysis detected four risk factors tested for mortality: age (Hazard Ratio, HR, by 10 year-increments: 2.08 [95%CI: 1.37-3.17], $P< 0.001$), male gender (HR: 1.92 [95%CI: 1.17-3.14], $P=0.009$, multiple comorbidities (MCM) (≥3) (HR: 1.71 [95%CI: 1.006-2.92], $P=0.047$ and NLR >5 at day5 (HR: 1.8 [95%CI: 1.11-2.94], $P=0.002$).
In multivariate analysis, two factors remained significantly associated with mortality, namely, decade of age (HR: 2.28 [95%CI: 1.49-3.47], $P< 0.001$) and male gender (HR: 2.26 [95%CI: 1.38-3.72], $P=0.001$). Two independent risk factors of postoperative cardiovascular complications were identified using a multivariate regression model: NLR >5 at day5 (OR: 3.34 [95%CI: 2.33-4.80], $P=0.001$) and MCM (OR: 3.04 [95%CI: 2.16-4.29], $P=0.006$). Postoperative infection was independently associated with a NLR >5 at day5 (OR: 2.12 [95%CI: 1.44-3.11], $P=0.02$).
Conclusion: The NLR, a biomarker widely available, easy to interpret at fifth postoperative day (NLR>5) is a strong predictor of postoperative cardiovascular complications and can be used to identify older patients at high risk of mortality after emergency surgery for hip fracture.

12AP4-6

Urinary neutrophil gelatinase-associated lipocalin as an early predictor of acute kidney injury in cardiac surgery patients

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Aim: To evaluate whether urinary neutrophil gelatinase-associated lipocalin (uNGAL) detects acute kidney injury (AKI) earlier than estimated glomerular filtration rate (eGFR) in cardiac surgery patients.
Methods: Two-hundred and seventy-four adult patients undergoing cardiac surgery were consecutively included from February to December 2011. Exclusion criteria were absence of diuresis due to end-stage renal disease or chronic renal failure and a previous cardiac catheterism with i.v. contrast use the week before surgery. Four serial blood and urine samples immediately before (PRE) and after (POST) surgery, and 1 (1d) and 2 (2d) days after surgery were obtained. uNGAL was measured in an Architect 6200 (Abbott Diagnostics®). AKIN criteria were used to diagnose AKI. The study was approved by the local ethics committee and all patients gave informed consent. Delta uNGAL was defined as the difference between the PRE and the POSTs concentrations.
Results: One-hundred and eighty-one patients (66.1%) were men; mean age was 68.2±12.2 years. Valve replacement was performed in 123, coronary artery bypass graft (CABG) in 81, valve surgery + CABG in 48, cardiac transplant in 5, aorta aneurism surgery in 9, and other procedures in 8 patients. Intensive care unit and hospital stays were 6.7±8.1 and 15.7±13.9 days, respectively.
Renal replacement therapy (RRT) was required in 16 patients (5.8%) within 48 hours of ICU stay and in 28 patients (10.2%) within four weeks. Mortality at 28 days was 2.9%. Eighty-six patients (31.4%) were diagnosed of AKI within 48 hours of surgery. Area under ROC curve of POST uNGAL for AKI diagnosis was 0.72 (0.66-0.79) ($p< 0.0001$) at an optimal cut-off value of 180 ug/L, with 78.7% specificity, 64% sensitivity and 74.1% accuracy. uNGAL advanced diagnosis of AKI in 44 patients (51.2%), whereas diagnosis was achieved at the same time as AKI criteria in 11 patients; AKI criteria outperformed uNGAL in only 36% of cases. Accordingly, uNGAL was useful to diagnose postoperative AKI in 63.9% of cases. Median delta uNGAL was 12.5 (from -1.9 to 71.1) and 154.5 (from 16.6 to 484.5) ug/L in non-AKI and AKI patients, respectively ($p< 0.0001$) and its area under ROC curve for AKI prediction was 0.70 (0.63-0.77) ($p< 0.0001$).
Conclusion: Compared to AKIN criteria, a urinary NGAL concentration >180 ug/L anticipates AKI diagnosis in more than 50% of cardiac surgery patients in the first 24-48 hours after intervention.

12AP4-7

Creatinine reduction ratio (CCR) is useful for excluding AKI after cardiac surgery: a preliminary retrospective study

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Background and Goal of Study: The incidence of acute kidney injury (AKI) following cardiac surgery is 5-30%.[1)] Experimental AKI models suggest that successful therapy should be implemented within 24-48 h after induction of renal injury. However, it is difficult to detect AKI incidence shortly after cardiac surgery, because the creatinine (Cr) concentration is diluted by the cardiopulmonary bypass (CPB). We hypothesized that the Cr reduction ratio (CRR) following CPB correlates with the hematocrit reduction ratio and similarly that the Cr reduction ratio might be associated with AKI incidence.
Materials and Methods: We retrospectively collected demographic and blood test data of 1137 patients who had undergone CPB. The correlation of the perioperative association between Cr and hematocrit was then assessed. CRR was calculated as follows: preoperative Cr − postoperative Cr / preoperative Cr. Patients were divided into two groups. The first group (training) was used to determine the threshold of AKI incidence, and the second group (validation) was used to assess prognostic value performance. AKI was defined as an increase in serum Cr of >0.3 mg/dl (26.4 μmol/L) or an increase >150% from baseline.
Results and Discussion: The AKI incidence was 14.5% (79/545) in the training group and 16.7% (99/592) in the validation group. Postoperatively, Cr concentration correlated strongly with hematocrit concentration (Pearson's r: 0.9549; R square: 0.9119). In the training set, CRR < 15% showed an AUC of 0.7091, sensitivity of 82.1%, and specificity of 43.6%. CRR performance had an odds risk of 3.743 (2.375-5.900), a positive predictive value of 0.280 (0.223-0.343), a negative predictive value of 0.906 (0.871-0.934), and a likelihood ratio of 1.942.
Conclusion: CRR is likely associated with perioperative renal injury. Therefore, CRR is a good prognostic indicator with high performance, especially for negative predictive values, and is useful for predicting AKI at an earlier stage than conventional means. In addition, using CRR in this manner is financially feasible. A limitation of this study is that no demographic or operative characteristics such as diabetes status, hypertension, blood transfusion, and CPB duration were incorporated into the analysis. Further investigation is therefore required for comprehensive assessment of the utility of this index.

12AP4-8

Postoperative relative thrombocytopenia in critically ill patients - intraoperative loss or heparin-induced thrombocytopenia type II (HIT)?

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Background and Goal of Study: In postoperative *non*-intensive care unit (ICU) patients, relative thrombocytopenia, defined as a decrease of >50% from preoperative baseline or a postoperative peak, has been proven a good predictor of HIT (1,2). It is unknown, whether this calculation also applies to postoperative ICU patients. When these patients are admitted to ICU, they usually had very extensive surgery and postoperative relative thrombocytopenia can easily be attributed to intraoperative loss/consumption. Therefore, we aimed to evaluate the incidence of postoperative relative thrombocytopenia in unselected surgical ICU patients and compare it to the incidence of proven HIT.
Materials and Methods: As part of a larger clinical trial (ClinicalTrials.gov NCT00798525; EudraCT number 2006-003122-28) and with ethical committee approval, we screened daily thrombocyte counts in all ICU patients receiving heparin prescribed for more than 24 hours from 05/2009 until 06/2010. Incidence of relative thrombocytopenia and its timing to the surgical procedure was analyzed and compared to the incidence of HIT as confirmed by heparin-induced platelet-activating assay (HIPA).
Results and Discussion: Screening of 2110 admissions yielded 17299 platelet counts. Relative thrombocytopenia occurred in 605 patients (29%). In 384 patients (18% of all patients, 63% of those with relative thrombocytopenia) it was observed directly after surgery. HIPA revealed positive results with typical platelet activation in 4 of these patients; one case had a "marginal" HIPA result with an apparent clinical course justifying the HIT diagnosis. Therefore, the incidence of proven HIT was 0.2% in our postoperative surgical patients. In three of these 5 patients (60%) relative thrombocytopenia occurred directly after surgery. The other two cases displayed relative thrombocytopenia on

postoperative days 9 and 10 after individual postoperative peaks.
Conclusion: Although relative thrombocytopenia in postoperative patients is often attributed to intraoperative loss/consumption, it should prompt further diagnostic tests for HIT, which occurs in 0.2% of our patients.
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12AP4-9

Separation of a general intensive care unit into medical and surgical units - preliminary results

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Background and Goal of Study: Most critically ill patients come to the intensive care unit (ICU) from the divisions of surgery and medicine. In Israel and Europe most ICUs are combined medical-surgical with one medical team. In the USA these units have developed separately with designated medical services. It is unknown and hard to evaluate which structure is superior. In our 1000 bed tertiary care university hospital, the 18 bed adult general ICU was separated into two units starting January 2012. Surgical and medical intensive care directors were appointed. The nursing staff function and unit geography did not change. We try to evaluate if the new services lead to better medical or administrative outcomes.
Material and Methods: Medical records from 2011 patients were compared to those from the same two month (February-March) period in 2012. Major outcome parameters were: ICU length of stay (LOS), 90 days mortality and APACHE II score. Data was analyzed to compare 2011 to 2012 as a combined unit and in 2012 to compare the medical to the surgical units.
Results and Discussion: 2012 patients vs. those from 2011 had an overall slightly lower APACHE II score and average ICU LOS - 16.60 vs. 19.51 and 7.73 vs. 11.01, respectively, ($P < 0.05$). In 2012 medical patients were slightly older than surgical - 58.06 vs. 50.3 respectively, ($p < 0.05$). There was no statistically significant difference in APACHE II scores, ICU LOS or 90 day mortality between services.

	2-3/2011	2-3/2012 (total)	2-3/2012 (surgical)	2-3/2012 (medical)
Number of patients	92	119	56	63
Age (Mean)	52.6	54.42	50.3 (1)	58.06(1)
Gender - male	70.6%(65)	70%(84)	76%(43)	65%(41)
Gender - female	29.3%(27)	29.4%(35)	23%(13)	35%(22)
APACHE II (mean)	19.51(1)	16.60(1)	14.98	18.04
ICU LOS	11.01(1)	7.73(1)	6.76	8.58
90 days mortality	40%(37)	26.89%(32)	28%(16)	25.4%(16)
Ventilated on admission	79.34% (73)	82.3%(98)	80.3%(45)	84%(53)
Vasopressors need on admission	44.5%(41)	33.6%(40)	30.35%(17)	36.5%(63)

[Results]
(1) $P < 0.05$

Conclusion: This preliminary report with a limited number of patients found no difference in main outcomes (90 day mortality, ICU LOS) in patients admitted to the surgical or medical ICU, despite older age of the latter. Should these results remain similar over time, they might encourage us to look for more subtle changes in outcomes or, alternatively, rethink the logic behind allocating limited hospital resources to create two different intensive care units.

12AP4-10

Where do patients go after gastric bypass surgery? A retrospective study of 456 patients

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Background and Goal of Study: Obesity is a chronic disease of which prevalence is rising. There is an important morbidity and mortality rate, related with bariatric surgery. As obese patients often present with comorbidities, 10% of the patients who undergo bariatric surgery show a complication during their hospital stay, and 6-20% of patients who undergo gastric bypass are admitted to an ICU. We aimed to describe the rates and reasons for admission into intensive and semi-intensive care unit after bariatric surgery, in our center.
Materials and Methods: This is a monocentric retrospective study. We analyzed patients submitted to laparoscopic bypass surgery in a hospital with experience in bariatric surgery over a period from January 2011 to November 2012.
Results and Discussion:

Age (mean)	40,9 years
Gender (Female:Male)	400(87,7%): 56(12,3%)
ASA	II 103(22,6%) III 353 (77,4%)
Comorbidities	Hypertension n=180 (39,5%) OSA n=31(6,8%) COPD n=47(10,3%) Diabetes n=74(16,2%) Hyperlipidemia n=150 (32,9%) Venous stasis n=45(9,9%) Tabagism n=52(11,4%) Others n=15(3,3%)

[Patients Demographic Data]

In our population of patients undergoing bariatric surgery, 12 (2,63%) were admitted to the semi-intensive care unit, of which 7 (58,3%) were on were on an elective basis and 5 (41,7%) emergently. Eleven patients (2,4%) were admitted to the ICU, 4 (36,4%) elective and 7 (63,6%) emergently. The rate of reinterventions in 24hours were 1,1% (n=5). Most of elective admissions were because of OSA and need for non-invasive ventilation, with a median stay of 12h - 24h. Emergent admissions were mainly done after emergent surgery due to surgical complications, mainly hemorrhagic shock. After 24h the main cause was septic shock. One patient was admitted for pulmonary embolism. Only 1 patient needed intensive care for more than 1 week. There was 1 death during ICU stay after 185d of length of stay (septic shock with multiorganic disfunction).
Conclusion(s): The Intensive and semi-intensive Care Unit admission in our population was 5%. The majority of the admissions in ICU were emergents, while most of semi-intensive unit care were elective. Candidates for bariatric surgery are often at high risk for complications because of obesity-related comorbidities.
Therefore, careful pre-operative evaluation, stratification of the risk and planning the pos-operative period, together with well-designed strategies for preventing and managing complications, are keys to success.

12AP4-11

The determination of threshold value of procalcitonin (PCT) as a biomarker for postoperative complications after open heart surgery with cardiopulmonary bypass (CPB)

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Background and Goal of Study: Cardiopulmonary bypass (CPB) induces a non-specific systemic inflammatory response syndrome (SIRS). As current use of clinical and biological tests fail to accurately detect infection or sepsis in the postoperative period following cardiac surgery with CPB, the value of procalcitonin (PCT) is investigated.
Materials and Methods: In 153 patients undergoing cardiac surgery with CPB, after Ethical Commitee approval in a prospective study. Serum PCT and C-reactive protein (CRP) values were collected before operation and daily until postoperative day 5. According to definition of SIRS, patients were divided post hoc into patients with SIRS
(n= 87) and patients without SIRS (n= 66).
Results and Discussion: Serum CRP values demonstrated a significant increase in both SIRS and no SIRS groups in postoperative day 1 until postoperative day 5 ($p > 0.05$) The increase in PCT levels increased more significantly in SIRS patients (peak PCT 4.89 ± 2.32 ng ml -1 vs 0.57 ± 0.33 ng ml-1) in comparison to patients without SIRS ($p = 0.0001$) on postoperative day 1. In

patients with postoperative complications (34/153, 22%) (circulatory failure= 15, pneumonia= 5, respiratory insufficiency=12, sepsis=2), PCT levels remain elevated until postoperative day 5 (8.46 ± 3.87 ng ml-1) whereas, diminished in patients with SIRS (0.97 ±0.28 ng ml-1) ($p< 0.0001$). A PCT threshold value of 10.5 ng L-1 was able to discriminate between sepsis and non-septic SIRS patients with a sensitivity of 100% and a specificity of 93% (area under the curve: 0.948 ± 0.039; $P < 0.01$).
Conclusion(s): PCT increased significantly after CPB in SIRS group in comparison to patients without SIRS on postoperative day 1 and remain elevated until postoperative day 5. A PCT threshold value of 10.5 ng L-1 discriminates between sepsis related SIRS group of patients and non-septic SIRS patients.
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12AP5-1

The role of Cell-free DNA as a marker to predict acute liver injury in rats

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Background and Goals of Study: Acute liver injury (ALI) is associated with a significant morbidity and mortality. Cell free DNA (CFD), a biomarker used for the diagnosis and monitoring of several diseases, has been implicated as a possible non-invasive prognostic indicator following ALI. This study examined the role of CFD as a potential biomarker to predict carbon tetrachloride-induced ALI in rats. We additionally investigated the pattern and timing of CFD levels following carbon tetrachloride-induced ALI, and investigated whether a relationship exists between CFD concentrations and known markers of hepatic injury including blood transaminases glutamate-pyruvate transaminase (GPT) and glutamate-oxaloacetate transaminase (GOT) and blood bilirubin concentration.
Materials and Methods: ALI was induced in 45 rats by carbon tetrachloride, administered by a nasogastric tube at doses of 1 ml/kg, 2.5 ml/kg, or 5 ml/kg of 50% solution. Fifteen additional rats were given a sham procedure. Blood samples were taken at t=0 (baseline), 3, 6, 12, 24, 48, 72, 96 and 120 hours for measurements of CFD, GPT, GOT, and total bilirubin. Histology and prothrombin time were examined at 24 and 120 hours after injection of 5 ml/kg carbon tetrachloride in 18 additional rats and in 10 control rats.
Results and Discussion: CFD levels in rats following ALI were significantly elevated in all blood samples starting at 12 hours after ALI ($P< 0.001$). Levels of blood GPT, GOT and total bilirubin were increased in all blood samples starting at 3 hours after ALI ($P< 0.0001$). CFD levels correlated with GPT ($R^2=0.92$), GOT ($R^2=0.92$) and total bilirubin ($R^2=0.76$). There was a correlation between CFD and liver damage seen on histological examination at 24 hours following ALI.
Conclusions: This study describes the pattern of CFD elevation in acute ALI in rats. The role of CFD in humans has not been clearly elucidated, but these findings suggest that CFD may be a useful biomarker for the prediction and measurement of liver damage in both experimental and clinical contexts.

12AP5-2

Severe sepsis and septic shock at the RD&E: how it is diagnosed and managed in the emergency department and the implications on critical care

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Background and Goal of Study: Severe sepsis carries a mortality rate of anywhere between 28-50% worldwide. This figure is larger than acute myocardial infarction (2.7 - 9.6%) and acute cerebrovascular events (9.3%) combined. However, throughout the UK and certainly at the Royal Devon and Exeter Hospital, there are "well-oiled" acute pre-hospital and secondary care pathways for stroke and myocardial infarction, but not for sepsis. Should there be one?
Sepsis is a treatable condition, and early diagnosis and management benefits have been well documented. The therapeutic benefits of medical interventions are also lost as time progresses. Many of these patients require Intensive Care input/admission. If these same patients were diagnosed earlier & had basic medical interventions quicker in the Emergency Department (ED), would they still need ICU admission? Therefore, there must be an emphasis within the ED on early diagnosis and rapid simple medical management.
The goal of the study was to assess diagnosis and treatment against seven clinical standards published by the College of Emergency Medicine, based on guidelines and care bundles published by the Surviving Sepsis Campaign.
Materials and Methods: A six month retrospective audit was performed at the Royal Devon and Exeter Hospital between august and February 2011-12. It included 30 patients with a diagnosis of "severe sepsis" or "septic shock".
Results and Discussion: The audit illustrated that the Emergency Department did not meet any of these standards, but was close to meeting most standards. This could be explained by a variety of reasons: poor documentation, difficult diagnosis, busy department, patient deterioration, and staff unaware of management protocols.
9/30 patients were admitted to the Intensive Care Unit, highlighting a huge burden of care of critical care services. If this group of patients can be diagnosed earlier and have simple medical management instigated faster, the morbidity and mortality from severe sepsis and septic shock could be reduced. This may also reduce the significant burden on critical care.
Conclusion(s): A new sepsis guideline involving a "flowchart" approach to diagnosis and management has been produced involving ICU, Medicine, Surgery & Microbiology. Staff awareness has been raised via teaching. Could a severe sepsis acute care pathway be introduced to expedite early diagnosis and management of these patients.

12AP5-3

Influence of continuous veno-venous hemofiltration (CVVH) on procalcitonin concentrations in patients with sepsis

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Background and Goal of Study: Hemofiltration affect the changes of the concentration of the mediators that contribute to the onset and maintenance of sepsis. The study reported in CVVH was performed for the first time in the Republic of Moldova in 2009. Between 2009 - 2012 we evaluated the modification on procalcitonin concentrations in patients with sepsis.
Materials and Methods: Procalcitonin (PCT) concentrations were evaluated by the immunoenzyme method in 57 patients undergoing CVVH from 2009 to 2012. CVVH was performed on acute hemodialysis unit ABM / ADM 08. 600S HF filter. Ultrafiltration rate of 35 ml / kg / h.
Results and Discussion: In 57 patients undergoing CVVH was found a decreasing in the concentration of procalcitonin during CVVH: first 4 hours after initiation CVVH procalcitonin index decreases approximately by 45 - 50% compared to baseline. Over 8 h and 12 h PCT dropped by 20%. These changes suggest that in the first 4 hours low concentration of procalcitonin may be a favourable index on clinical prognosis of septic patients.
Conclusion(s): CVVH applied early in sepsis ensure the removal of procalcitonin and other mediators causing hemodynamic stabilization and subsequent favorable clinical course. CVVH applied in the Republic of Moldova contributed to the revision of tactics of treatment and decreased 8% mortality rate on septic patients.
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Acknowledgements: CVVH was used for the first time in the Republic of Moldova with the appreciation procalcitonin in the septic patients.

12AP5-4

HES 130/0,4 versus 4% gelatin: effects on renal function, coagulation parameters and capillary leak in elderly and septic patients

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Background and Goal of Study: Organ dysfunction and capillary leak are well known features of septic situations. We studied the effect of two 'relatively safe' volume solutions on kidney function and capillary permeability in septic patients over sixty years old.
Materials and Methods: Following the approval of hospital ethics committee, 30 patients (> 60 yrs) in whom the fast volume replacement was indicated were randomized into two study groups: Hydroxyethyl starch 130/0.4 solution was given to the first group (HES group; n=15) and Gelatin 4 % was administered to the second group (GEL group; n=15) of patients for three days at the infusion dose of 50 $mLkg^{-1}$/day on the first day and 25 $mLkg^{-1}$/day on the following two days; in addition to the crystalloid solutions. Blood samples were collected before and after the colloid infusion (72^{th} hours) for the detection of blood urine nitrogene (BUN), creatinine (Cr), glomerular filtration rate (GFR), activated partial thromboplastin time (APTT), international normalised ratio (INR). As a surrogate of capillary leak, urine samples were collected for urine microalbumin/creatinine ratio (MACR). Outcome of the patients were also recorded. NNCSS (Number Cruncher Statistical System) 2007 was used for statistical analysis.
Results and Discussion: There were no differences between the BUN and Cr levels before and after the colloid infusions in both groups (p>0,05). After the infusion of colloid solutions for three days, there were also no significant differences between the following parameters in two groups: BUN (Gr HES; 33.2 ± 21.6 mgdL, Gr. GEL; 30.8 ± 15.1 mgdL), Creatinine (Gr HES; 0.8 ± 0.5 mgdL, Gr. GEL; 0.9 ± 0.3 mgdL), GFR (Gr HES; 81.6 ± 29.3 $mLdk^{-1}1.73m^2$, Gr. GEL; 72.4 ± 25.5 $mLdk^{-1}1.73m^2$), APTT (Gr HES; 32.8 ± 9.2, Gr. GEL; 33.6 ± 8.1), INR (Gr HES; 1.2 ± 0.1, Gr. GEL; 1.4 ± 0.3), MACR (Gr HES; 106.8 ± 3.9 mg/day, Gr. GEL; 119.1 ± 2.4mg/day). The mortality rate in the two groups were similar (33 % in gr HES, 40 % in gr GEL).
Conclusion(s): Hydroxyethyl starch 130/0.4 and Gelatin 4 % showed similar, not clinically significant effects on kidney and coagulation function and capillary leak in severely septic elderly patients .
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12AP5-5

Influence of L-arginine on inflammation markers after urgent abdominal surgery

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Background and Goal of Study: Inflammation is a protective mechanism of the body for fighting against infection or injury, including surgical procedures. Imbalances in the inflammatory response are often responsible for the fatal outcome [1]. L-arginine-enriched total parenteral nutrition supports the protection of the peritoneum, improving survival in models of peritonitis [2].
The Goal: To study the effect of L-arginine on inflammation markers after emergency abdominal surgery.
Materials and Methods: After local ethics committee approval and obtaining informed consent, 30 patients were prospectively divided into two groups depending on the characteristics of post-operative intensive care. In the 1 (control) group (n=15), patients received standard intensive care therapy. In group 2 (n=15), patients received L-arginine (4,2 g intravenously once a day) from the 1 until the 3 postoperative day in addition to standard therapy. All patients were comparable according to age, sex, concomitant pathology, ASA class (IIE-IIIE) and type of surgery (laparotomy following peritonitis). The levels of IL-1α, TNFα and IL-10 were investigated before surgery (stage 1), on the 1 (step 2), the 3 (step 3) and the 7 day (stage 4) after surgery.
Results and Discussion: Analysis has not revealed reliable reduction in IL-1α level after 1 day (20,35±5,88 vs 17,16±2,44 pg/ml); it`s reliable decrease on the 3 (28,90±6,08 vs 16,82±1,45 pg/ml (p< 0.05)) and the 7 day (22,76±4,13 vs 19,81±3,76 pg/ml (p < 0.05)) after surgery in patients treated with L-arginine. In this group TNFα level was reliably decreased on the 1 day after surgery (1,98±0,64 vs 3,99±0,49 pg/ml (p< 0.05)) and on the 3 day was significantly lower (2,52 ±0,64 vs 5,32±1,74 pg/ml (p< 0.05)). On the 7 day no reliable differences of TNFα level in both groups were detected. On the 1 day level of IL-10 was significantly decreased in the 2 group (14,84±2,98 vs 19,5±6,69 pg/ml (p< 0.05)), followed by unreliable increase on the 3 (9,19±1,79 vs 7,19±2,1 pg/ml) and the 7 day (7,15±1,23 vs 8,61±0,72 pg/ml).
Conclusion(s): L-arginine reliably decreases the levels of proinflammatory IL-1α and TNFα in the postoperative period.
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12AP5-6

Immobilization but not inflammation causes muscle weakness of the diaphragm

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Background and Goal of Study: Mechanical ventilation in critically ill patients artificially immobilizes the diaphragm. Additionally, a systemic inflammatory response syndrome (SIRS) is common. Aim of this study was to reflect this pathology and its effect on muscle force generating capacity in a double-hit rat model.
Materials and Methods: 40 rats were randomized to receive either 12 days Tetrodotoxin induced immobilisation of a hemidiaphragm (immo) or sham operation. The contralateral hemidiaphragm served as control (within group comparison). The groups were further divided to receive either Corynebacterium parvum (Cp) induced SIRS or saline injection (4 groups, n=10 per group). After 12 days, both hemidiaphragms were excised. Maximum tetanic twitch force and force-frequency relationship (0,1 - 200 Hz) was measured in an in-vitro hemidiaphragm-phrenic nerve system. Statistical analysis was performed with general linear models with a hierachical approach allowing pairwise comparision if main effects proved to be significant (p < 0.05).
Results and Discussion: Tetanic force was significantly decreased in operated hemidiaphragms (p < 0.001) and in animals with immobilization (p= 0.045), with a significant interaction term of p < 0.001. Force frequency maximum was shifted to lower values in operated hemidiaphragms (p < 0.001) and in animals with immobilization (p< 0.001). Cp affected neither tetanic force nor force frequency maximum significantly (p>0.05). Results of the post-hoc analyses are marked in the table below. Data are estimated marginal mean and 95% confidence interval.

Group	Tetanic twitch (mN)		Force frequency maximum(Hz)	
	Operated HD	Contralateral HD	Operated HD	Contralateral HD
Sham / saline	79 [69 - 90]	74 [65 - 83]	100 [100 - 100]	100 [100 - 150]
Sham / Cp	86 [76 - 97]	85 [76 - 94]	100 [80 - 100]	100 [100 - 100]
Immo / saline	63 [52 - 73]#*	87 [78 - 96]*	80 [60 - 100]#*	100 [100 - 100]
Immo / Cp	60 [50 - 70]#*	80 [71 - 89]	80 [60 - 80]#*	100 [100 - 100]

[Table 1: muscle function]

* p< 0.05 Immo vs. sham (within the respective Cp group); # p< 0.05 operated vs. contralateral hemidiaphragm (HD)
Conclusion(s): Twelve days of functional immobilization profoundly weakens the force generating capacity of the diaphragm. SIRS per se does not affect strength of the diaphragm. The combination of immobilization and SIRS did not potentiate the immobilization induced muscle weakness.
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12AP5-8

Prospective comparison of incidence of bloodstream infection using real-time ultrasound-guided technique versus landmark technique in the catheterisation of central venous catheters

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Background and Goal of Study: The risk of central venous catheter-related bloodstream infection (CVC-BSI) is closely related to insertion conditions (1). The ultrasound-guided technique (UST) offers several advantatges over the landmark technique (LT) (2), but in turn, it requires additional devices and manipulation, which could increase the incidence of CVC-BSI. Our hypothesis is that placement of short duration central venous catheters (CVC) using the UST does not increase the risk of CVC-BSI.
Materials and Methods: Prospective, non randomized study, including CVC placed by our service in surgical patients (May 2010 - May 2011). Calculation of the sample size was realized from a CVC-BSI study performed in our center. Data collected: patient sex, insertion technique, CVC's insertion site, place of insertion, use of parenteral nutrition and incidence of CVC-BSI. Chi square and Fisher exact test were used for statistical analysis.
Results and Discussion: 546 cases were included. 367 CVC were inserted using LT and 179 using UST. Most of them were placed in the operating room (85.7%). Internal jugular vein was the most common site of insertion (69.8%). Average duration of CVC was 6.6 days. No significant differences were found in demographic data, duration or insertion site between LT group and UST group. The incidence of CVC-BSI was 1.3% (7 cases), without significant differences between the two groups (1 case in UST group and 6 cases in LT group). The incidence of CVC-BSI in patients with parenteral nutrition was statistically significant higher (5% of incidence, p 0.03).
Conclusion(s): The UST for placement of short duration CVC does not increase the risk of CVC-BSI. Its use can be recommended in surgical and critical patients, since it decreases mechanical complications (1)(2) without increasing infectious complications.
The need of parenteral nutrition is a risk factor related to the increase of CVC-BSI.
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12AP5-9

Correlation between colloid infusion and extravascular lung water in septic shock patients

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Background and Goal of Study: Colloids are potent volume expanders used for fluid resuscitation in septic shock patients. In these patients, its use seems not to increase extravascular lung water (EVLW) or worsening of oxygenation (2) and they could help increase oncotic pressure and central venous pressure gradient (3). The goal of our study was to evaluate the correlation between total volume of 6% hydroxyethyl Starch 130/0,4 (HES) administration and EVLW.
Materials and Methods: Secondary analysis of a prospective observational study in 36 surgical patients with septic shock during the first two days of ICU admission. All patients received goal-directed fluid therapy with crystalloids (500 ml 0.9% saline) or colloids (250 ml 6% HES) depending upon physician's choice. Patients were stratified in three groups depending of the total colloid infused: G1 low (mean=871 ml), G2 moderate (mean=1500 ml) and G3 high (mean=2148 ml). We recorded GEDI, ELWI and PaFi ratio values at 48 hours, as well as total fluid infusion, fluid balance, urine output, ventilation-free days and length of ICU stay (LIS).
Results and Discussion: Groups did not differ in demographic and severity scores. Mean total volume of crystalloids was similar of 3340 ml without differences between groups. Fluid balance and urine output were also similar in the three groups. All three groups showed a mean GEDI >700 ml/m^2, but patients receiving less colloids (G1) showed a higher GEDI. Increased volume of colloids infused was not associated with increased ELWI or lower PaFi ratios at 48 hours. No differences were found in ventilation days or LIS.
Conclusion(s): The impact of colloids on lung water accumulation remains uncertain. Resuscitation with different doses of 6% HES 130/0,4 during the first two days of ICU admission in surgical patients with septic shock did not impact in the ELWI value.
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12AP5-10

Incidence of rebound hyperthermia and inflammatory characteristics in cooled post-cardiac arrest patients

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Background and Goal of Study: Currently, therapeutic hypothermia (TH) is the only therapy that improves neurological outcome and increases survival after cardiac arrest (CA). With TH, patients' body temperature is decreased to 33°C (for 24 hours) followed by slow active rewarming (0,3°C/h). Although it is mentioned that the majority of cooled pts develop rebound hyperthermia, further investigations were, until now, not reported. In this study, we analysed the incidence and characteristics (including inflammatory features) of post-cooling fever in pts treated with TH (compared to the characteristics of post-CA fever in non-cooled pts).
Materials and Methods: With local IRB approval, 76 adult post-CA patients were included (39 prospective pts treated with TH (2011-2012) and 37 retrospective pts treated without TH (2008-2009)). Temperatures were measured continuously, while white blood cell count (WBC) and C-reactive protein (CRP) were measured daily. Fever was defined as body core temperature exceeding 37.7°C. (Statistics: Mann-Whitney and Chi-square).
Results and Discussion: The overall incidence of fever differed significantly between pts treated with TH and without TH (91% vs. 64%; p=0,008). No significant difference in incidence of post-cooling fever was found between survivors and non-survivors (91% vs 92%; p=0,764).
However, cooled non-survivors suffered from a longer (37.5% of the total 72hrs period after rewarming) and more severe (significantly higher temperature) fever compared to cooled suvivors. When comparing non-cooled survivors with non-cooled non-survivors, a significantly higher incidence of fever was observed in the non-cooled non-survivors (55% vs. 80%; p=0,605). As to the inflammatory characteristics of post-cooling fever, WBC significantly decreased from day 1, while CRP increased until day 3.
Overall, 80% of all patients had a positive sputum culture, while in 61% chest X-rays were positive for lung infiltrates revealing pneumonia. (85% of pts received antibiotics).
Conclusion(s): Our findings suggest that TH does cause a hyperthermic response after rewarming, since almost all cooled patients developed fever. One of the possible explanations might be the occurrence of pneumonia and infection, another explanation might be a disturbance of the central thermoregulation by TH. Future investigations should focus on these possible mechanisms.

12AP5-11

Syndecan-1 as marker of ischemia and reperfusion in patients undergoing liver transplantation. A pilot study

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Background and Goal of Study: The endothelial glycocalyx is important for the maintainance of vascular integrity and changes in its structure cause an increase in vascular permeability. The importance of the integrity of the glycocalyx and its vasculoprotective role has been proven in experimental data. The aim of our study was to determine the effect of ischemia/reperfusion injury on the shedding of glycocalyx during human orthotopic liver transplantation (OLT) and its impact on postoperative kidney function.
Materials and Methods: A total of 22 patients (age mean: 54 ± 11; 6 women), undergoing OLT with mean MELD of 18 were studied. Arterial blood samples for syndecan-1, an integral protein of glycocalyx, were drawn at 5 different time points (T) during OLT (T0 = induction of anesthesia; T1 = clamping of inferior caval vein; T2 = declamping/reperfusion; T3 = end of surgery; T4 = 24 hours after reperfusion) and determined by ELISA. Acute kidney injury (AKI) following OLT was assessed according to RIFLE-score.

Results and Discussion: There was a significant increase of syncecan-1 at T2 (273 ± 108 ng/ml;) compared to T0 (77 ± 61 ng/ml) and T1 (92 ± 61 ng/ml), respectively ($p < 0.0001$). This significant increase of syndecan-1 also persisted at T4. The sensitivity (67%) and specificity (70%) of syndecan-1 increase from T1 to T2 was very low to predict an AKI (stage: injury and failure) according RIFLE classification (ROC 0,58; $p=0.5$).
Conclusion(s): This study provides evidence for shedding of the endothelial glycocalyx during ischemia/reperfusion in human OLT. The predictive value of syndecan-1 regarding the incidence of AKI is very low.

12AP6-1

Outcome analysis of major burn patients after admission to the burns intensive care unit in a tertiary regional referral center

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Background: The clinical course of severely burned patients may be stormy and the prognosis tends to be poor in patients with multiple comorbidities and those with inhalational injury. The aim of this study is to develop an objective and reliable predictive model for morbidity and mortality in major burn patients. This will help us identify the important factors influencing outcomes and allows more evidence-based prognostication.
Methods: Adult patients admitted to the burns intensive care unit (BICU) in a major tertiary referral center from 2008-2011 are selected. Demographic factors, types, severity and complications of burn injury as well as outcomes are reviewed.
Results: In the 4-year period, 181 patients were admitted to BICU. Mean age (SD) was 41 (16) years old. Mean (SD) total body surface area burn was 37.2 (30.2)%. Patients' existing medical conditions, details of burn injury and outcomes were listed in table 1. Mortality was 39.5%. Mean (SD) length of stay in the BICU and hospital for patients who eventually survived the burn injury were 8.4 (13.4) and 28.5 (37.9) respectively.
Lower airway burns has a significant relationship with the development of renal failure after multivariate analysis (Odds ratio 5.1, Confidence interval 1.1- 24.0). Greater total body surface burns, development of acute respiratory distress syndrome and older patients with more extensive burns predispose to mortality as shown in table 2.
In our cohort of patient, the probability of death may be estimated by this equation:
Probability of death= $(1+e^{y})^{-1}$
y= -7.008+0.04(TBSA) +1.791(ARDS)*+0.054(Age+TBSA)
*= ARDS (0=no, 1=yes).
Conclusion: We have developed a predictive model for mortality and length of hospital stay in major burn patients. This may be useful in prognosis during early stages of care.

12AP6-2

Recombinant thrombomodulin protects mice against histone-induced lethal thromboembolism

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Background and Goal of Study: Histones, ubiquitous DNA-binding proteins, are released into the extracellular space during sepsis[1)] and thrombotic microangiopathies (TMAs)[2)]. Neutralizing histones with antibodies can rescue mice from lethal sepsis, suggesting that extracellular histones are major mediators of death[1)]. This study was designed to investigate cellular and molecular basis of histone-induced lethality, and to assess the protective effects of recombinant thrombomodulin, a newly approved drug for disseminated intravascular coagulation (DIC) in Japan, on histone-induced thrombosis.
Materials and Methods: Mice were injected intravenously with purified histones, and the standard laboratory tests, histological examinations, electrocardiogram, and echocardiogram were performed. The influence of extracellular histones on endothelial cells and blood cells was analyzed *in vitro*. The protective effects of recombinant thrombomodulin on extracellular histones were then analyzed both *in vitro* and *in vivo*.
Results and Discussion: Extracellular histones triggered von Willebrand factor (VWF) release from endothelial cells and promoted VWF-rich thrombus formation in mice. This resulted in thrombotic occlusion of pulmonary capillaries and subsequent right-sided heart failure. These mice displayed signs of DIC, including thrombocytopenia, prolonged prothrombin time, decreased fibrinogen, fibrin deposition in capillaries, and bleeding symptoms. Recombinant thrombomodulin bound to extracellular histones, and prevented histone-induced VWF release, platelet aggregation, thromboembolism, and death.
Conclusion(s): These findings suggest that extracellular histones may cause complex thrombotic disorders in which secondary TMA overlaps with DIC. Recombinant thrombomodulin can suppress the activity of extracellular histones, and this may contribute to the effectiveness of the drug against thrombotic disorders.
References:
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12AP6-3

Is prolonged QTc interval associated with the severity and complications of liver cirrhosis?

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Background and Goal of Study: Despite the hyperdynamic circulation, the heart in advanced cirrhosis is impaired and this cardiac disfunction is named cirrhotic cardiomyopathy. Recent research suggest that cirrhotic cardiomyopathy may be involved in the pathogenesis of the hepatorenal syndrome. One of the hallmarks of cirrhotic cardiomyopathy is acquired prolongation of the QT interval corrected for heart rate (QTc).
The aim of this study was to investigate if prolonged QTc interval correlates with the severity of the liver disease, with the hepatorenal syndrome or with other cirrhotic complications.
Materials and Methods: 53 patients with liver cirrhosis Child Pugh C admitted in ICU in a six month period were included in a retrospective observational study.Patients with known chronic renal disease,cardiac disease or taking QT-prolonging drugs were excluded from the study group.The demographic and laboratory data were obtained.The presence of ascites was documented by clinical means and ultrasonography. The severity of hepatic encephalopathy was graded with the West Haven Criteria. QT interval was read from a standard 12 lead electrocardiogram and was corrected for heart rate using Bazett's formula. Statistical analysis was performed using SPSS Statistics v.19.1.
Results and Discussion: The study group included 38 men (71.7%) and 15 women.Mean (±SD) age was 52.15 (±10.08). 29 patients (54.7%) had prolonged QTc (>440ms). Our study found a correlation between prolonged QTc interval and the severity of the cirrhosis assessed by MELD score ($P=0.003$). QTc interval was significantly higher in patients with hepatorenal syndrome than in the cirrhotic patients without this complication ($P=0.008$). Prolonged QTc also correlates with the degree of hepatic encephalopathy ($P=0.022$), hyponatremia ($P=0.001$) and coagulopathy ($P=0.003$).QTc interval was not significantly prolonged in patients with ascites ($P=0.079$) or spontaneous bacterial peritonitis ($P=0.09$). QTc interval was not significantly higher in the subgroup of patients without chronic β-blocker therapy ($P=0.108$).
Conclusion(s): QTc interval prolongation is correlated not only with the severity of the cirrhosis, but also with some of the most severe complications of the liver disease such as the hepatorenal syndrome and the hepatic encephalopathy.
Prolonged QTc interval and other markers of cirrhotic cardiomyopathy may have a prognostic significance and should be routinely assessed in the patient with severe cirrhosis.

12AP6-4

Management of vasospasm after aneurysmal subarachnoid hemorrhage: an European survey

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Background and Goal of Study: Many aspects of aneurysmal subarachnoid hemorrhage (SAH) therapy remain controversial. The European Neuroanaesthesia and critical care Interest Group (ENIG group) conducted a survey to determine the clinical practices of physicians treating SAH, and to evaluate the discrepancy between practice and published evidence.
Materials and Methods: The research team generated a 31-item online questionnaire, which was distributed by the ENIG Group. Nine questions focused on vasospasm prevention, diagnosis and treatment. The survey remained on-

line from early October to the end of November 2012. Fisher's exact test was used for the analysis of responder subgroups.
Results and Discussion: There were 262 completed surveys from 14 European countries (30% France, 19% Italy, 16% Germany, 14% Spain, 9% United Kingdom and 22% other countries). Respondents included anesthesiologists (31%), neurointensivist (25%) or both (44%). Regarding vasospasm prevention, near all respondents used nimodipine (97%), 21% statins (45% in France; less than 10% in Spain, UK and Germany) and 21% Magnesium (47% in Austria, 6% in Spain). Regarding neuromonitoring, most respondents (79%) routinely used transcranial Doppler ultrasound to monitor vasospasm whereas CT perfusion and CT angiography were used by 26 and 42%, respectively. Regarding endovascular methods to treat symptomatic vasospasm, 25% of respondents used intra-arterial vasodilatator alone, 5% cerebral angioplasty alone, 48% both methods. In high-volume clipping (>60% of clipping) treatment centers 42% of respondents never used endovascular methods to manage vasospasm compared with 14% at high-volume coiling treatment centers ($P< 0.001$). The most commonly used intra-arterial vasodilator was nimodipine (80%) whereas milrinone was used by 22% (54% in France; none in Italy, Spain, UK) and papaverine by 20%. More respondents (44%) selected triple-H therapy over hypertension alone (30%) to treat vasospasm. Twenty-one percents of respondents also increased cardiac output with an inotropic drug to treat symptomatic vasospasm.
Conclusion: This study found striking variability in practice patterns of European physicians involved in SAH. Significant differences were noted between countries, and between high and low-volume coiling centers.

12AP6-5

The role of intracerebral glutamine levels as a marker of the therapeutic efficiency of FPSA (fractionated plasma separation and adsorption) in acute liver failure treatment - a controlled study in pigs

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Background and Goal of Study: Intracerebral glutamine is proposed to be one of the most important factors responsible for astrocytal swelling and development of cerebral edema in acute liver failure (ALF). The influence of the treatment by artificial liver devices on the cerebral damage caused by ALF is usually monitored by only measuring the intracranial pressure (ICP). The aim of this study was to determine the potential role of the cerebral glutamine level in evaluating the efficiency of fractionated plasma separation and adsorption (FPSA) treatment of ALF.
Materials and Methods: A surgical resection model of ALF was used. Laboratory data and data from monitoring by cerebral microdialysis and ICP of the ALF group (ALF only), FPSA group (ALF group treated with the FPSA method) and SHAM (only laparotomy) group were compared using statistical analyses (ANOVA, t-test).
Results: The extracellular brain glutamine level was significantly higher in both ALF and FPSA groups compared to the SHAM group in the 2^{nd} - 12^{th} hours and 3^{rd} - 12^{th} hours of the experiment, respectively. The glutamine level was significantly lower in the FPSA group compared to the ALF group in the 6^{th} - 10^{th} hours of the experiment. In both ALF and FPSA groups a significant increase in the extracellular brain glutamine levels was observed compared to the SHAM group. The increase in glutamine levels was significantly higher in the ALF than in the FPSA group. The ICP was significantly higher in the ALF group in the 9 - 12^{th} hour of the experiment than in the FPSA-treated group. From the 5^{th} hour, the values for ICP were significantly higher in both the ALF and FPSA groups than in the SHAM group.
Conclusion(s): The data show clearly the positive influence of FPSA on the cerebral accumulation of glutamine. Significantly lower values for glutamine in the FPSA group than in the ALF group were observed already during the therapy and even earlier than when the significant difference in the ICP value between the groups was observed. However, analysis of glutamine is technically difficult and bed-side analysis of samples for glutamine concentration is not easily available. From this point of view, estimation of intracerebral glutamine should be further evaluated for its clinical use.

12AP6-6

The effects of cardiac output on the initial distribution volume of glucose in pigs without changing the fluid volume status

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Background: Initial distribution volume of glucose (IDVG) measures central extracellular fluid (ECF) volume and it has been well correlated with the CO in animals with fluids volume removal and loading (1, 2) and in patients without heart problems (3). However, ratio of IDVG/CO has been shown larger in patients with heart failure than in patients without it (4). There is no investigation about the effects of cardiac output (function) on IDVG without changing the fluid volume status.
Methods: After obtaining an approval of Hirosaki University ethical committee, we anesthetized 10 pigs weighting 11-26kg with ketamine, pentobarbital, remifentanil and vecuronium. We performed tracheostomy and the lung was mechanically ventilated. Physiological saline solution had been infused through the experiment (4ml/kg/hr). We measured IDVG with 2g glucose injection and plasma volume (PV) with 10mg indocyanine green injection as previously-described (1, 2) after the experimental preparation (control), at the state of high CO (High CO: 150% of control), low CO 1 (Low CO1: 70%) and low CO 2 (Low CO2: 40%). We administered dobutamin (5-10μg/kg/min) for high CO state and a combination of propranolol (10mg) and lidocaine (7mg/kg or 20mg/kg) for low CO states. Each measurement was performed with a more than 30 min interval.
Results:Induced CO changes did not affect the IDVG and PV measurements in pigs without changes in fluid volume status. The changes in hemodynamic variables, IDVG and PV were shown on the table.

	Control	High CO	Low CO 1	Low CO 2
%CO	100	147.2±26.7	65.9±11.0	37.3±14.4
Mean BP (mmHG)	85.3±14.5	98.5±16.9*	64.7±15.9*	40.4±8.4*
HR (bpm)	118.8±24.4	161.5±33.2*	86.2±17.7*	62.0±11.6*
Mean PAP (mmHg)	20.2±3.6	21.1±2.8	22.3±5.5	19.8±4.1
CVP (mmHg)	8.8±2.6	7.9±2.2	10.4±2.5*	11.9±2.6*
IDVG (L)	2.84±0.51	2.78±0.36	2.81±0.31	2.89±0.33
PV (L)	1.33±0.24	1.31±0.25	1.37±0.33	1.36±0.36

[Changes in hemodynamic variables, IDVG and PV]

*P< 0.05 vs Control
Conclusion: Our study suggest that IDVG can measures central ECF volume with the minimum influence of cardiac function if the cardiac function is more than 40% of normal. Taking the previous results into consideration, IDVG can be a unique indirect indicator of cardiac preload with the minimum influence of cardiac function.
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12AP6-7

Risk factors and outcome of reintubation after cardiac surgery

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Background and Goal of Study: Cardiac surgical patients are at increased risk of postoperative respiratory failure. Reintubation after cardiac surgery (CS) has negative consequences for the patient, including longer intensive care unit (ICU) length of stay (LOS) and higher morbidity and mortality. Noninvasive ventilation (NIV) can reduce reintubation rate and improve prognosis (1). The aim of our study was to determine the incidence, risk factors and outcome of patients needing reintubation after cardiac surgery before implementing a NIV protocol.
Materials and Methods: For the present study we performed a retrospective analysis of prospectively collected data recorded in our Cardiac Anesthesia database including patients operated on of mayor cardiac surgery between 2002 - 2010. We excluded tracheostomized patients before surgery and patients who never achieved extubation. We measured incidence, time elapsed since first extubation (before 24h, 24 - 48h, and after 48h) and outcomes

(need for tracheostomy, ICU LOS, mortality). Risk factor analysis included preoperative, intraoperative, and early (first 24 hours) postoperative variables. Factors associated with reintubation in the univariate analysis were entered into a backward multivariate logistic regression model.
Results and Discussion: 205 (6,9%) out of 2986 cases underwent reintubation. 93 (45%) of them 48 h after first extubation. Tracheostomy was performed in 86 (42%). Median (25^{th} - 75^{th} percentile) ICU LOS was significantly longer for patients requiring reintubation: 19 d (9-35) vs. 2 d (3-4). Mortality was also much higher in this group (30,7% vs 0,3%). Independent risk factors for reintubation found in the multivariate analysis were (OR [95% confidence interval]): emergent surgery (3,5 [1,7-7]), complex surgery (2 [1,4-3]), previous CS (2[1,2-3,3]), insulin dependent diabetes mellitus (1,9 [1,1-3,5]), history of heart failure (1,6 [1,1-2,4]), intraoperative blood transfusion (1,6 [1,1-2,4]), packed red blood cells transfused during the first 24h (1,2 [1,11-1,29] per concentrate), and time on mechanical ventilation (1,006 [1,003-1,009] per hour).
Conclusion(s): Reintubation after CS has a negative impact on prognosis in terms of cost (ICU LOS), morbidity (need for tracheostomy) and mortality. Measures to reduce reintubation rate shall be implemented
References:
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Acknowledgements: We appreciate the efforts of the ICU staff in maintaining tha Cardiac Anesthesia Database.

12AP6-9

Postoperative, prolonged and refractory cerebral salt wasting syndrome (CSWS) after severe head trauma - what should we do?

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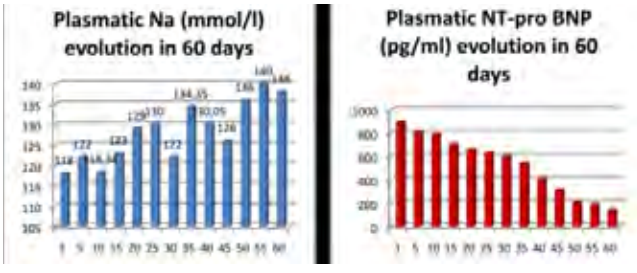
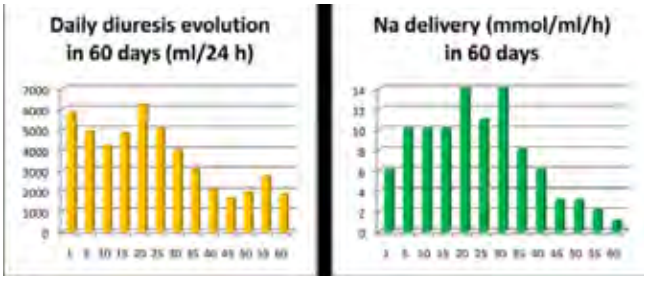
Background: CSWS usually devellops in the first week following brain insult and is defined by extracellular volume depletion due to excessive natriuresis in patients with intracranial disease; its duration is usually brief but it can last for several months
Case report: A 74 years old woman was admitted in ICU for polytrauma with multiple fractures (femoral, humeral, pelvic, rib fractures) and severe head trauma; the brain CT scan on admission showed subarachnoidal haemorrhage and temporal bone fracture
At 3 p.o. days (femoral+humeral osteosynthesis) she developped progressive headaches, deteriorated consciousness and vomiting refractory to medical treatment.
Biochemical: Plasmatic Na level 98-102 mmol/l, glucose, blood urea, creatinine- normal value, NT-proBNP 890 pg/ml, ADH< 2 ng/ml.
Urinary: Na level 180 mmol/l, osmolality 720 mosm/kgH2O, uric acid 399 mg/24 hours.
No hystory of hyponatremia, no medication-related hyponatremia, adrenal and thyroid functions tests-normal.
Clinically: Hypovolemia, high urinary output.
The diagnosis of CSWS was made; the clinical course was uneventful.
The treatment include NaCl molar (1 mmol/ml) supplementation, volume replacement therapy, methylprednisolon 32 mg/day.
Discharge day 62 with plasmatic Na 138 mmol/l, no i.v. Na supplementation.
A second hit 2 weeks after discharge, conservative treatment with NaCl tablets, 1 gr NaCl each 4-6 hours.





[Results]

Discussion: Traumatic brain injury may severely impair brain function; neuroendocrine dysfunction is an important complication Most TBI-associated hyponatremia are mild and asymptomatic, but in severe cases the differential diagnosis CSWS/SIADH, also difficult to make, is decisive for the treatment options.
References:
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2. Vespa P. Cerebral salt wasting after traumatic brain injury: an important critical care treatment issue. Surg Neurol 2008;69(3):230-2
Learning points: The CSWS related hyponatremia had a prolonged and difficult recovery; till now there are few data concerning the therapeutic approach of chronic CSWS, requiring new research.

12AP6-10

Which is the best invasive ventilation mode in chronic obstructive lung patients undergoing major abdominal surgery for early extubation? Bi-level positive airway pressure or pressure- synchronized intermittent mandatory ventilation

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Background and aim: Chronic obstructive pulmonary disease (COPD) is considered independent risk factors for mortality and cardiopulmonary complications after major abdominal surgery. Although non-invasive ventilation (NIV) has been shown to be effective to avoid the tracheal intubation during postoperative period in COPD patients, physicians are greatly worried by the possible dangerous effects of higher pressures during NIV for the recent surgical anastomosis after major abdominal surgery. The aim of the study was to compare BIPAP and P-SIMV modes for early extubation time and re-entubation risk in COPD patients undergoing major abdominal surgery in intensive care unit.
Methods: We analyzed 56 patients who had undergone major abdominal surgery between February 2012 and October 2012 in intensive careunit, retrospectively. Patients with COPD were treated modes P-SIMV (SIMV group, n = 27) and BIPAP (BIPAP group, n = 29) after major abdominal surgery in the post-operative intensive care unit (eVolution® 3e Ventilator, e Vent Medical). Demographic data, preoperative FEV 1 value (< 70% of light, medium< 50-70, severe < 30-50), the presence of co-morbidities (hypertension, diabetes, renal failure), type of operation, emergency / elective cases, duration of intensive care unit stay, duration of mechanically ventilation and the need for re-intubation and extubation times were recorded.
Results: Age, gender, type of operation, hypertension, diabetes mellitus, renal failure, forced expiratory volume in 1 s (FEV1), elective or emergency surgery were similar in both groups. The duration of intensive care unit stay and mechanical ventilation were significantly shorter in BIPAP group compared to SIMV group (respectively,p = 0.011 and p = 0.018). The need for re-intubation, 8 patients in SIMV group, 2 patients in BIPAP group (p = 0.038).
Conclusion: High-and low-level positive airway pressure with two different BIPAP mode prevents dynamic airway collapse, according to the P-SIMV mode in patients with COPD by providing a better patient compliance, extubation time and reduce the possibility of re-intubation.

12AP6-11

Percutaneous tracheostomy with Percutwist™: experience of 57 cases

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Background and Goal of Study: Tracheostomy is considered the airway management of choice for patients who require prolonged mechanical ventilation (1,2,3). Percutaneous dilation tracheostomy (PDT) has proven as effective as surgical (2). The preferred techniques for tracheostomies are still debated (2). The objective of this study is to evaluate the efficacy and safety of PercuTwist™ set for PDT.
Materials and Methods: This prospective observational study was conducted to evaluate PercuTwist™ set in our critical care unit. 57 tracheostomies were collected in 5 years.
Before starting, intravenous sedation was deepened and a single dose of neuromuscular-blocking drug was administered.
Fiberoptic bronchoscope (FOB) was employed for removal endotracheal tube and continuous visual monitoring of PDT. The PDT was performed between the first and the second tracheal rings.
Data collected prospectively included demographic characteristics, risk factors of difficulty tracheostomy and procedure duration. The incidence of complications was also measured and analyzed.
Results and Discussion: 40 men and 17 women were included. Mean age was 66,21 years (SD 14,66). The duration of the procedure was 5,11 min. (SD 2,9). Risk factors are shown in Table 1

Risk factors	n	%
Obesity	19	32,3
Short neck	24	42,1
Previous tracheostomy	2	3,5
Surgical neck wound	3	5,3

[Table 1]

and incidence of complications are shown in Table 2

Complications	n	%
Minor bleeding	10	17,5
Major bleeding	0	0
Accidental extubation	5	8,8
Hypoxemia	0	0
Difficulty TT insertion	16	28,1
Poor FOB visibility	15	26,3
Peritracheal insertion	0	0
Infection at 7 days	0	0

[Table 2]

Tracheostomies were completed successfully in all patients.
Conclusion: PercuTwist™ technique is a safe, quick and easy technique. The rate of immediate complications was low with this technique.
References:
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Resuscitation and Emergency Medicine

13AP1-1

Can mass education and a television campaign change the attitudes towards cardiopulmonary resuscitation in a rural community?

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Background and Goal of Study: Survival after out-of-hospital cardiac arrest (OHCA) is improved when bystanders provide Basic Life Support (BLS). However, bystander BLS rates are often low. The aim of this study was to assess the effects of a one-year targeted media campaigns and widespread education in a rural Danish community. Specifically, we investigated if the proportion willing to provide BLS and deploy an AED increased.
Materials and Methods: BLS and Automated External Defibrillator (AED) courses were offered and the local television station had broadcasts about resuscitation. A telephone enquiry assessed the attitudes towards different aspects of resuscitation among randomly selected citizens before (N=824) and after the project (N=815).
Results and Discussion: From 2008 (N=824) to 2009 (N=815) there was a significant increase in the proportions who had participated in a BLS course within the past 5 years, from 34% to 49% ((P=0.0001), who were willing to use an AED on a stranger (p< 0.0001), confident at providing chest compressions (p=0.03) and confident at providing mouth-to-mouth ventilations (MMV) (p=0.048). There was no significant change in the proportions willing to provide chest compressions (p=0.15), MMV (p=0.23) or confident at recognizing a cardiac arrest. Both in 2008 and 2009 the most frequently reported reason for not being willing to provide chest compressions, MMV and use an AED was insecurity about how to perform the task.
Conclusion(s): Targeted media campaigns and widespread education significantly increased the willingness to use an AED, and the confidence in providing chest compressions and MMV. The willingness to provide chest compressions and MMV remained unchanged.

13AP1-2

Minimum oxigen flow needed for vital support during simulated post- cardiopulmonary resuscitation

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Background and Goal of Study: According to the ERC and AHA guidelines, FiO2 should be titrated to the lowest level to achieve an O2Sat ≥94%. The goal of this study was to determine the minimum oxygen flow (OF) needed and the time to reach it during post cardiac arrest care.
Materials and Methods: Experimental analysis consisted of a simulated post cardiac arrest situation. Four different resuscitators with reservoir were tested: Mark IV, Spur II, Revivator Plus and O-TWO, which were connected to a test lung. Four different OF were tried (2, 5, 10 and 15 lpm). An oxygen paramagnetic analyzer was used. Three measures of FiO2 for each model and flow were carried out. Tidal volume administered was of 500-600 ml at 12 bpm. The same investigator ventilated the lung simulator with each bag.
Different situations with associated pre-fixed PAFi and consequent FiO2 were proposed for patients after return of spontaneous circulation: No pulmonary pathology, FiO2 0.2; acute lung injury, FiO2 0.32; severe acute hypoxaemia, FiO2 0.8. Data was recorded into program Datex- Ohmeda S5 Collect. Statistical analysis was performed using SPSS 15.0. P≤0.05 was statistically significant.
Results and Discussion: FiO2 of 0.32 or more was obtained using any of the OF and resuscitators tested. Using 2 lpm, it took 30s. with Mark IV (34.8 (1.3)), Revivator (35.7 (1.5)) and SpurII (34.4 (2.1)); and 35s. with OTWO (36.3 (4.3)). Using 5 lpm, it took 15 s. with Revivator (34.3 (1.5)); 20 s. with Mark IV (44.9 (6.9)); 25s. with SPUR II (52.6 (8.3)); 30s. with OTWO (42.4 (4.4)). Never was FiO2 of 0.80 reached using 2 or 5lpm OF with almost any of the devices. Using 10 or 15 lpm, a FiO2 of 0.80 was obtained, after 40 s. and 35s. respectively, with Mark IV (for 10 lpm: 84.2 (0.9); for 15 lpm: 85.6 (0.3); and Revivator (10 lpm: 86 (2) ; 15 lpm: 84.3(1.5)). FiO2 of 0.80 or more was achieved at 50s. using SpurII (10 lpm: 88.9 (4.5) ; 15 lpm: 87.1 (6.4)) and OTWO (10 lpm: 88.6 (2.3) ; 15 lpm: 87.8 (0.1)). Clinically and statistically significant differences (IC 95%) were found during the first 60s. between Mark IV and OTWO at 10 lpm (p= 0.012); Spur II and OTWO at 15 lpm (p= 0.027).

Conclusions: For patients with no pulmonary pathology it would be enough to ventilate them without reservoir and with environmental air. Those presenting acute lung injury, could be ventilated with any of the resuscitators with 2 lpm. Presenting severe hipoxaemia, ventilation with 10 lpm should be enough.

13AP1-3

Traumatic patient radiology protocol review in a third level hostpital

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Background: For the initial management of the traumatic patient (PTP) an efficient approach is needed, optimizing the time delay to obtain an early diagnosis and an effective treatment. In view of the resources available, protocols (P) should be mandatory, reviewed and updated in order to guarantee the fulfillment of the requirements.
Methods: A review of the early radiological explorations obtained from a sample of PTPs is presented to assess the accomplishment of our current P, established in 2005. The sample set is compound of PTPs received during 9 months.
In the presence of a high impact PTP, our P establishes: first, cervical, thoracic and pelvic XR; then, cranial CT depending on the exploration and GCS; finally, the rest of radiological examinations taking into account the exploration and the causes of the injury. For each PTP, age, sex, causes of the injury and early explorations carried out were considered. The cervical rachis exploration and the possible thoracic-abdominal injury in the patient's medical record were also taken into account.
Results: The sample set was split into 2 groups.

1.TBI Traumatic brain injury-56 patients(25%)			
100% Cranial CT			
29%TBI only		71% TBI+ high impact trauma (HIT)	
75% Without Thorax XR	25% With Thorax XR	70% Protocol	30% Thorax XR + Cervical XR

[Table 1]

In the TBI+HIT group, 30% had a complete XR bone sequence and 15% a cervical CT because of XR displaying problems in the low cervical vertebras.

2.PTP Polytraumatics-169 patients (75%)					
TAC		CONVENTIONAL XR			
Thorax+Abdominal	Cervical	Cervical	Thorax	Pelvic	Thoracolumbar rachis
75%	17%	92%	100%	10%	13%
2% of extra patients received this exploration because of clinical worsening		55% of those patients had front and side projections			

[Table 2]

Note that in 6,5% of the patients with low clinical suspicion, the CT showed severe injuries.
Conclusions: Even if the adhesion to PTP management protocol is sometimes difficult in third level hospitals because of the wide range of patients received, reviewing and updating them is the only way to assess its efficiency, allowing us to improve the approach to this complex type of patient. The fact that 6.5% of the patients with low clinical suspicion had a CT showing important injuries is an evidence that this exploration should be recommended not only for the clinical exploration but also for the lesion mechanism.
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13AP1-4

Manual vs. LUCAS CPR on different supporting surfaces: a prospective, randomized, cross-over manikin study

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Background and Goal of Study: High-quality chest compressions (CC) are decisive for survival and good neurological outcome of cardiac arrest patients. However, conducting CC is complex. Although CC depth decreases when cardiopulmonary resuscitation (CPR) is performed on a mattress and even the use of a backboard does not necessarily improve CC depth, in-hospital CPR is still commonly performed on patients lying in bed and stabilized on a backboard. Mechanical CC devices deliver uninterrupted guideline-conform CC and may improve the quality of in-hospital CPR on a mattress. We compared manual and LUCAS CC during simulated CPR on different supporting surfaces.
Materials and Methods: Twenty-four ALS-certified paramedics were enrolled in this study. They formed random teams of two and each participant performed all scenarios in a randomized order. The simulated CPR-scenario (~6min) was performed on a modified Resusci-Anne® manikin (Laerdal, Stavanger, Norway), which was lying on different surfaces, i.e. on the floor, on a firm standard and on a soft ICU mattress. After a short emergency assessment at the beginning of the test the participants started to compress the manikin's chest. In the LUCAS group the participants continued with mechanical CC after the first rhythm analysis until termination of the study, whereas the manual group participants changed doing manual CC every two minutes. The manual CPR-scenarios on the two mattresses were done once with and once without a backboard.
Results and Discussion: Manual compared to LUCAS CC were less frequently correct, on the floor: manual 33% vs. LUCAS 90% ($p < 0.001$); on a standard mattress: manual 32% vs. backboard 27% vs. LUCAS 91% ($p < 0.001$); and on a soft ICU mattress: manual 29% vs. backboard 30% vs. LUCAS 91% ($p < 0.001$). CC depth was less in the manual group, on the floor: manual 53mm vs. LUCAS 56mm ($p = 0.003$); on a standard mattress: manual 50mm vs. backboard 51mm vs. LUCAS 55mm ($p < 0.001$); and on a soft ICU mattress: manual 49mm vs. backboard 50mm vs. LUCAS 55mm ($p < 0.001$). Hands-off time was shorter in the manual group, on the floor: manual 26sec vs. LUCAS 41sec ($p < 0.001$); on a standard mattress: manual 27sec vs. backboard 30sec vs. LUCAS 43sec ($p < 0.001$); and on a soft ICU mattress: manual 26sec vs. backboard 31sec vs. LUCAS 43.5sec ($p < 0.001$).
Conclusion: In the LUCAS group CC were more often correct and CC depth deeper but hands-off time was longer.

13AP1-6

Timing and management of emergency surgery

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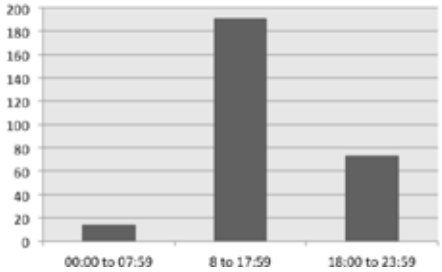
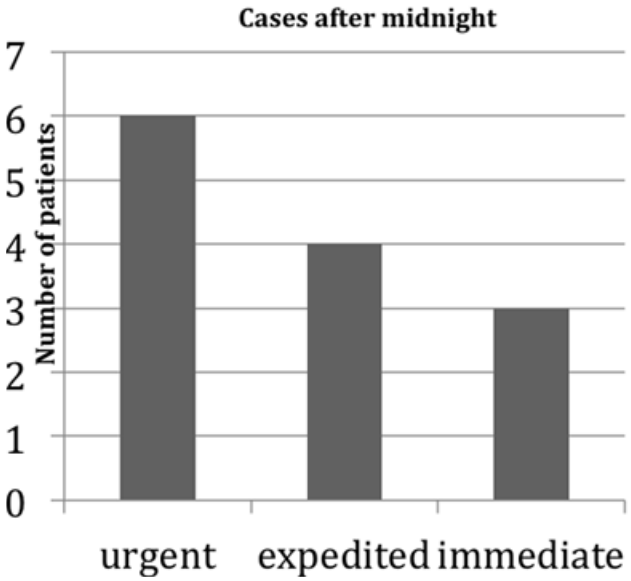
Background and Goal of Audit: Out of hours emergency surgery has been shown to have a poorer outcome for patients especially when operating after midnight[1]. NCEPOD (National Confidential Enquiry into Peri-operative Deaths) guidelines from 2003 recommends that 60% of emergency cases should be performed in the normal working day from 08:00 to 18:00 and less that 5% of cases should be performed after midnight. We wanted to assess our compliance with these guidelines.
Materials and Methods: Theatre emergency lists and Data collection sheet filled in by Anaesthetists after each case. Headings included were: Age of patient, ASA grade of patient, Operation and speciality, NCEPOD grade of urgency[2], Time operation booked,started and finished, Consultant Surgeon present, Consultant Anaesthetist present.
Results and Discussion: 279 emergency cases over 9 week period from 28/09/2012 to 29/11/2012. Tables of ASA Grade,Age, Speciality, timing of cases, cases performed after midnight.



[Start times]



[Cases after midnight]

Consultant surgeons present for 50.9% of cases. Consultant anaesthetists present for 45.2% of cases. 67% cases performed during normal working day 08:00-18:00.
4.3% cases performed after midnight.
Note 13% of cases performed under Local Anaesthesia.
Conclusion: Patients operated on out of hours may have poorer outcomes secondary to reduced senior staff present. We wanted to assess our compliance with NCEPODS recommendations. With 67% of cases performed during the normal working day and 4.3% of cases performed after midnight we found that our hospital was compliant in this 9 week period despite the lack of a designated emergency operating theatre.
References:
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2. NCEPOD classification of intervention December 2004,www.ncepod.org.uk

13AP1-7

Pregnant patient resuscitation: simulation training

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Background and Goal of Study: Biomedical simulation improves the performance of health professionals during critical events, which contributes to increase patient safety.
Coimbra`s Biomedical Simulation Center regularly organizes courses in the multidisciplinary field of obstetric emergencies.
Cardio-respiratory arrest(CRA) in the pregnant woman is a very rare event and it`s approach requires a fast and effective performance. The Advanced Life Support(ALS) during pregnancy has some peculiarities.
Our aim was to evaluate multidisciplinary teams performance during CRA in a pregnant patient.
Materials and Methods: Twelve simulation videos of cardiac arrest in a pregnant woman in the context of emergent cesarean section were analyzed. Based on the 2010 recommendations of the European Resuscitation Council (ERC) for cardio-pulmonary resuscitation(CPR), we used a checklist with 21 items taking into special consideration the ALS in the pregnant patient. We evaluated the adequacy of essential gestures and the time since the beginning of CRA to the institution of Basic Life Support(BLS) and defibrillation.
Descriptive analysis was performed using SPSS version 11.
Results and Discussion: All teams identify the rhythm and request the emergency car, taking an average 0:18 minutes:seconds to start chest compressions.
Time to apply first shock was 1:39 minutes:seconds.
Only two teams accomplished chest compressions pauses of less than five seconds. After signs of recovery of spontaneous circulation(ROSC), half the teams filed to fulfill two minutes of BLS.
Epinephrine and amiodarone have been administered in the correct dose/timing by seven and five teams. In only five groups was a team leader.
We identified gaps in crucial steps of the ALS algorithm.
This issue analysis in a simulation environment by some authors found major deficiencies in the pregnant woman resuscitation. Those were also our findings, namely the lateral uterus deviation and early neonatologist call. Unlike other authors, we found that all teams performed fetal extraction within five minutes, probably because the scenarios took place in the operating room.
Conclusions: Leadership remains a problem in the management of critical events in healthcare.
There are still important deficiencies in the general application of the ALS algorithm and the pregnancy particularities are often forgotten.
Training of adequate ALS algorithm application during pregnancy can only be achieved by simulation.

13AP2-1

Caveolin-1 was involved in the attenuation of alpha-adrenergic vasoconstriction in a rat model of abdominal sepsis

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Background and Goal of Study: Caveolae are flask-like invaginations of the plasma membrane that participate in signal transduction. Caveolin is one of the key structural components of caveolae and controls the activities of various molecules and receptors. For example, caveolin-1 (Cav-1) inhibits endothelial nitric oxide synthase (eNOS) activity, which is involved in the attenuation of alpha-adrenergic vasoconstriction in sepsis.[Purpose] To investigate whether Cav-1 participates in the attenuation of alpha-adrenergic vasoconstriction mediated by eNOS in sepsis.
Materials and Methods: Sprague-Dawley rats (n=20) were used. Abdominal sepsis was induced by the cecal ligation and puncture (CLP) technique under general anesthesia (n=10). The control group underwent laparotomy but the cecum was not ligated nor punctured (sham operated group, n=10). In half of the rats from both groups (n=10), Cav-1 antibody (200 μL, Cell Signaling Technology) was injected through the tail vein 48 hours before the laparotomy. The descending thoracic aorta was excised 12 hours after the laparotomy under deep anesthesia and cut into rings of 3 mm in width. Expression of Cav-1 and phenylephrine (PE)-induced vasoconstriction were compared among the rings excised from the sham operated group, CLP group, Cav-1 antibody/sham operated group, and Cav-1 antibody/CLP group (n=5, each). Cav-1 expression was examined immunohistochemically and by Western blot analysis.
Results and Discussion: Cav-1 expression was significantly increased in the CLP group in comparison with the sham operated group. Cav-1 was not expressed in the vascular rings from the rats administered Cav-1 antibody. PE-induced vasoconstriction in the CLP group was attenuated compared to the sham operated group, indicating that abdominal sepsis suppressed smooth muscle contraction. PE-induced vasoconstriction in the Cav-1 antibody/sham operated group was also attenuated compared to the sham operated group, confirming that Cav-1 inhibits eNOS activity. However, PE-induced vasoconstriction was comparable between the Cav-1 antibody/sham operated group and the Cav-1 antibody/CLP group, indicating that the effect of CLP was abolished in the absence of Cav-1 activity.
Conclusion(s): Cav-1 participated in the attenuation of alpha-adrenergic vasoconstriction mediated by eNOS in this rat model of abdominal Sepsis.

13AP2-2

Base deficit delta as a predictor model of outcome in traumatic patients

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Background and Goal of Study: Comparison of survival probability scores BISS and TRISS as a predictor model of outcome in traumatic patients.
Materials and Methods: Prospective Study including traumatic patients admitted in the hospital of Sabadell from November 2008 to November 2010. The patients included in the study had an injury severe enough to required intensive care unit admission. 118 patients were included, the revised trauma score (RTS), injury severity score (ISS) and trauma injury severity score (TRISS) was calculated at admision and then a blood sample was taken during the first hour of atention in the emergency department, intensive care or the operation room in order to determinate the base deficit, We consider the base deficit normal range between -2 to 2 mmol/L. the a comparision of the base deficit delta between survivers and no survivers was done. We calculate the relation between the base deficit delta and the ISS, RTS and TRISS in or-

der to compare our BISS and TRISS with the original ecuation and adjust the new coeficient to our patients. To compare the medians values we used the wilcoxon/Kruskal/Wallis test. To calculate the new coefficient of our population we used the stepwise logistic regression for the BISS and TRISS.
Results and Discussion: From November 2008 to November 2010 the hospital of Sabadell admitted 354 traumatic patients. 167 of these patients required ICU admission, of those admitted in the ICU we determinate the base deficit to 118 patients. The base deficit shows to be higher in the no survivor group (5.35) compared with the survivor group (2.25) (P=0.0157). The base deficit delta correlates with a low RTS, high ISS And low survive probability according to the original survival model of the TRISS and BISS coefficients extracted from the MTOS data base. The base deficit delta correlates significantly with the mortality (Chi square 5.8625 P= 0.015).
Conclusion(s):BISS model predicts the outcome in traumatic patients as well as the TRISS model does, its more objective and less complicated to obtain. Because of this, the BISS model deserves a role in the evaluation of traumatic patients.

13AP2-3

Facilitation of prehospital endotracheal intubation: use of drugs and auxiliary intubation devices

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Background and Goal of Study: In order to elucidate which factors facilitate prehospital intubation, a study was performed in which the use of medication and auxiliary intubation devices other than a laryngoscope during prehospital endotracheal intubation was investigated.
Materials and Methods: Medical records of all patients being intubated by the Mobile Emergency Care Unit in Odense, Denmark, from 01.01.2009 - 12.31.2011 were scrutinized by the investigators. The following parameters were registered: The use of sedation, the use of opioids, the use of muscle relaxant, and the use of auxiliary intubation devices.
Results and Discussion: 463 patients were registered as intubated. 229 suffered from cardiac arrest, 71 were trauma patients, 49 presented with respiratory distress, and 46 with central nervous system pathology. 23 were intoxicated and 42 categorized as others. Three patients were erroneously registered and thus excluded.
Patients with central nervous system pathology received the highest amount of medication when intubated (sedation 71.7 %, opioids 50.0 %, muscle relaxants 73.9 %).2/3 of the traumatized patients received medication (sedation 60.6 %, opioids 53.5 %, muscle relaxants 69.0 %).
Patients with cardiac arrest received very little medication in conjunction with the intubation (sedation 7.4 %, opioids 7.4 %, muscle relaxants 6.6 %). Auxiliary intubation devices were used in 2.4 %.
Conclusion(s): This investigation shows that intubation is not only the act of inserting a tracheal tube. Apart from in cases of cardiac arrest, almost all patients requiring intubation were given titrated doses of opioids, sedatives, and muscle relaxants. All these potent drugs may infer serious consequences for the patient. Circulatory failure, allergic reactions and the inability of the paralyzed patient to breathe spontaneously, should intubation fail, are all potential hazardous consequences of administering these drugs. Prehospital intubation should only be allowed by personnel well-trained in performing the manual procedures as well as having intimate knowledge of the drugs facilitating intubation.
References:
1. Paul AM et al.Scott Med J. 2012;57:84
2. Lecky F et al, Cochrane Database Syst Rev 200816;(2):CD001429

13AP2-4

Prehospital pain management: do we have to learn more about it?

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Background: Prehospital analgesia options for medical teams in the field have been limited and the inadequacy of pain relief is recognized as a weakness in prehospital care[1]. Prehospital oligoanalgesia is prevalent among trauma victims, even when the emergency medical services team includes a physician[2].The aim of this study was to evaluate the quality of pain management in prehospital emergency care and to get more information about the administration of analgesics in prehospital patients.
Materials and Methods: This was a retrospective study of patients attended by pre-hospital teams between January and September of 2010. To discover the frequency of pain as a symptom and type of analgesia provided, review of clinical records (completed by physicians in the field) was performed. This study and collection of data were previously approved by Portugal's National Institute for Emergency Medicine. Data were analyzed using the Chi-Squared test and Student t-test and differences were considered statistically significant when $p < 0.05$.
Results and Discussion: From all the data collected (N=642), the authors selected pain events (N=252) and these were divided in trauma (N=186) and medical (N=66) situations. Analgesia was administrated only in 29,6% of cases and preferencially in medical situations. There was no difference between genders but we found a positive association between distance to the hospital and administration of analgesia In respect to the amount of analgesia provided, the highest percentage goes to Acute Coronary Syndromes followed by polytrauma events and thoracic pain. The drug most commonly precribed was morphine, alone or in combination with paracetamol; ketamine was seldom used.
Conclusions: Prehospital pain management has become an important patient care issue. Most patients with moderate or severe pain did not receive adequate prehospital pain medication. We consider that development of multimodal pain protocols and stop pain programmes within Emergency Medical Services could contribute to improvement of pain relief in prehospital settings.
References:
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13AP2-5

Emergency patients receiving prehospital medical treatment obviating admission to hospital. A three-year study

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Background and Goal of Study: The Mobile Emergency Care Unit (MECU) in Odense, Denmark consists of one rapid-response car, manned with a specialist in Anaesthesiology and an Emergency Medical Technician (EMT). The MECU services a population of 260,000 and has approximately 5,000 runs per year. 11% of the patients receive final treatment enabling the MECU to leave the patient at the scene. The aim of the study was to investigate the patients treated at the scene in a way that obviated the need for admission to hospital.
Materials and Methods: During a three-year period (1.1 2008 to 31.12 2010), all records at the MECU regarding patients left at the scene were sought. We investigated diagnoses assigned (ICD 10 classification) , examinations, assessments, measurements, medical treatments, and whether the patients' had renewed contact with the health care system within 24 hours from the first contact.
Results and Discussion: During the three-year period 1668 patients were left at the scene. 54 were lost to follow-up. Observational diagnosis (28%) represented the largest group of patients. "Other diagnoses" assigned to the R-group (24%) including "lipothynmia, syncope and collapse" represented the second largest group of patients. 107 (6.7%) had a renewed contact within 24 hours. Patients requiring renewed contact despite receiving finalising treatment the day before were primarily patients having been involved in traffic accidents. Blood pressure, oxygen saturation and pulse are measured in about 50% of the patients left at the scene. GCS is assessed in 56% of the patients. Respiratory rate is assessed in 22 % of the patients.
Conclusion(s): Patients treated by the MECU and left at the scene are often assigned an observational diagnosis. Except these, patients with syncope, chronically ill, alcoholics and addicts are among the majority.
The documentation is to a large extent insufficient. However, despite missing documentation of vital parameters throughout the discharge summaries, this does not seem to have an influence on patients' survival, leaving other diagnostic tools as part of the assessment as a possibility.
References:
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13AP2-6

Positive inotropic effect of lipid emulsion Intralipid® in healthy rat myocardium

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Background and Goal of Study: Local anesthetic systemic toxicity is a rare but dramatic side effect in locoregional anesthesia practice which leads to cardiac arrest. In this case, while its effect is incompletely understood, administration of intravenous lipid emulsion is efficient and recommended. A "lipid sink" action and a metabolic effect may be involved. Whatever, a positive inotropic effect may be involved in healthy cardiac dysfunction. The aim of our study was to test the positive inotropic effect of lipid emulsion (Intralipid®) in the healthy rats.
Materials and Methods: The inotropic effect of lipid emulsion has been explored in vivo (echocardiography, 10 rats) and in vitro (papillary muscle, 12 muscles) in healthy adult Wistar rats (3-months-old). In vivo, left ventricle ejection (LVEF) and shortening fraction (LVSF) were assessed before and after an Intralipid® injection (IVSE, 5mL. kg-1). In vitro, inotropic effect of cumulative concentrations of Intralipid® (0.2 to 1.2%) was measured in papillary muscles in comparison with saline. The inotropic effects were compared in isotonic and isometric conditions, using the maximum unloaded shortening velocity (Vmax) and maximum isometric active force (AF).
Results: A positive inotropic effect of Intralipid® was measured in comparison to saline, in vivo, (LVEF 109±2 vs 101±2% and LVSF 123±8 vs 102±4 % of baseline value, $p < 0.05$ respectively) and in vitro, in isometric and isotonic conditions (Vmax 115 ± 2 vs 102 ± 7% and AF 119 ± 5 vs 101 ± 6 % of baseline value, $p < 0.05$ respectively).
Conclusion: Intralipid® induces a positive inotropic effect in heart of healthy rat both in vivo and in vitro which may explained in part its beneficial effect in local anesthetic toxicity. The underlying mechanism still remains to be determined.
References:
Anesthesiology. 2012;117:180-187

Acute and Chronic Pain Management

14AP1-1

The efficacy and safety of oxycodone hydrochloride injection for postoperative analgesia: a prospective, randomised, blinded, multicentre, positive-controlled clinical trial

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Objective: Oxycodone, an opiate agonist, is indicated for moderate-to-severe pain relief, and has been shown to have greater potency for postoperative pain relief and reduced adverse events (AEs) compared with morphine.[1] The primary objective of this study was to investigate the efficacy and safety of oxycodone and morphine injection in alleviating acute postoperative pain.
Methods: Patients aged 18-65 years and undergoing abdominal or orthopaedic surgery were randomised to receive oxycodone hydrochloride or morphine sulphate via patient-controlled administration (PCA) for 48 hours post-surgery. Oxycodone or morphine (1 mg) was intravenously injected via PCA pump for every bolus dose and the lock-out time was set to 5 min. The primary efficacy endpoint was pain at rest rated on a visual analogue scale (VAS) during 48 hours post-surgery.
Results: A total of 224 patients were recruited (n=109 morphine; n=115 oxycodone). There was no significant difference in resting and coughing VAS scores between groups, indicating that the analgesic effect of oxycodone was non-inferior to that of morphine. No patient in the oxycodone group required rescue analgesia, while four patients in the morphine group required rescue analgesia. The incidence of overall AEs was 24% in the morphine group and 14% in the oxycodone group, and the incidence of nausea and vomiting was lower with oxycodone than with morphine, although not statistically significant. Of patients undergoing orthopaedic surgery (n=96), the incidence of nausea and vomiting was significantly lower in those receiving oxycodone than morphine (6.5% vs 24.0%; $P=0.018$ and 4.4% vs 18.0%; $P=0.036$, respectively). No serious AEs, including respiratory depression, occurred. Patient analgesia satisfaction rates were 92% in the oxycodone group and 86% in the morphine group.
Conclusions: The efficacy of oxycodone and morphine injection for acute postoperative pain relief was similar (1:1 dose ratio). For patients who had undergone orthopaedic surgery, the incidence of nausea and vomiting was significantly lower in the oxycodone than in the morphine group. As nausea and vomiting have a marked impact on quality of life, patient analgesic satisfaction was greater in the oxycodone group. The AE profiles of oxycodone and morphine in this study indicate clinical benefit of oxycodone use for acute postoperative pain relief, particularly in patients who have undergone orthopaedic surgery.
References:
1. Lenz H, *et al. Pain Med* 2009;109:1279-83.

14AP1-2

Efficacy and tolerability of controlled-release oxycodone for acute postoperative pain after head and neck cancer surgery: prospective, observational, open study

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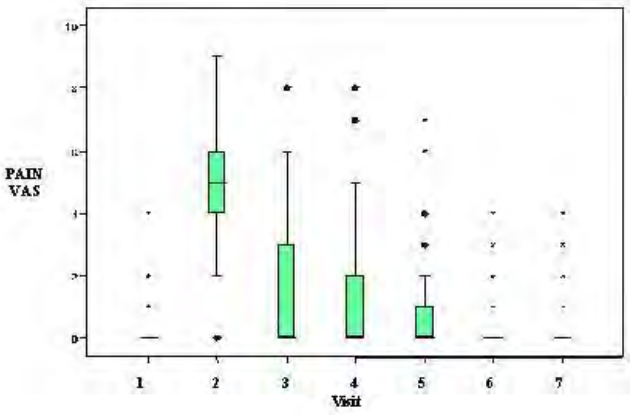
Background and Goal: The effective management of pain is an important component of recovery in the postsurgical setting. Oxycodone is a semisynthetic opioid analgesic agonist of μ, and partially also κ-opioid receptor. There is a lack of studies on the use of controlled-release oxycodone for acute postoperative pain after head and neck cancer surgery. The aim was to determine the efficacy and tolerability of controlled-release oxycodone in this specifically set of patients.
Material and Methods: Eighty-three adults patients schedule for elective neck and head cancer surgery were included in this prospective, observational, open study. All patients received general anaesthesia (propofol, fentanil, dexmedetomidine, cisatracurium and sevoflurane). From the first postoperatory pain score ≥ 4 (Visual Analogic Scale-VAS), patients received oral controlled-release oxycodone 40 mg (20 mg 12/12 hours) on the first day and 20 mg (10 mg 12/12 hours) on the second day after surgery. Pain and adverse events were assessed in 7 visits: 1 (preoperative), 2 (PACU - first dose of oxycodone), 3,4,5 and 6 (12, 24, 36, and 48 hours after the first dose of oxycodone, respectively) and 7 (the seventh day after surgery).
Results and Discussion: Of the 83 patients enrolled, 14 did not complete the study. There is a significant decrease in pain intensity (visits 3, 4, 5, 6) after onset of analgesia (visit 2) (graph 1). The frequency of the adverse effects is presented in table 1. There were no severe adverse events.



*[Graph 1. Box-Plot diagram of the pain intensity (visual analogic scale - VAS) Dunn test *p<0.001]*

Adverse Event	Visit 3 (n=72) Frequency (%)	Visit 4 (n=72) Frequency (%)	Visit 5 (n=72) Frequency (%)	Visit 6 (n=72) Frequency (%)	Visit 7 (n=69) Frequency (%)
Nausea	14 (19,44)	11 (15,28)	4 (5,56)	1 (1,39)	1 (1,45)
Vomit	8 (11,11)	9 (12,50)	1 (1,39)	1 (1,39)	-
Dizziness	2 (2,78)	3 (4,17)	1 (1,39)	-	3 (4,35)
Itch	2 (2,78)	1 (1,39)	-	-	-
Insomnia	2 (2,78)	-	-	-	-
Constipation	-	-	3 (4,17)	-	3 (4,35)
Urinary retention	1 (1,39)	-	-	-	-
Other	1 (1,39)	9 (12,50)	15 (20,28)	-	6 (8,69)
Total	30 (41,67)	33 (45,83)	24 (33,33)	11 (15,28)	13 (18,84)

[Frequency of adverse events after oxycodone]

Conclusion: Postoperative oral controlled-released oxycodone is well tolerated and reduces substantially the pain scores after head and neck cancer surgery.

14AP1-3

Intravenous methadone with ketamine is more effective than intravenous morphine with ketamine for postoperative analgesia in patients undergoing lower extremity fracture surgery

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Background and Goal of Study: Lower extremity fractures, especially tibia fractures are painful and require large doses of opioids for postoperative analgesia. Regional anesthesia is contraindicated because of risk of compartment syndrome. Methadone may be a better alternative to morphine due to longer half life and its effect on both mu opioid receptors and NMDA receptors. We designed this study to compare morphine with methadone given intraoperatively and studies its effects on postoperative analgesia.
Materials and Methods: To achieve 90% power at a significance level of 0.05, we needed 40 patients in each group to measure a 40% reduction in morphine usage in the methadone group.
We included patients with isolated fractures undergoing femur or tibia surgery. We excluded patients who were on opioids for more than 2 weeks or those who had a BMI more than 35.
All patients received a standardized anesthetic and were randomized to either 0.2mg/kg morphine or methadone 0.2 mg/kg. Anesthesia providers were allowed to give as much fentanyl in 1 mcg/kg increment every hour. Patients were followed up for pain scores and morphine consumption in the recovery room, on the postoperative day 1 and 2.
Results and Discussion: We have enrolled 75 patients. We analyzed data at 50% patient recruitment, that is being presented here. Methadone provides 40% morphine sparing until postoperative day one.

	Morphine	Methadone
Mean Age	32.3	34
Gender (M/F)	14/5	17/2
BMI (kg/m2)	25.4	26.5

[Demographics]

	Morphine	Methadone
Preopertaive Midazolam (mg)	2.36	2.26
Intraoperative Fentanyl (Mcg)	140	174
Intraoperative Ketamine (mg)	16	17.2

[Intraoperative Variables]

	MORPHINE		METHADONE	
	Mean	SD	Mean	SD
Verbal Rating Scale in Recovery room (0-10)	6	3.6	6.6	3
Morphine Consumption in Recovery room (MG	10.3	9.6	13.4	11.5
Verbal Rating Scale at 24 hours (0-10)	7.8	2.2	6.2	2.9
Morphine Consumption at 24 hours (MG)	62.1	59.2	37.7	16
Verbal Rating Scale at 48 hours (0-10)	6.3	2.5	5	2.5
Morphine Consumption at 48 hours (MG)	30	26.5	22.4	20.9

[Major Outcomes]

Conclusion(s): Methadone may be a more effective alternative to morphine for lower extremity fracture surgery.
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14AP1-4

Analgesic consumption after total knee replacement (TKR) in 11 European Hospitals participating in the Pain-Out Project

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Introduction and aims: Pain after TKR is moderate-severe, regardless of the type of analgesia administered. We have assessed the analgesic requirements during postoperative day 1 after TKR, in 11 European hospitals participating in the PainOut Project (www.pain-out.eu).
Patients and methods: Data was obtained from 990 patients on postoperative day 1. Patients completed a self-administered questionnaire about pain, AE and satisfaction; in a different questionnaire the investigators recorded the type of surgery, anaesthesia, analgesia, co-morbidities, etc. All Ethics Committees approved the protocol and patients gave informed consent. Student's t-test, Mann-Whitney's and ANOVA were used. $P < 0.05$ was considered significant.
Results: Mean age was 68.8±10.5 years, being 63.3% women. Postoperatively, 46.9% of patients received morphine (mean dose 17.2±20.1 mg/patient/day; range 168-1) with significant differences between hospitals regarding % of patients ($p < 0.001$) and dose ($p < 0.001$). Oxycodone, tramadol and piritramide were administered to 18.4%, 17.6% and 14.8% of patients, at doses of 11.0±6.4, 180.8±103.9, 18.5±12.9 mg/pt/day respectively. Differences between hospitals were observed except for piritramide ($p=0.064$).
Consumption of paracetamol (76.5% of patients, mean dose= 3061.3mg/pt/day), metamizol (22.5%, 2606.5mg/pt/day) and diclofenac (15.1%, 129.9mg/pt/day) also showed significant differences between hospitals. Two hospitals similarly ($p=0.376$) used ketoprofen (27.3%, 123.1mg/pt/day).
Each patient received 2.8±1.0 analgesic-drugs (range 1.8-3.6; $p < 0.001$ between centres); the number of drugs did not influence pain outcomes. Mean score for worst pain (WP) was 6.0±2.9 (range 4.9-8.8; $p < 0.001$ between hospitals). Patients with WP≥4 (74.6%) received 18.0±21.1mg/pt/day morphine, while those with WP < 4 received 13.64±15.20mg/pt/day ($p=0.190$).
Conclusions: Significant differences between hospitals were observed regarding % of patients receiving a certain type of analgesic-drugs and the doses administered. Morphine administration does not correlate with WP.
Other factors (type of anaesthesia, nerve blocks, non-pharmacological treatments) must also be taken into account when assessing postoperative pain outcomes.
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14AP1-5

Painful knee prosthesis: relationship between endogenous analgesia and persistent post-surgical pain: preliminary data

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Background and Goal of Study: Incidence of persistent post-surgical pain (PPP) after total knee arthroplasty (painful prosthesis) is vaguely estimated[1]. Preoperative endogenous analgesia (EA) efficiency has been proposed as a valid tool to predict PPP after surgery[2].
Our hypothesis suggests that patients with a preoperative incompetent EA are more prone to develop PPP. We are conducting a study aimed to establish the relationship between the preoperative efficiency of EA and persistent post surgical pain (PPP) after total knee arthroplasty (TKA). We show the descriptive preliminary data.
Materials and Methods: Prospective observational study in patients older than 18, scheduled for TKA. EA efficiency was measured during the month previous to surgery using quantitative sensory testing (QST)[3]. Variables: primary variable: 1. Presence of pain in a 0-10 numerical scale in the operated knee, 3 months after surgery. Secondary variables: 2. Preoperative EA efficiency measured with QST. 3. Presence of generalised hyperalgesia. 4. Preoperative pain measured by a 0-10 numerical scale.
Results and Discussion: Mean age of patients was 72 years old (95% CL 69-75), 70.4% of them female. The incidence of PPP at 3 months was 30%. 37% of patients showed a preoperative inefficient EA, and 25.9% generalised hyperalgesia. Percentage of patients with a preoperative pain intensity superior to 3 was 51.9% (rest) and 85.2% (movement). Anxiety and depression was

present in a 23.1% and 25.9% of patients, respectively. Most of patients were treated with paracetamol/NSAID (55.6%) and only 14.8% with weak opioids. Interestingly, 29.6% of patients didn't follow any preoperative analgesic treatment.

Conclusion(s): Our preliminary data show a PPP incidence after orthopaedic surgery (TKA) similar to that of other better-studied surgeries. An inefficient preoperative EA was present in 37% of patients, probably at risk to develop PPP. The relevance of preoperative EA as a predictor of PPP after TKA will be established at the end of the study.

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14AP1-6

Role of catastrophising in the intensity of postoperative pain after TKA

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Background and goals: Despite multimodal analgesia, total knee arthroplasty (TKA) is associated with severe postoperative pain. Movement evoked pain (MEP) is rarely assessed although early mobilization is critical for fast-track rehabilitation. Psychological factors influence postoperative pain and recovery. This study assessed the role of pain catastrophizing on pain at rest and at mobilisation after TKA.

Methods: After IRB approval, patients scheduled for TKA completed catastrophization questionnaire (Sullivan's Pain Catastrophizing Scale, PCS) before surgery. TKA was performed under general or spinal anaesthesia followed by postoperative multimodal analgesia consisting of local infiltration of the knee (LIA) by the surgeon, Celecoxib, paracetamol and oral opioids. Pain intensity at rest and mobilisation (VAS score 0-10) was recorded from day 1 to day 8. Statistical analysis used unpaired t-test and Pearson's or Spearman Rank Order correlations ($P < 0.05$ significant).

Results: 87 patients were included (31 men, 56 women; age 66±10 y; median PCS score 11.5). For data analysis, patients were separated in 2 groups: high (PCS $\geq$11) and low (PCS < 11) catastrophizers. Patients with high PCS (n=42) presented with statistically higher pain at mobilization from day 3 to day 8, than patients with low PCS (n=45).

At day1, MEP was 166% (IQR 108-200%) higher than pain at rest in high PCS patients compared to 145% (IQR 117-300%) in low catastrophizers (P=0.830). At day 3 MEP was 275% (IQR 200-350%) higher than pain at rest in high catastrophizers compared to 146% (IQR 127-225%) in low catastrophizers (P=0.009) and at day 7 MEP was 167% (IQR 133-200%) higher than pain at rest in high catastrophizers vs 71% (IQR 55-100%) in low catastrophizers (P=0.001). Preoperative PCS value was correlated to the intensity of MEP intensity at day 3 (r=0.311;P=0.04) and day 4 (r=0.373;P=0.02).

Amongst PCS' dimensions, helplessness was significantly correlated with early MEP.

Discussion: The present results are in agreement with PCS scores in a general surgical population and with severity of MEP after TKA (1). Preoperative catastrophizing is a reliable predictor of severe postoperative pain, specifically at mobilization as already observed. Psychological interventions aimed to modulate negative mental imaging of pain may help to control severe postoperative pain.

14AP1-7

Intravenous postoperative analgesia after major urologic surgery: comparison of nalbuphine, morphine and tramadol in combination with ketamine

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Background and Goal of Study: The aim of this study was to compare the efficacy of postoperative analgesia and the incidence of adverse effects after intravenous administration of nalbuphine, morphine and tramadol in combination with ketamine in patients undergoing major urologic surgery.

Materials and Methods: 277 patients, ASA I-III, undergoing major urologic surgery under general anesthesia were included in this study. Study patients were randomly assigned, concerning postoperative analgesia regimens, in three groups:

Group A (n=94) received nalbuphine (bolus dose 0.05 mg/kg and continuous infusion (CIV) at a rate 0.15 mg/kg/h), Group B (n=78) received tramadol (bolus 1.5mg/Kg and CIV at a rate 0.15 mg/Kg/h) and Group C (n=105) received morphine (bolus 0.05mg/Kg and CIV at a dose [mg/24h=18-(age x 0.15)].

In all groups opioids were administered in combination with ketamine (bolus 0.5mg/Kg and CIV at a rate 0.15 mg/Kg/h). Postoperative analgesic technique started 30min before end of anesthesia.Infusion pumps were designed to provide 24h postoperative pain relief Anesthesia was standardized in all patients. In all studied groups, efficacy of postoperative analgesia and the incidence of side-effects were evaluated at 6h and 24h postoperatively. Pain intensity was assessed by visual analogue scores (VAS 0-10). If VAS scores were >3, additional analgesics were provided. Statistical analysis was performed with ANOVA and chi-square test.

Results and Discussion: A satisfactory level of analgesia (VAS< 4) was recorded in all studied groups but group B showed significant higher VAS scores compared to groups A and C at all times recorded. Additional analgesics were provided in all patients, but patients in group B received significant higher doses compared to groups A and C at 6h postoperatively. No significant differences were noted between studied groups concerning the incidence of pruritus and sedation at 6h and 24h. Group A and C presented significant higher incidence of nausea, vomiting (PONV) compared to Group B at all times recorded.

Conclusion(s): Intravenous administration of nalbuphine, morphine and tramadol in combination with ketamine after major urologic surgery were effective concerning postoperative analgesia. Tramadol plus Ketamine group was associated with greater incidence of pain, additional analgetics and lower incidence of PONV. Nalbuphine, Morphine plus Ketamine groups presented significant higher incidence of PONV.

14AP1-8

Comparison of two methods of postoperative analgesia for laparoscopic surgery of ovarian cysts: ultrasound-guided TAP block versus infiltration of trocar ports

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Background and goal of study: The purpose of this study was to compare the analgesic effect of TAP bloc to the infiltration of tracar ports in patients undergoing laparoscopic ovarian cyst surgery .

Materials and Methods: In this randomized, double-blind study, 40 patients undergoing laparoscopic ovarian cyst surgery were allocated in tow groups: group A(n=20) received at the end of surgery bilateral ultrasound-guided TAP blocks (20 mL 0.25% bupivacaine) with saline infiltration of trocar ports; group B(n=20) received local infiltration of the trocar ports (5ml 0.25% bupivacaine in each port) with bilateral ultrasound-guided TAP blocks with saline. Postoperative pain treatment consisted of iv paracetamol 1g, IV morphine (0-4 hours) and iv nefopam (4-24 hours) postoperatively. The outcomes were post operative pain scores at rest and in movement, first opioid request, opioid consumption, and side effects. Patients were assessed 0, 20, 40, 60, 80, 100, 120 minutes, 4, 6, 12 and 24 hours postoperatively. Group-wise comparisons of visual analog scale (VAS) pain, Morphine and Nefopam consumption were compared with the Student-test. Categorical data were analyzed using the $\chi 2$ test (the difference was considered as significant if $p< 0.05$).

Results and Discussion: The demographic characteristics, surgery duration and remifentanil consumption were similar in both groups.The mean visual analog scale pain scores (VAS) at rest and on movement were similar in the first 80 min in post operative and significantly reduced in group A between 80min and 24h: VAS at rest average (22,4 +/- 3,7 mm)in group A versus in group B (28,6+/- 5,3mm)(p= 0,019) ; VAS on movement average in group A (29.4+/-3.4mm)vs (38.5+/-6.4mm) in group B (p=0.005). Table 1 shows, first analgesic request, morphine and nefopam consumption.

	Group A	Group B	p
First analgesic request (min)	30(0-100)	30(5-120)	0.23
Morphine doses received in the first 4 hours (mg)	3.9(2-10)	7.85(2-14)	<0.05
Nefopam doses received in the first 24 hours (mg)	18(0-40)	49(20-80)	<0.05

[Table 1]

The incidence of nausea and vomiting was significantly higher in group B than in group A (40% versus 15% respectively; p=0.048). More patients developed pruritus in group B than in group A (30% versus 5% respectively; p=0,01). There were no complications associated to the TAP block.
Conclusion: The TAP block provides more analgesic efficacity than infiltration of trocar ports up to 24 hours in postoperative of ovarian cyst laparoscopy, with fewer side effects.

14AP1-9

Chronic post-surgical pain and its impact in quality of life and recovery

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Background and Goal of Study: Chronic post-surgical pain (CPSP) develops after surgery and persists for at least 2 months, excluding other causes[1]. The aim of this study was to evaluate the incidence of CPSP and its impact in quality of life (QoL) and quality of recovery (QoR).
Materials and Methods: After study approval by the institutional ethics committee, a prospective study was conducted in patients scheduled for elective surgery admitted in the Post Anesthesia Care Unit (from June to July 2012). CPSP was assessed with the Brief Pain Inventory (BPI), QoL was evaluated with the SF-36 Health Survey (SF-36) and QoR with the 40-item Quality of Recovery score (QoR-40). These evaluations were performed preoperatively (T0) and 3 months after surgery (T3) in 66 patients. Inclusion criteria: patients undergoing orthopedic, urologic, gynecologic and general surgery. Exclusion criteria: unable to give informed consent and cognitive impairment. The primary end point was CPSP. Descriptive analyses of variables were used to summarize data and non-parametric tests were performed for comparisons.
Results and Discussion: Eleven patients had CPSP 90 days after surgery (17%). Comparison in each SF-36 domain score between T0 and T3 indicated that the median (M) results for non CPSP patients improve in some SF-36 domains: bodily pain (M: 84 vs. 62, p< 0.001), vitality (M: 48 vs. 38, p=0.014), emotional role (M: 100 vs. 75, p< 0.001) and mental health (M: 66 vs. 52, p=0.002). While in CPSP patients were similar for all domains except for social functioning for which values are better at T3 (M: 63 vs. 75, p=0.024). Regarding QoR obtained at T0 and T3, non-CPSP patients presented an improvement in total score (M: 180 vs 187, p=0.002), while patients with CPSP didn't improve (M: 189 vs. 186, p=0.066). When evaluating each domain of QoR, non-CPSP patients improve emotional status (M: 36 vs 40, p=0.013) and physical comfort (M: 53 vs. 58, p< 0.001), while in patients with CPSP all domains didn't improve.
Conclusions: CPSP is an important outcome after surgery because its incidence in our patients was considerable and these patients didn't improve their QoL and QoR 3 months after surgery compared to those without CPSP.
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14AP1-11

One half of the patients suffered from moderate - postoperative chronic pain following craniotomy

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Background and Goal of Study: The aim of this study was to determine the aetiology and quantity of postoperative chronic pain following craniotomy.
Materials and Methods: After IRB approval and obtaining informed consent 104 patients (45 male, 54 female; aged between 18- 70, ASA I-III) that had craniotomy were included in this prospective study. Before craniotomy, scalp around incisional area was infiltrated with 20 ml local anesthetic (1% lidocaine with 35 mcg. mL-1 adrenaline). All patients' age, weight, height, gender and the cause (vascular or tumor) and the duration of the surgery coexisting diseases, preoperative headache, and additional daily medicaments were also recorded. All patients' heart rate, systolic and diastolic blood pressure, pain scores Ramsay sedation status scale was assessed and reported before surgery and at 0., 30th. and 60th. minutes, on 24 and 48 hours after surgical procedure. Postoperative chronic pain was assessed also six months after surgical procedure.
Patients who were unconscious before or after surgery, with limited cooperation and impaired cognitive functions were excluded from the study.
The pain scores were evaluated by Kruskal-Wallis test, connection between coexisitng diseases, vital signs and pain scores with Friedmann test, evaluation between score for time zones with Wilcoxon test demographic data and operative data with Chi-square test and differences parameters among data with Mann-Whitney U test. Significance level was set at $p < 0,05$.
Results and Discussion: Mean age of the patients was 46,69± 13,44 years (mean±SD), BMI was: 26, 94±5,25 kg.m^2, duration of surgery was 183,12± 57,68 min. We found that 51% of male patients and 50,8 % of female patients had postoperative persisting chronic pain at sixth month measurements.
Several surgical and patient risk factors predispose patients to postoperative chronic pain following neurosurgery. We couldn't find any correlation or statistically significant, relationship according to VAS and VRS surgical pathology (vascular or tumor) , ASA status of the patients, BMI, coexisting disease and duration of surgery.
Conclusion(s): Acute and chronic pain following craniotomy is frequent and underrecognized. We think that more attention should be focused on headache and persistent postoperative pain which can impair work and social life of the patients.

14AP2-1

Can early administration of pregabalin reduce the incidence of postherpetic neuralgia?

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Background and Goal of Study: In postheperpetic neuralgia (PHN), nerve injury begins before the appearance of the vesicular rash, and pregabalin suppresses neural irritation and microglial activation. We investigated whether early administration of pregabalin could decrease the incidence of PHN.
Materials and Methods: We performed a retrospective analysis in patients with herpes zoster (HZ) who consulted our dermatologists (n = 82). We divided patients treated with pregabalin into two groups based on how soon after HZ onset the drug was initially administrated: within seven days (group A, n = 26) or after seven days (group B, n = 31). Variables studied were the incidence of PHN, risk factors for PHN (age, prodromal pain, severe rash, hypoesthesia, and immunosuppressive state), dose and side effects of pregabalin, and other drugs used. The unpaired t-test and Mann-Whitney U test were used for statistical analysis, and P values less than 0.05 were considered to be significant.
Results and Discussion: Pregabalin was given to 57 (64.0%) patients. The incidence of PHN was 23.1% in group A and 64.5% in group B (P = 0.005). The percentage of patients in groups A and B who did not develop PHN despite prodromal pain was 75.0% and 25.0% (P = 0.016), respectively. The average intervals from HZ onset to treatment with pregabalin for the two groups were 4.6 ± 1.9 days and 27.5 ± 20.6 days (P = 0.001), respectively. There were no significant differences between groups in terms of average age (71.0 vs. 68.2 years, P = 0.689), initial dose (92.3 vs. 107.3 mg, P = 0.254), and maximal dose (176.0 vs. 171.8 mg, P = 0.775).
During varicella zoster viruses (VZV) reactivation, the virus replicates centrally then spread down sensory nerve to infect the skin. The enhancement of brain-derived neurotrophic factor activity caused by cross-reaction with VZV augments the responsiveness of the neural network in the pain pathway. Early treatment with pregabalin in patients with prodromal pain may diminish allodynia and the risk of PHN.
Conclusion(s): We conclude that early administration of pregabalin for HZ can be expected to reduce the incidence of PHN.
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14AP2-2

Outcome and extent of epidural adhesiolysis attainable with epiduroscopy in failed back surgery syndrome relates to the type of previous lumbar surgery

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Background and Goal of Study: Previously we proved that the extent of epidural adhesiolysis correlated with outcome after epiduroscopy in failed back surgery syndrome (FBSS). Yet, the rigidity of epidural fibrosis did not correlate with the time interval between back surgery and epiduroscopy. In this study we investigated if the extent of epidural adhesiolysis attainable with epiduroscopy related to the type of back surgery.
Materials and Methods: The ethics committee of the Ziekenhuis Oost-Limburg approved the study. Patients with FBSS with predominant leg pain

and epidural fibrosis on MRI were included. 3 types of back surgery were identified: discectomy, discectomy with anterior or posterior lumbar interbody fusion (ALIF, PLIF) and laminectomy. All patients underwent epiduroscopy under light sedation. In short, a video-guided catheter was introduced through the sacral hiatus into the epidural space. Next, mechanical adhesiolysis of fibrosis around the culprit nerve root was performed. Full or no adhesiolysis were defined as perineural and epidural or no enhanced contrast spread respectively on the post-procedure epidurogram. VAS-score before and 6 months after epiduroscopy and global perceived effect (GPE) were noted. A Wilcoxon matched-pairs signed rank test was used for statistical analysis. Data are presented as mean±SEM or incidences.
Results and Discussion: Over a 2-year period 34 patients were included. 21 patients had a discectomy, 9 patients had a discectomy with ALIF or PLIF and 4 patients had a laminectomy. Full *vs.* no adhesiolysis was attained in 31.8% *vs.* 33.3%, 11% *vs.* 55.6% and 25% *vs.* 25% in the discectomy, discectomy with ALIF or PLIF and laminectomy group respectively. 6 months after epiduroscopy the VAS-scores in the discectomy group were significantly lower (7.2±0.4 *vs.* 6.2±0.9, $p=0.005$) as opposed to the discectomy with ALIF or PLIF group or laminectomy group (7.2±0.2 *vs.* 6.3±0.6, $p=0.25$ and 7.5±0.3 *vs.* 6.8±1.0, $p=0.29$). A GPE of > 50% improvement was noted in 28.6%, 11.1% and 25% of the discectomy, discectomy with ALIF or PLIF and laminectomy group respectively.
Conclusions: Epiduroscopy with full adhesiolysis of epidural fibrosis resulting and better clinical outcome is more readily achievable after discectomy and laminectomy procedures as opposed to ALIF- or PLIF-surgery.

14AP2-3

Effect of tramadol/acetaminophen combination tablets for patients with postherpetic itch

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Background and Goal of Study: Pruritus originating after herpes zoster is called postherpetic itch (PHI) ,which is found in 20-30 percent of all herpes zoster patients and intractable. However, there is little data available on the effect of tramadol/acetaminophen combination tablet for PHI. This study aimed to determine the safety and efficacy of tramadol 37.5 mg/acetaminophen 325 mg combination tablets (TAC) in patients with PHI.
Materials and Methods: We retrospectively performed a chart review of 25 outpatients (mean age, 61.3 years; range, 28 to 84years) with postherpetic itch They were treated by different 3 physicians, who regulated TAC dosage at every visit for better anti-pruritic effects (less than a visual analog scale 30mm) and relief of adverse effects by TAC. A visual analog scale (VAS) from 0 to 100mm was utilized to subjectively measure the severity of itch at the time of visit. Recently a new method for quantitative measurement of pain intensity using a painless electrical stimulation, PainVision®(PV: Nipro Co., Osaka, Japan) has been developed.
Furthermore, we demonstrated PV was helpful for the quantitative measurement of itch sensation. Two different types of current perception threshold (CPT) were measured by PV at every visit. One CPT was the minimum perception threshold (MPT) defined by the lowest electrical current detected; the other CPT was itch equivalent threshold (IET) at which the subject starts to perceive the equivalent strength as ongoing itch. ID is calculated from two parameters as follows. ID was calculated as (IET-MPT)/MPT. Statistical analysis was carried out by paired t-test and p values less than 0.05 were considered as statistically significance.
Results and Discussion: TAC therapy decreased the average VAS scores from 47.6±15.8 mm to 18.9±15.3mm ($p< 0.0001$) and the average ID from 129.4±78.1 to 39.8± 25.7 ($p= 0.0011$). No patients experienced a serious adverse event. The antipruritic effects of TAC may occur by inhibition of the pre-synaptic uptake of the neurotransmitters norepinephrine and serotonin.
Conclusion(s): Our data demonstrated that TAC therapy has antipruritic activity in patients with PHI. PV may be useful for quantitative assessment of therapeutic efficacy of antipruritic agents.

14AP2-4

The efficacy of levobupivacaine for epidural block in elderly outpatients with degenerative spinal disease

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Background: Although epidural levobupibacaine has been widely used for postoperative analgesia, there are few reports on the efficacy and safety of epidural levobupivacaine in elderly outpatients. This study carried out to evaluate the efficacy of levobupivacaine for lumbar epidural block in elderly outpatients with degenerative spinal disease.
Methods: With approval of the institutional Ethics Committee and written informed consent from each patient, we studied 21 patients having the indication of epidural block for radiculopathy (L5 or S1) associated with degenerative spinal disease.
The patients were allocated to one of two groups according to age. Group A (middle age, n=11) included patients aged less than 65 years (51±10 years, mean±SD) and group B (elderly, n=10) more than 75 years (81±4 years). Epidural block was performed by caudal approach with 15ml of 0.125% levobupivacaine.
The upper levels of analgesia, motor blockade and residual pain were evaluated by pin prick, Bromage scale and visual analogue scale (VAS), respectively, at 15, 30, 60 and 90 minutes after epidural block. Systolic arterial blood pressure (SAP) and heart rate (HR) were recorded simultaneously. The times to recover mobilization, ambulation and spontaneous micturition were also measured. Significant difference (<0.05%) was determined by Wilcoxon's rank sum test, Mann-Whitney U-test and chi-square test.
Results: The height and weight in group B were significantly lower than those in group A. The upper level of analgesia in group B (range L3-L5, median L5) was significantly lower than that in group A (range L1-L2, median L1) at 30 min after epidural block.
There were no significant differences in VAS, Bromage scale, SAP or HR between the two groups throughout the time course.There were no significant differences in the times to recover mobilization, ambulation and spontaneous micturition between the two groups.
Conclusion: Lumbar epidural block by caudal approach with 0.125% levobupibacaine provides similar pain relief, motor blockade and sympathetic nerve blockade in the elderly compared to the middle aged, in spite of the lower level of analgesia in the elderly. The procedure is useful and safe in elderly outpatients with degenerative spinal disease.

14AP2-5

Is there any relation between anatomy of lumbar disc herniation and effectiveness of epidural steroids?

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Background and Goal of Study: Epidural corticosteroid injections are one of the most commonly used interventions to manage radicular pain from disc herniation[1]. There is no evidence to determine if exist any anatomic variation that responds better. The aim of our study was to evaluate whether the anatomy presentation of disc herniation is related to the effectiveness of epidural steroids.
Materials and Methods: Prospective, observational study in patients diagnosed of lumbar radicular pain due to lumbar disc herniation. All patients received epidural steroids (triamcinolone) and local anaesthetic (ropivacaine 0.15%). The route of administration was interlaminar, caudal or transforaminal. We considered the technique successful when pain estimated by VAS (visual analogue scale) decreased fifty per cent from the initial value. Observing the RM/TC imaging we defined two groups: disc herniation (localized displacement of disc material beyond the limits of the intervertebral disc space) and disc bulge (symmetrical presence of disc tissue "circumferentially" 50-100% beyond the edges of the ring apophysis)[2]. We used a two-way ANOVA to analyze the data.
Results and Discussion: 188 patients: 43% females and 57% males. Mean age was 55. Pre-VAS was 6.98 +/- 1.8 and post-VAS was 3.94 +/- 2.5 p< 0,001. VAS decreased in more than 50% using our technique but although the VAS was higher in women than in men the decreases were similar. The route of steroid administration was interlaminar (153), caudal (18) and transforaminal (17). PreVAS was 7.05 +/- 1.7, 6.83 +/- 2,1, 6.47 +/-1,73 and postVAS 4.17 +/- 2.6, 3.22 +/-2.2, 2.65 +/-1.9, respectively. We observed that the transforaminal technique provided best pain relief at first treatment p>0.046. Comparison of disc herniation (108) versus disc bulge (80) groups showed preVAS in disc herniation was 6.8+/- 1.8 and postVAS was 3.87 +/-2.6 versus preVAS (bulge herniation) 7.21 +/- 1.7 and post-VAS 4.04 +/- 2.52. Although VAS was higher

in the disc bulge group after treatment there were no differences between the two groups P>0.05 .
Conclusion: First descriptive study to show the relevance of the anatomical description in RM/TC imaging to evaluate the effectiveness of epidural steroids.
Further studies in larger series are needed to confirm these findings.
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14AP2-6

Oxygen/ozone therapy for cervicobrachialgy: clinical outcome in the short term

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Background and Goal of Study: intramuscular paravertebral injection of a mixture of Oxygen/Ozone (O2-O3) is commonly used in the treatment of pain due to lumbar herniated disc. This study aims to evaluate the effectiveness of intramuscular paravertebral injection of O2-O3 in pain relief (first endpoint) and improvement of quality of life (QoL) (second endpoint) in patients with chronic pain due to cervical bulging or herniated discs (cervicobrachialgy).
Materials and Methods: Patients with cervical herniated discs lasting from >6 months and unsuccessfully undergoing conservative therapy were enrolled. Patients were submitted to sessions of O2-O3 biweekly for the first 8 sessions and weekly for the last 4 sessions. Pain relief was assessed by Numeric Rating Scale (NRS). QoL was assessed by SF-36 and disability related to the cervical-brachial district by Neck Disability Index (NDI). Tests were administered before (T0), on 30th day (T1), at the end (T2) and six months after the end (T3) of treatment. Cluster Analysis was used to evaluate the presence of meaningful groups of similarity (clusters) and analysis of variance (ANOVA) for repeated measures was used to examine whether clusters were different as regards SF-36, NRS and NDI throughout the study steps.
Results and Discussion: 29 consecutive patients (age 56.6±6.8) were enrolled. On T0 NRS was 5.86±2.9 and it decreased to 0.48±0.9 on T3 ($p< 0.001$). Cluster analysis applied on T0 to SF-36 highlighted the presence of two clusters based on different Role limitation due to Physical problems (RP) and to Emotional status (RE): 17 patients had a RP score 0 and RE score 0 (cluster 1), 12 patients had a RP was 60.4±32.8 and RE was 80.2±22.5 (cluster 2). RP and RE improved at T3 in cluster 1 (RP 94.1±24.2 and RE 91.6±28.8, $p< 0.001$ vs T0), while remained stable in cluster 2. The two clusters showed different baseline NDI values: 20±9.6 (cluster 1) and 9.25±4.9 (cluster 2, $p< 0.001$) while no difference between the clusters was found for NRS baseline values. At T3 NDI was reduced in both clusters ($p< 0.01$ vs T0) without difference between clusters.
Conclusion(s): The main result of this study is that QoL is affected by disabiliy (NDI) more than by the pain itself (NRS). Intramuscular paravertebral O2-O3 injection is effective in reducing pain and improving QoL in patients with cervical bulging or herniated discs. This improvement is effective independently from baseline functioning Status.

14AP2-7

Pulsed radiofrequency treatment of the Gasserian ganglion in trigeminal neuralgia: a 10 year retrospective analysis

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Background and Goal of Study: In older patients suffering from trigeminal neuralgia (TN) percutaneous pulsed radiofrequency (PRF) of the Gasserian ganglion has been suggested as an alternative treatment option to conventional radiofrequency (RF). Currently, RF is considered first line treatment but PRF poses a smaller risk of major neurological complications. However, the efficacy of PRF may be lower compared to RF. In this study the long term value of PRF in older TN patients with high operative risk is evaluated.
Materials and Methods: A retrospective analysis (chart review and telephone interview) was performed of TN patients, refractory to pharmacological management, and treated with PRF of the Gasserian ganglion in our centre over the last 10 years. PRF was applied for 4 minutes with a frequency of 2 Hz and a pulse width of 20 ms at 45 Volt, not exceeding a temperature of 42° C at the tip of the electrode. An independent evaluator scored: global perceived effect (GPE,%), time to recurrence and complications. A GPE of < 50%, >50% or >75% was considered poor, good or excellent pain relief respectively. Data are presented as mean ± standard error of mean.
Results and Discussion: 72 patients (men:women ratio 1:1.3, age 64 ± 2.3 years) were included with a follow-up period of 29 ± 4.3 months. 54 patients (75%) had idiopathic TN and 18 patients (25%) secondary TN due to multiple sclerosis. 7 patients (10%) were previously treated with a Janetta microvascular decompression. 34 patients (47%) reported a good (13%) to excellent (87%) pain relief lasting more than 5 months after PRF treatment of the Gasserian ganglion.
In this group duration of pain relief averaged 20.1 ± 3.8 months with a mean of 1.6 procedures per patient while 17 patients (50%) still had an on-going effect on the time of evaluation. 38 patients (53%) had poor pain relief or good but short-lived pain relief (< 5 months) after PRF and received other treatment modalities. History of multiple sclerosis or surgery did not influence the responder rate. No neurological or other complications were reported.
Conclusion: PRF of the Gasserian ganglion can be an alternative to other percutaneous techniques in the management of TN for older and/or high operative risk patients as approximately half of them benefited well from this save and minimal invasive method on a long-term basis.

14AP2-8

Depression and anxiety: independent risk factors for chronic pain?

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Background and Goal of Study:We defined chronic pain as the pain that persists beyond the time necessary to heal the lesion.There are many articles on the relation of anxiety and depression with chronic pain. Depression is very common in chronic pain disorders with prevalence between 1,5% and 87% of patients. The objective of this study was to evaluate the relationship of anxiety and depression with chronic pain.
Materials and Methods:Retrospective study.131 patients, followed in the Chronic Pain Unit, during 2012 were enrolled All patients were classified according to the Hospital Anxiety and Depression Scale. We considered depression or anxiety when the score was≥10. We analyzed the demographic features and the pain score according to the visual analogic scale (VAS). T-test, Mann-Whitney test and Chi-square were used, with a significance level of 95% ($p < 0,05$).
Results and Discussion:Patients had a mean age of 60,7±15 years and 58 % were female. 8,4% of the patients had a previous history of psychiatric disorder. Regarding the pain etiology: 50,4% osteoarticular, 41,2% oncological and 8,4% neuropathic pain. Median VAS was 5,8±2,4. 48,9% of the patients had anxiety and 36,7% had depression on the HAD scale. The prevalence of depression (36,7%) in our sample was similar to the one found in other studies. We verified that higher score of pain were associated with anxiety ($p = 0,03$). No difference was found regarding the depression and higher score of pain ($p = 0,88$). The pain etiology wasn't related with depression ($p = 0,23$) or anxiety ($p = 0,39$). The association between anxiety and chronic pain that we verified is according to the literature, obviously chronic pain patients are anxious because their condition interferes with their daily activity, sleep, relation with others, etc.
On the other hand, unlike other studies, we didn't find any relationship between depression and the score of pain. Many studies have found a relationship between depression and pain, but they have failed in establish a causal relationship between the two disorders.
Conclusion(s):We concluded that depression disorders are not associated with higher scores of chronic pain, but anxiety is associated with pain. This study also raises the question if it is necessary to treat anxiety at the same time as the chronic pain, or if treating only the chronic pain the problem of anxiety will be solved.

14AP2-9

Effect of chronic knee pain on cognitive function: clinical study

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Background and Goal of Study: Chronic knee pain is a clinical problem that puts person to inconvenience in several different ways in social, familial and business environments. Disorders causing knee pains can occur in various ways and due to various diseases. In clinic, while etiology and causes of chronic knee pain are generally known, its effects on cognitive functions are

not fully understood, so that in this study, we aimed to measure and evaluate the relationship between cognitive function and 'chronic knee pain', a kind of chronic pain, with international standards.
Materials and Methods: 98 patients with ages of 18-70 having knee pain for at least 6 months were included into the study. It was determined that A1 was the group with chronic knee pain whose cognitive functions were evaluated before treatment and A2 was the group whose cognitive functions were evaluated after taking treatment for chronic knee pain. Both group A1 and A2 had same number of patient and same individuals. Montreal Cognitive Assessment-MOCA, an international test for measurement and evaluation of cognitive functions, was applied to the patients before and after treatment. The patients with MOCA score 26 and over were accepted as normal in terms of cognitive functions.
Results and Discussion: MOCA score of group A2 was significantly higher than of group A1 and VAS values in group A2 significantly decreased according to A1. While the patient in group A2 showed statistically significant increase in abilities of visual functions, language, abstract thinking, delayed recall which is the units of cognitive function according to A1, orientation score decreased.
Conclusion(s): The chronic pains resulting from the knee arthritis might lead to cognitive function disorders in long term. This can be prevented with the present arthritis and the effective treatment of pain and the life quality of the person can be increased. Moreover, the use of more costly diagnosis and treatment ways by the clinician and the patient can be prevented.
References:
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14AP2-10

Chronic cluster headache treated with occipital and supraciliary nerve stimulation-a new approach

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Background: Chronic cluster headache (CCH) is a disabling neurological disorder, characterized by sudden onset of excruciating unilateral periorbital pain accompanied by ipsilateral autonomic features such as lacrimation, rhinorrhea and flushing. Attacks last up to three hours and in its chronic form, appears on daily base and often refractory to medical therapy.
Case report: A 65 caucasian women with CCD for the last 30 years complaining of multiple daily episodes with huge limitation of her daily life activities. Localized in left peri-orbital and temporal regions,was described as being like an electric shock and burning, foreign body sensation,with aura consisting of luminous dots and lacrimation, with allodynia in the left peri-orbital and supraciliary region. She was referred to our pain unit and a structured educational and drug therapy plan was implemented, associated with locoregional blocks, which proved to be ineffective. Peripheral neurostimulation of the occipital nerve proved to be effective, with shorter scores of pain intensity and number of crises that lasted for a period of two years.
As the complaints reappeared, the occipital lead was repositioned and a supraciliar lead was implanted, achieving a good paresthetic area.The sixth month control currently reveals a patient without clinical complaints. She manages without limitations her daily life activities and has high degree of satisfaction.
Discussion: CCH is one of the most painful headaches.15% of CCH sufferers are chronic. The surgery required for implantation of occipital nerve stimulation is minimally invasive and has a low risk of neurological morbidity. The system include subcutaneous leads that are inserted transversely at approximately the C1 level, in the area of the occipital nerve innervation and tunneled extensions from the leads to an impulse generator in the chest wall, low back or abdomen. Lead migration is the most common complication. Recently there has been considerable progress in neurostimulation techniques, especially occipital nerve stimulation reported to be effective in CCH, suggesting a new therapeutic opportunity in patients with intractable CCH.
References:
Strand NH, Trentman TL; Occipital nerve stimulation with the microstimulator for treatment of medically refractory chronic cluster headache. Pain Physician 2011;14:435-440
Learning points: These are promising, experimental therapies and further consistent data are needed.

14AP2-11

Effect of pulsed radiofrequency treatment for postherpetic itch

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Background and Goal of Study: Postherpetic neuralgia (PHN) is one of the most intractable pain disorders, particularly among elderly patients.Pruritus originating after herpes zoster is called postherpetic itch (PHI), which is found in 20-30 percent of all herpes zoster patients and intractable. PHI is often seen in the first division of the trigeminal nerve (V1) dermatome, compared to other areas. Pulsed radiofrequency (PRF) procedure has been used in clinical practice for the treatment of chronic neuropathic pain conditions without neuronal damage. However, there is little data available on the effect of PRF for PHI. This study aimed to determine the safety and efficacy of pulsed radiofrequency in patients with PHI in theV1distribution.
Materials and Methods: We retrospectively performed a chart review of 11 outpatients with PHI refractory to conservative therapy. After impedance and sensory electrical nerve stimulation thresholds were assessed, PRF (NeuroTherm, NT500, Toyo Medic was performed through supraorbital approach at 42 degrees for 6min under the ultrasound-guidance (LOGIQe, GE). A visual analog scale (VAS) from 0 to 100mm was utilized to subjectively measure the severity of itch at 4-16 week follow-up. The data were analyzed using the one-way ANOVA test. $P<0.05$ was considered to be statistically.
Results and Discussion: The mean VAS pre and VAS4wks were 5.7 ± 1.2 and 3.0 ± 2.1, respectively ($p=0.0036$). (means$\pm$SD). No patients experienced a serious adverse event. Although the precise mechanism of the action of PRF remains unclear, there is some evidence for a neuromodulatory effect, including the enhancement of the bulbospinal descending inhibitory pathways (noradrenergic and serotonergic). Ultrasound scanning enhances both accuracy and safety profile of PRF.
Conclusion(s): To our knowledge, this is the first study showing antipruritic effects of PRF treatment for itch. Our data demonstrated that PRF treatment may have antipruritic activity in patients with PHI.

14AP3-1

Epigenetic regulation of BDNF genes in rat orofacial neuropathic pain model

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Background and Goal of Study: Epigenetic changes resulting from DNA methylation and chromatin remodeling can modify the activation of certain genes. Since these effects may be prolonged, they might contribute to the mechanisms of chronic pain.
Brain-derived neurotrophic factor (BDNF) can potentiate pain transduction from primary sensory neurons to the spinal dorsal horn in response to nerve injury, and is known to be regulated by epigenetic modulation. However, it is not clear whether there is a correlation between epigenetic modulations of BDNF and neuropathic pain.
We examined whether epigenetic mechanisms might regulate the expression of exon III of the BDNF gene in the trigeminal ganglion in an infra-orbital nerve (ION) injury model of orofacial neuropathic pain.
Material and methods: We used the rat ION loose ligation model, sham and naive animals. Samples were taken from the animals' trigeminal ganglia 14 days after surgery, by which time the injured animals were exhibiting pain behavior. Methylation analysis of CpG islands around exon III was performed using the Solid4 system (Life Technologies, CA). Histone modification was examined by chromatin immunoprecipitation using an antibody panel against k4 and k9 dimethylation and k29 acetylation of H3, followed by real time PCR with the cyber green assay. Clustering analyses were performed using Ward's method. Groups were compared by one-way ANOVA and statistical differences were resolved post-hoc using the Tukey-Kramer multiple-comparison test.
Results and Discussion: Fourteen days after injury, the pain thresholds of injured rats were statistically significantly lower than sham and naïve rats. Analyses of the dendrogram from the methylation profiles of exon III showed distinct differences between nerve injured and naive rats, and sham and naive rats at the first branch (Fig) . Histone dimethylation of k4 and k9 were increased and k29 acetylation was decreased in injured rats compared with sham and naïve rats.

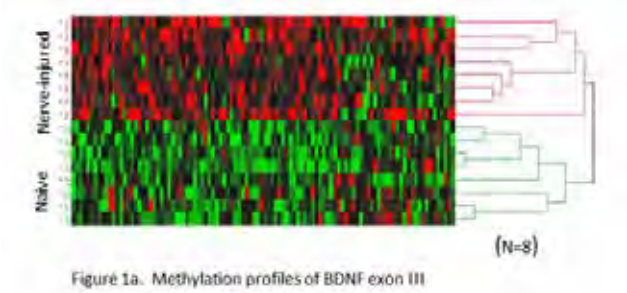

Figure 1a. Methylation profiles of BDNF exon III

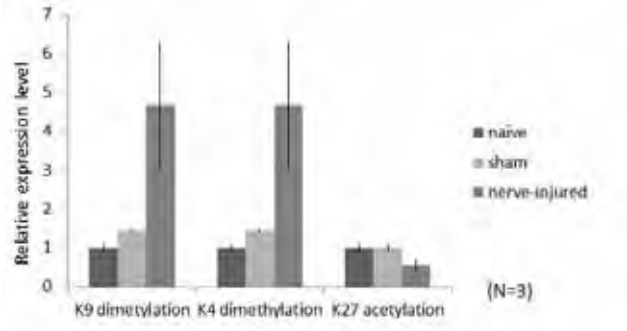

Figure 1b. Relative expression levels of BDNF exon III after chromatin immuno-precipitation

[Figure]

Conclusion: We found that epigenetic changes occurred in the early phase of injury in the orofacial neuropathic pain model, and these changes led to transcriptional suppression of BDNF gene.

14AP3-2

Patients with neuropathic pain exhibit higher concentrations of neuropeptide Y in their blood

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Background and Goal of Study: Neuropeptide Y (NPY) is an important mediator between the central nervous system and the immune system. Moreover, neuroinflammation is an important factor in the generation of neuropathic pain (NP). We investigated the role of NPY as a possible biomarker for NP in humans.
Materials and Methods: The Ethics Committee of the Ziekenhuis Oost-Limburg approved the study. NPY- concentrations were determined by ELISA (Peninsula Laboratories® - Bachem, United Kingdom. Detection range: 10 - 39 pg/ml) in cerebrospinal fluid (CSF), serum and plasma (S&P) from patients with NP (NP-group), nociceptive pain (CSF-controls) and pain free volunteers (S&P-controls).
The NP-group consisted of patients suffering from failed back surgery syndrome with predominant radicular pain (DN4 ≥ 4). The NP-group was age and gender matched with CSF-controls and S&P-controls. CSF-controls were patients with nociceptive knee or hip pain (DN4 < 4) scheduled for arthroplasty under spinal anesthesia. S&P-controls were healthy volunteers. Patients and controls with conditions known to alter CSF, S&P concentrations of NPY were excluded. All samples were collected between 8 and 12 AM to minimize effects of a circadian rhythm. A Wilcoxon matched-pairs signed rank test was used to compare data between NP-group and CSF- and S&P-control groups. Data are presented as mean±SEM.
Results and Discussion: Over a 3-year period 20 NP-patients were included. 12 NP-patients (7M/5F, age 53±4y) were matched with CSF-controls and 13 NP-patients (5M/8F, age 46±2y) were matched with S&P-controls. NPY-concentrations in plasma and serum of the NP-group were significantly higher compared to S&P-controls (519.2±75.6pg/ml *vs*. 289.2±21.0pg/ml, $p=0.0009$ and 739.9±156.6pg/ml *vs*. 397.7±18.0 pg/ml, $p=0.02$ respectively).
There was a marked increase in NPY concentrations in serum compared to plasma in the NP-group as well as the in the S&P-controls ($p=0.004$ and $p=0.0008$ respectively) indicating significant release of NPY from blood platelets. CSF-concentrations of NPY in CSF showed no difference between the NP-group and CSF-controls (190±113pg/ml *vs.* 270.6±123.0pg/ml, $p=0.45$)
Conclusions: In humans, NPY is stored and released from blood platelets. NPY-concentrations in serum and plasma of patients with NP are higher compared to healthy controls indicating a possible role for NPY as biomarker.

14AP3-3

Neuropathic pain decreases serum and plasma concentrations of CGRP-α in humans

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Background and Goal of Study: Calcitonin gene-related peptide (CGRP) is associated with neurogenic inflammation and neuropathic pain (NP).
Moreover, migraine attacks correlate with increased plasma CGRP levels. We investigated a possible role for CGRP-α as biomarker in NP.
Materials and Methods: The Ethics Committee of the Ziekenhuis Oost-Limburg approved the study. CGRP-α concentrations were determined by ELISA (Nuclilab®, Ede, The Netherlands. Detection range: 2.15-300pg/ml) in cerebrospinal fluid (CSF), serum and plasma (S&P) from patients with NP (NP-group), nociceptive pain (CSF-controls) and pain free volunteers (S&P-controls).
The NP-group consisted of patients suffering from failed back surgery syndrome with predominant radicular pain (DN4 ≥ 4). The NP-group was age and gender matched with CSF-controls and S&P-controls. CSF-controls were patients with nociceptive knee or hip pain (DN4 score < 4) scheduled for arthroplasty under spinal anesthesia. S&P-controls were pain-free volunteers. Patients and controls with conditions known to alter CSF, S&P concentrations of CGRP-α were excluded. All samples were collected between 8 and 12 AM to minimize effects of a circadian rhythm. A Wilcoxon matched-pairs signed rank test was used to compare data between NP-group and CSF- and S&P-control groups. Data are presented as mean±SEM.
Results and Discussion: 12 NP-patients (7M/5F, age 53±4y) were matched with CSF-controls and 13 NP-patients (5M/8F, age 46±2y) were matched with S&P-controls. CGRP-α concentrations in plasma and serum of the NP-group were significantly lower compared to S&P-controls (13.5±4.2pg/ml *vs*. 19.8±1.7pg/ml, $p=0.02$ and 12.38±2.1pg/ml *vs*. 62.0±8.0pg/ml, $p=0.0001$ respectively). CGRP-α concentration was markedly higher in serum when compared to plasma in the S&P-controls but not in the NP-group ($p=0.0008$ *vs.* $p=0.33$ respectively). No differences were noted in CSF concentrations of CGRP-α between the NP-group and CSF-controls (6.2±2.0pg/ml vs. 5.0±1.1pg/ml, p=0.39).
Conclusions: CGRP-α concentrations in serum and plasma of patients with NP are significantly lower compared to pain-free controls. In the former group, CGRP-α release from platelets is decreased. Whether this is caused by depleted platelet stores or deficient release warrants further investigations. These initial results call for further research into CGRP as biomarker for NP.

14AP3-4

No significant role of spinal 5-HT3 and 5-HT7 receptor in descending serotonergic modulation in inflammatory pain induced by carrageenan of rat

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Background and Goal of Study: While much evidence supports that spinal 5-HT3 receptor(5-HT3) plays a facilitatory role in various pain states, electrophysiological studies demonstrated that it is involved in nociception induced by intraplantar injection of formalin, but not carrageenan. In contrast, 5-HT7 receptor(5-HT7R), the lastly identified subtype, was shown to be inhibitory in descending modulation, but pronociceptive in formalin test. In addition, depletion of spinal serotonin has been shown to attenuate pain behaviour in the formalin test, but there have been no such reports regarding the carrageenan model. This study compared the role of spinal 5-HT3R and 5-HT7R and evaluated the direction of spinal serotonergic modulation in carrageenan-induced inflammatory pain.
Materials and Methods: Male SD rats (220-250g) were randomly administered with AS-19(5-HT7R agonist), SB-269970(5-HT3R antagonist), mCPBG(5-HT3R agonist), or ondansetron(5-HT3R antagonist) through intrathecal (i.t.) catheter 10 min prior to intraplantar injection of carrageenan. Paw withdrawal threshold was measured using von Frey test. In a second set of experiments, spinal serotonin was depleted using i.t. 5,7 dihydroxytryptamine (5,7-DHT) to evaluate the role of descending serotonergic pathway. Depletion of serotonin in spinal cord was examined by liquid chromatography tandem mass spec-

trometry. Student t-test or one-way ANOVA was used for statistical analysis.
Results and Discussion: No significant difference was observed in animals treated with intrathecal agonist or antagonist of 5-HT3R and 5-HT7R compared to control, suggesting no significant involvement of 5-HT3 or 5-HT7 receptor. Intrathecal treatment with 5,7-DHT significantly reduced the concentration of serotonin in comparison with control ($p < 0.001$). Mechanical allodynia induced by intraplantar carrageenan in animals treated with 5,7-DHT was enhanced compared to control group ($p < 0.01$), suggesting that descending serotonergic modulation is mainly inhibitory in carrageenan-induced inflammatory pain.
Conclusion: This study suggests that dominant mechanism of descending serotonergic modulation on carrageenan-induced inflammatory pain is inhibitory, but neither spinal 5-HT3 nor 5-HT7 receptor plays an important role.
References:
Differential mediation of descending pain facilitation and inhibition by spinal 5HT-3 and 5HT-7 receptors. Brain Research 2009.

14AP3-5

Antinociceptive actions of tramadol revealed by *in vivo* patch-clamp recordings in the spinal cord dorsal horn

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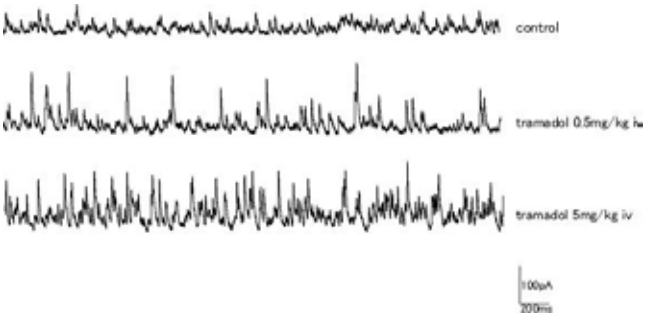
Background and Goal of Study: Tramadol is considered to produce analgesia by activating μ-opioid receptors and inhibiting reuptake of monoamines in the CNS. Previous electrophysiological study using spinal slice preparation has shown that tramadol induced outward currents in substantia gelatinosa (SG) neurons possibly via μ-opioid receptors activation. Further, microdialysis experiments have demonstrated that tramadol increased 5-HT and noradrenaline in spinal dorsal horn suggesting facilitation of descending inhibitory system. These actions could alter nociceptive transmission in spinal dorsal horn neurons. The aim of this study is to elucidate how tramadol act in vivo synaptic responses in spinal SG neurons.
Materials and Methods: Male adult Sprague-Dawley rats (7 - 9 weeks old) were anaesthetized with urethane intraperitoneally, and then a laminectomy was performed to expose thoracic and lumbar regions (TH12 - L2) of the spinal cord. In vivo whole-cell recording were made from SG neurons(lamina II) at holding potentials of 0 mV to record inhibitory postsynaptic currents (IPSCs) and - 70 mV for excitatory postsynaptic currents (EPSCs).The effects of intravenous administration (0.5, 5, 15 mg/kg) and superfusion (1 mM) of tramadol were evaluated.
Results and Discussion: Intravenous tramadol increased the amplitudes and the frequencies of IPSCs (Figure). The same effects were observed even when intravenous naloxone was pretreated. However, IPSCs were not changed by superfusion of tramadol on the spinal surface. Intravenous tramadol produced outward currents and decreased the amplitudes and the frequencies of EPSCs at holding potential of -70 mV. Our results indicated that potentiation of IPSCs by intravenous tramadol may be as a result of activating descending inhibition. Tramadol-induced outward currents may lead hyperpolarization of SG neurons.



[Figure]

Conclusion(s): The present study demonstrated that systemically administered tramadol induced facilitation of descending inhibitory system and hyperpolarization of cell membrane of SG neurons. The coordination of these actions could suppress nociceptive transmission in SG neurons and imply analgesic properties of tramadol.

14AP3-6

Peripheral nerve injury reduces antinociceptive effects of systemic morphine via spinal 5-HT$_3$ receptors

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Background and Goal of Study: Morphine is used for various pain treatment, but the analgesic effect of morphine is reduced in neuropathic pain state. In the present study, we compared the efficacy of systemic morphine in normal rats and rats with peripheral nerve injury by examining function of descending serotonergic (5-HT) and noradrenergic (NA) mechanisms.
Materials and Methods: Male SD rats were used in all experiments and spinal nerve ligation (SNL) surgery was performed. Withdrawal threshold to pressure applied to the hindpaw was measured using an analgesimeter. Rats received intraperitoneal morphine (1, 3, and 10 mg/kg). Antagonist studies were performed using the 5-HT$_3$ receptor antagonist, ondansetron. To examine whether the 5-HT have analgesic or antianalgesic effect, 5,7-dihydroxytryptamine (5,7-DHT), a selective neurotoxin for serotonergic terminals; was administered intrathecally 2 weeks after SNL. Microdialysis studies from the dorsal horn of the lumbar spinal cord were performed to measure NA and 5-HT levels after intraperitoneal injection of morphine.
Results and Discussion: Intraperitoneal morphine produced dose-dependent analgesic effects in normal and SNL rats. The effects were greater in normal rats treated with 3 and 10 mg/kg of morphine compared with SNL rats. Although intrathecal pretreatment with ondansetron attenuated the antinociceptive effect of morphine in normal group, it increased the effect of morphine in SNL group. In a similar way, intrathecal pretreatment with 5,7-DHT attenuated the antinociceptive effect of morphine in normal group, but increased the effect of morphine in SNL group. In microdialysis studies, NA concentrations in the dialysates did not change over time in normal and SNL rats after intrperitoneal injection of morphine. On the other hand, 5-HT concentrations increased approximately 500% of the baseline value in normal and SNL rats, and remained increased for 2 h after injection compared with the saline-treated group. These results suggest that systemically administered morphine increases 5-HT in the spinal cord and spinal 5-HT$_3$ receptors contribute to antinociceptive effect in normal state. However, increased 5-HT and 5-HT$_3$ receptors in the spinal cord contribute to decreased efficacy of morphine in neuropathic pain.
Conclusion: Systemically administration of morphine increases 5-HT in the spinal cord, and increased 5-HT attenuates the antinociceptive effect of morphine in neuropathic pain.

14AP3-8

Intrathecal ketamine and pregabalin synergistically reduces neuropathic pain without motor impairment in mice

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Background and Goal of Study: Precise mechanism of neuropathic pain is still unclear and current treatment does not produce a sufficient pain relief. Ketamine and pregabalin have been commonly used to treat neuropathic pain. This study was designed to examine the possible analgesic effect of ketamine and pregabalin co-treatment at sub-effective doses on neuropathic pain in mice.
Materials and Methods: Chronic constriction injury (CCI) neuropathic pain mouse model was employed. Ketamine or pregabalin was intrathecally injected to confirm their individual dose-dependent analgesic effect. Based on the dose-effect curve, these two agents were intrathecally co-administrated at the sub-effective dosages. In addition, the potential side effects of ketamine on the motor function were observed with rota-rod test. Finally, immunohistochemistry and image analysis were performed to determine the effects of these two agents on CCI-induced astrocyte activation.
Results and Discussion: 1. CCI persistently induced typical neuropathic pain responses such as mechanical allodynia and thermal hyperalgesia with astrocyte activation in spinal dorsal horn.
2. On 7 days after CCI induction, intrathecal treatment of NMDA antagonist, ketamine (3, 10, 30 and 100 mg) dose dependently attenuated CCI-induced mechanical allodynia and thermal hyperalgesia. Higher dose (100 mg) of pregabalin also suppressed mechanical allodynia and thermal hyperalgesia whereas pregabalin with lower doses (10 and 30 mg) did not produce this analgesic effect.
3. Combining ketamine (3 or 10 mg) with pregabalin (30 mg) significantly reduced CCI-induced neuropathic pain with an inhibition of CCI-evoked astrocyte activation in spinal dorsal horn. In addition, these combined treatments

did not alter the normal motor function as compared with higher doses of ketamine. Taken together, combination of NMDA antagonist, ketamine and Ca^{2+} channel blocker, pregabalin exhibited a synergic analgesic effect on experimental neuropathic pain mouse model without producing adverse effect such as motor impairment.

Conclusion(s): This study shows that ketamine and pregabalin individually produces an analgesic effect on neuropathic pain in a dose-dependent manner, whereas their co-administration at sub-effective doses exhibits synergic effects. Combination treatment of these two drugs provided a quick, stable and enhanced effect, with less side effects of ketamine.

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14AP3-10

Toll-like receptor signaling affects cisplatin-induced mechanical allodynia in mice

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Background and Goal of Study: The cancer therapeutic, cisplatin, produces a persistent tactile allodynia in mice. We previously validated the presence of an ongoing pain state in cisplatin-treated mice and found up-regulation of Activation Transcription factor 3 (ATF3) in the DRG in the absence of spinal glial activation. Toll-Like Receptors (TLRs) play a key role in the innate immune system. Current work shows them to be related to spinal nociceptive signaling. Here using mutant mice, we examined the role of the TLR signaling cascade on allodynia and changes in DRG ATF3 in cisplatin-treated mice.

Materials and Methods: Cisplatin (2.3 mg/kg/day x 6) or saline were administered to wild type (WT) male C57BL/6 mice, TLR3 KO mice, TLR4 KO mice, MyD88 KO mice, TRIFlps2 mice, and Double KO (both MyD88 KO and TRIFlps2) mice, respectively. We examined mechanical allodynia using von Frey hairs at before and at intervals over the ensuing 30 days. At day 30, we measured the ATF3 changes of DRGs in each group.

Results and Discussion:

i) Cisplatin-treated WT mice showed a prominent allodynia from day 3 to day 30.

ii) Double KO (both MyD88 KO and TRIFlps2) mice did not show allodynia at any time.

iii) In TLR3 KO mice, TLR4 KO mice, and MyD88 KO mice group, mechanical withdrawal thresholds were decreased compared to vehicle.

But it did not mean allodynia (i.e. withdrawal thresholds > 0.6). iv) In TRIFlps2 mice, cisplatin allodynia showed showed an initial onset but was decreased at day 24, 26, and day 30. v) In TLR3 KO mice, TLR4 KO mice, MyD88 KO mice, and Double KO mice, the increase in DRG ATF 3 was abolished. ($P > 0.05$) vi) The cisplatin-injected mice showed a modestly retarded weight gain as compared to vehicle during the initial dosing, but were not statistically different in WT mice, TLR3 KO mice, TRIFlps2 mice, or MyD88 KO mice. Body weight of Double KO mice and TLR4KO mice was significantly decreased from day 9 to day 17 and from day 15 to day 17, respectively. But, they gained weight after cisplatin treatment.

Conclusion(s): Cisplatin treatment developed mechanical allodynia in WT mice, but this allodynia was differentially reduced or abolished in TLR-KO mice. TLR signaling may thus be involved in developing cisplatin-induced polyneuropathy.

14AP4-1

Minocycline dose-dependently reduces neuropathic pain behavior in a rat chonic constriction injury model

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Background and Goal of Study: Minocycline reduces neuropathic pain (NP) in different animal models. However, no investigations were performed into dose-response effects. In this placebo-controlled study we used a rat sciatic chronic constriction injury model and 4 doses of minocycline to determine effects on cold and heat hyperalgesia.

Materials and Methods: The animal ethics committee of the Radboud University Nijmegen approved the study. Sprague-Dawley rats underwent a CCI of the left sciatic nerve under isoflurane/N20 anaesthesia as described by Bennett and Xie. NP was confirmed 7 days after surgery.

Hereafter rats were randomised to receive 0.9% NaCl 5ml/kg/d (n=5), minocycline 25 mg/kg/d (n=5), 50 mg/kg/d (n=5), 100 mg/kg/d (n=6) or 200 mg/kg/d (n=5) orally in 2 gifts from d7 till d11. Cold and heat hyperalgesia were measured on d7 and d11 with a cold plate test (number of left hind paw lifts per 5 minutes) and Hargreaves test (latency until left hind paw lift) respectively. A Wilcoxon matched-pairs signed rank test was used to compare behavioural data on d7 and d11.

To explore a dose-response effect of minocycline, a contingency table with a cut-off of 60% recovery was tabulated and a *chi*-square test for trend was performed. Data are presented as mean±SEM, $p \leq 0.05$ was considered statistically significant.

Results and Discussion: Rats in the placebo group showed no significant improvement in cold and heat hyperalgesia between d7 and d11 (26±3.8 *vs*. 14.4±1.6 lifts, $p=0.06$ and 10.1±2.3 vs. 14.3±1.4 s, $p=0.16$ respectively). Rats in the 50, 100 and 200 mg/kg/d minocycline groups on the other hand, exhibited progressively less cold hyperalgesia after 5 days of treatment (24.8±4.9 *vs.* 14.8±4.7 lifts, $p=0.05$; 19.5±3.6 vs. 12.0±4.7 lifts, $p=0.04$; 19.6±3.9 vs. 9.0±3.4 lifts, $p=0.03$ respectively). Heat hyperalgesia was significantly reduced in the 50mg and 200mg minocylcine groups (11.3±1.2 vs. 14.6±1.2 s, $p=0.03$; 9.0±1.5 vs. 14.4±1.5 s, $p=0.03$ respectively). The *chi*-square test for trend showed a linear effect on heat hyperalgesia with increasing doses of minocycline ($p=0.01$).

Conclusions: In a rat CCI model for neuropathic pain minocycline reduces cold and heat hyperalgesia in doses of 50mg/kg/d and higher. There is a linear effect on heat hyperalgesia with increasing doses of minocycline.

14AP4-2

Naloxone at ultralow concentration can reverse inflammatory changes in astrocyte Ca^{2+} signalling: a novel mechanism for modulation of pain?

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Background and Goal of Study: Long-term pain is partly a consequence of ongoing neuroinflammation. Astrocytes are known to play a role in the development and potentiation of neuroinflammation. Inflammation causes dysfunction in the Ca^{2+} signalling in the astrocyte networks resulting in increased release of pro-inflammatory cytokines. The neurons will then increase their excitability. Activation of Toll like receptor 4 (TLR4) is associated with an increased release of IL-1β as well as development of morphine tolerance and diminished efficacy of morphine for pain relief. The endogenous μ-opioid receptor agonist endomorphin-1 (EM-1) normally activates the inhibitory $G_{i/o}$. During inflammation there is a switch to the excitatory $G_{s,}$ which is associated with increased excitability in the neurons and diminished pain relief of morphine. Can inflammatory induced changes in astrocyte Ca^{2+} signalling be restored with ultralow concentrations of naloxone?

Methods: Primary cultures, calcium imaging, ELISA.

Results: Inflammatory reactive astrocytes express TLR4, which detects lipopolysaccharide (LPS) and evokes intracellular Ca^{2+} transients. After incubation with LPS, TLR4 was up-regulated, and IL-1β release was increased. EM-1 evoked Ca^{2+} transients in astrocytes. These transients were attenuated after short-time LPS incubation, but increased after long-time incubation. Neither naloxone, nor pertussis toxin (PTX), totally blocked EM-1 evoked Ca^{2+} responses. However, a combination of ultralow concentration naloxone (10^{-12}M) and PTX (100 ng/ml) totally blocked the EM-1 evoked Ca^{2+} responses. This suggests that ultralow concentrations of naloxone block the μ-opioid receptor coupled G_s protein. At picomolar concentration naloxone demonstrated the ability to restore the Ca^{2+} transients.

Conclusions: The inflammatory receptor TLR4 increases after LPS incubation and the endogenous μ-opioid receptor agonist EM-1 induced intracellular Ca^{2+} release in astrocytes. The changes in intracellular Ca^{2+} release induced by LPS were restored with ultralow concentration of naloxone, probably due to a switch between the G_s and G_i/G_o proteins. Picomolar concentration naloxone blocks the G_s protein and switches the μ-opioid receptor back to the inhibitory G_i/G_o protein. This mechanism could be of interest for new therapeutic targets.

14AP4-3

The flavonoid quercetin suppreses the development of neuropathic pain behavior in rats

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Background and Goal of Study: Quercetin is known to have antioxidant and antinociceptive effects. One of bioactivities of quercetin is inhibition of mitogen-activated protein kinase/extracellular signal-regulated kinase (ERK) kinase (MEK)1(1). ERKs activated by MEKs transduce extracellular signals to intracellular events, and ERK1/2 are involved in the development of pain hypersensitivity after tissue and nerve injury (2). The aim of this study was to examine the effect of quercetin on the development of neuropathic pain using a rat spared nerve injury (SNI) model.
Material and methods: A total of 11 male Sprague-Dawley rats weighing 165-210g were used. Rats were subjected to SNI of the sciatic nerve on the left side. In the quercetin (Q) group (n=6), the rats were given free access to the MF diet containing 1% (w/w) quercetin for two weeks until sacrification. Mechanical withdrawal threshold (MWT) were measured before and 1, 3, 7, 10 and 14 days after SNI. The rats were perfused and fixed on day 14 after SNI. Bilateral L5 DRGs were dissected out and processed for phosphorylated-ERK (p-ERK) immunohistochemistry.
The number of p-ERK1/2-immunoreactive (IR) neurons were counted. Statistical analysis was performed by two way repeated measurement ANOVA followed by post-hoc test for behavioral assessment and Student's t-test for immunohistochemistry. Data are shown as mean±SD. $P < 0.05$ was considered significant.
Results and Discussion: MWT was significantly higher in the Q group compared with the control (C) group 7 days after the surgery (11.8±6.3 vs 2.54±0.46, $p < 0.05$). Immunohistochemical studies showed that the proportion of ipsilateral p-ERK1/2-IR neurons increased compared with those in contralateral in the C group but not in the Q group ($p < 0.05$). There was no significant difference in the proportion of ipsilateral p-ERK1/2-IR neurons between Q and C group (p=0.40).
Conclusion: Our results suggested that quercetin suppressed the development of neuropathic pain behavior and the inhibition of p-ERK was involved in a part of the mechanism.
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14AP4-4

Novel TrkA inhibitory peptides suppress pain induced by tumor

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Background and Goal of Study: TrkA, a high-affinity receptor of nerve growth factor (NGF), is a therapeutic target against pain. Previously we developed a synthetic peptide, including a part of the amino-acid sequence of the activation loop of TrkA in addition to the cell-penetrating peptide sequence, TAT. This peptide, IPTRK3, inhibited TrkA activity intracellularly, and suppressed noxious pain, neuropathic pain, and cancer pain in rodent models [1-3]. In the present study, to develop a new agent having shorter amino-acid sequence than IPTRK3, we synthesized two cell-penetrating peptides, IPTRK4 and IPTRK5, and examined the effects of these peptides on pain in a mouse, inoculated with mouse melanoma cells.
Materials and Methods: To examine direct effects of these peptides on TrkA activity, recombinant TrkA was used in an in vitro assay. As mouse melanoma cells, B16-F1, possess TrkA, we measured the effect of these peptides on either NGF-stimulated proliferation of B16-F1 cells or NGF-stimulated autophosphorylation of TrkA in B16-F1 cells using a Western blot analysis. We also evaluated cell permeability of FITC-labeled peptides, using fluorescence microscopy. Then we administered peptides intraperitoneally into a mouse, inoculated with B16-F1 cells into the left hind paw, to investigate the effect on mechanical allodynia and the paw volume.
Results and Discussion: We confirmed that both IPTRK4 and IPTRK5 permeate the cell membrane. These peptides inhibited TrkA activity in vitro, and suppressed both NGF-stimulated cell proliferation of melanoma cells and NGF-stimulated autophosphorylation of TrkA. As IPTRK5 showed potent inhibitory effects rather than IPTRK4, we injected IPTRK5 intraperitoneally into a mouse on days 5, 6, 7, 8 and 9 days after melanoma inoculation.
After inoculation, mechanical threshold using a set of von Frey filaments showed a gradual decrease, that is caused by mechanical allodynia, and the volume of left hind paw showed a gradual increase, which was likely caused by tumor growth of melanoma. On day 20 after inoculation, IPTRK5 significantly suppressed both mechanical allodynia and the increase in paw volume.
Conclusion(s): TrkA inhibitory peptide, IPTRK5, likely has potential to be a novel analgetic.
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14AP4-5

CDK5, CRMP2 and NR2B in spinal dorsal horn and dorsal root ganglion have different role in pain signaling between neuropathic pain model and inflammatory pain model

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Background and Goal of Study: Previously we showed that intrathecally administered recombinant Sema3A protein, a repulsive axonal guidance factors, suppressed mechanical and heat hypersensitivity in neuropathic pain model rat. In this study, we analyzed the temporary changes of expression level of CDK5 and CRMP2, the downstream of Sema3A signaling, and NR2B in spinal dorsal horn (SDH) and DRG of neuropathic pain and inflammatory pain model rat.
Materials and Methods: Male SD rats (170-190g) were divided in 5 groups (naïve rats, sham op group, CCI group, CCI+Sema group and formalin group). CCI group received chronic constriction injury of left sciatic nerve . CCI+Sema group received recombinant Sema3A protein (1000 unit) intrathecally at Day 0, 2, 5 after CCI operation. Formalin group received 50 uL of 1% formalin at left hindpaw. SDH and bilateral L4-6 DRG was harvested at POD3 or 14 and 45 minutes after formalin injection, then processed for Western blotting analyses against CDK5, CRMP2, phosphorylated CRMP2 (pCRMP2) and NR2B.
Results and Discussion: Intrathecal Sema3A administration for CCI rats effectively reduced mechanical hypersensitivity in CCI hindpaw. In Western blot analyses, CDK5 in SDH was significantly downregulated at POD14 of CCI and 45 min after formalin injection compared to naïve rats. On the other hand, expression of CRMP and pCRMP was significantly upregulated in SDH of CCI and formalin group, and Sema3A administration enhanced the expression and phosphorylation of CRMP2 in CCI rats. Expression of NR2B in SDH was significantly upregulated in CCI, CCI+Sema and formalin group, but NR2B was reduced at POD14 of CCI compared to POD3 although mechanical hypersensitivity was more profound in POD14 than in POD3 of CCI rats. In DRG, although expression level of CDK5 did not changed CCI and Sema3A administration, expression of CRMP2 was significantly upregulated by CCI and Sema3A administration partially suppressed the CRMP2 upregulation in CCI rats. Our data showed that amount of CDK5, a downstream molecule of Sema3A signaling, and NR2B were inversely related in SDH both in neuropathic pain and inflammatory pain model compared to naïve and sham rats. Intrathecal administration of Sema3A suppressed the changes of the expression level of those proteins.
Conclusion(s): Our data suggests that Sema3A signaling proteins may be involved in pain signaling pathway.

14AP4-6

Effects of intrathecal administration of atypical antipsychotics in a rat model of trigeminal neuropathic pain

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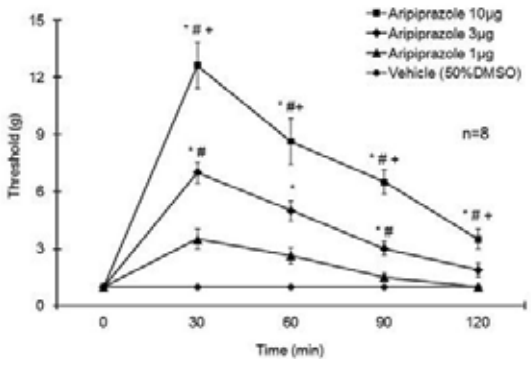
Background and Goal of Study: The atypical antipsychotics are usually used to treat psychiatric conditions, such as schizophrenia, bipolar depression, and psychotic agitation. They have a high affinity for dopamine and serotonin receptors. Thus, they are expected to use in a chronic pain condition by descending dopaminergic and serotonergic controls at the spinal level. The present study evaluated the potential antiallodynic effects of intrathecal administration of the atypical antipsychotics in a rat model of trigeminal neuropathic pain.
Materials and Methods: Male Sprague Dawley rats underwent unilateral chronic constriction injury to the right infraorbital nerve(ION). Two nylon (5-0) ligatures were tied around the ION. Series of von Frey filaments were used to determine pain hypersensitivity to mechanical stimulation on day 14 after sur-

gery. A polyethylene (PE-10) catheter was implanted for upper cervical spinal injection of drugs. The time course (0-120min) of the antiallodynic effects and the dose-response effects of intrathecally administered three atypical antipsychotics, 1,3,10 microgram of aripiprazole, 3,10,30 microgram of quetiapine and olanzapine were examined. The time course data for the dose-response effects were analyzed by two-way analysis of variance and Tukey-Kramer multiple-comparison test.

Results and Discussion: From 30 min to 120min after injection, mechanical thresholds after treatment with 10 microgram of aripiprazole were significantly higher than after treatment with 3 and 1 microgram of aripiprazole. From 30min to 120min, those of 30 microgram of quetiapine and 30 microgram of olanzapine were significantly higher than after treatment with10, 3 microgram of quetiapine or olanzapine ($P < 0.05$). The peak effects of each drug occurred 30 min after injection (figure 1).



[Figure 1: Intrathecal administration of aripiprazole produced dose-dependent antiallodynic effects. (n=8)]
* P<0.05 compared with vehicle (50%DMSO) group.
# P <0.05 compared with 1 μg-treated group.
+ P <0.05 compared with 3 μg-treated group.

Conclusion(s): These results indicated that atypical antipsychotics may elicit antiallodynic effects in a rat model of trigeminal neuropathic pain.

14AP4-7

An increase in antinociceptive effect of beta-endorphin (1-27) after intracerebroventricular administration of a mixture of three peptidase inhibitors

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Background and Goal of Study: It has been reported that intracerebroventricular (i.c.v.) administration of beta-endorphin (1-27) (EP27) (0.06-2 nmol) antagonized antinociception of beta-endorphin (1-31) in mice. On the other hand, EP27 at the high doses (over 5 nmol) was a full antinociceptive agonist. Previous our study demonstrated that a mixture of three peptidase inhibitors (PIs) amastatin (an aminopeptidase inhibitor), captopril (a dipeptidyl carboxypeptidase inhibitor) and phosphoramidon (an endopeptidase-24.11 inhibitor), increased the antinociception of opioid peptides.

To elucidate the hypothesis that EP27 at low dose was degraded completely to an inactivate metabolite, in other words; antagonist, we examined the antinociceptive effects of EP27 with pretreatment of a mixture of three PIs, mediated by inhibition of degradation of the peptides.

Materials and Methods: All the present animal experiments were performed in strict accordance with the Guidelines for Tokai University. The injection cannula was aimed at the third cerebral ventricle of Male Wistar rats (180-220 g). The antinociceptive effect was measured by the tail immersion assay with 55ºC water as the nociceptive stimulus. The percent of maximal possible effect (MPE) for each animal at each time was calculated using the following formula: %MPE = [(test latency - baseline latency)/(5 - baseline latency)] x100. The area under the curve value for the antinociceptive action of drug on each rat was calculated for some experiments. When a significant difference among the data during the experiment after drug administration was obtained in Kruskal-Wallis test or a two-way repeated ANOVA, the Dunn's multiple comparison test applied to determine the significance.

Results and Discussion: I.c.v. administration of EP27 at the dose of 0.3, 1 and 10 nmol by themselves did not have antinociception. On the other hands, i.c.v. administration of EP27 at the dose of 1 and 10 nmol, but not 0.3 nmol, with a mixture of three PIs (10 nmol each) had significantly antinociception.

Conclusion(s): These results showed that EP27 at low dose without PIs was degraded completely to an inactivate metabolite.

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14AP4-9

H_1 histamine blocking agents: doxylamine and pheniramine, have a potent infiltrative cutaneous analgestic effect in rat

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Background and Goal of Study: Histamine$_1$ (H_1) antihistamines are widely used for the treatment of allergic diseases. These drugs have a similar aromatic ring and amine structure with that of local anaesthetics, and proved having a prominent sodium channel blocking activity. Therefore, we performed a dose-response study of the local anaesthetic effects of H_1 antihistamines in a rat model.

Materials and Methods: In study one, eight H_1 antihistamines (doxylamine, pheniramine, diphenhydramine, orphenadrine, triprolidine, chlorpheniramine, brompheniamine, hydroxyzine) were screened for the local anaesthetic effect by subcutaneous injections them to the shaved dorsal skin of S.D. rats (n = 6 in each group). The inhibition of the cutaneous trunci muscle reflex to pinpricks was quantitatively evaluated as anaesthetic effect. No response to out of six pinpricks was defined as 100% maximum possible effect. Two of the most potent H_1 antihistamines (doxylamine and pheniramine) were then chosen for further dose-response studies, and compared with two clinically used local anaesthetics, lidocaine and bupivacaine.

Results and Discussion: On an equimolar basis, we found doxylamine and pheniramine possess the most potent local anaesthetic effect. The dose response curve and time course of drugs' effects at a dose of ED_{75} were obtained. The rank of potency was as following rank: bupivacaine > doxylamine ≒ lidocaine > pheniramine. The ranking of durations: doxylamine > pheniramine ≒ bupivacaine > lidocaine. Previous studies regarding the local anesthetic effect of antihistamines mostly focused on diphenhydramine which might cause serious complication such as injection pain, irreversible sensory impairment, and skin necrosis. In our study, doxylamine and pheniramine revealed reversible analgesic effects via skin infiltration in rat comparable to that of lidocaine.

Conclusion(s): Doxylamine and pheniramine possess the most potent infiltrative analgesic ability among the screened H_1 blocking antihistamines. The potencies were weaker than bupivacaine but similar to lidocaine. In addition, doxylamine had the longest duration of drug effect.

14AP5-1

Effects of ultrasound guided transversus abdominis plane block in gynecological laparoscopic surgery

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Background and Goal of Study: Epidural patient controlled analgesia is generally used for pain control after abdominal surgery. However, there are concerns regarding the potential of serious complications and need for anticoagulant therapy after such operations. A transversus abdominis plane (TAP) block is a recently introduced peripheral nerve block for providing analgesia to the anterior abdominal wall that has been shown effective for improving postoperative pain relief in several clinical trials. We evaluated the analgesic efficacy of a TAP block and total dosage of anesthetic agents in patients who underwent laparoscopic gynecologic surgery in a randomized controlled double-blind clinical trial.

Materials and Methods: After obtaining approval from the appropriate ethics committees, informed consent was obtained from 114 women aged 18 to 71 years old with ASA physical status I or II, who were scheduled for laparoscopic gynecologic surgery in addition to postoperative analgesia with patient-controlled IV fentanyl.

In the present randomized double blinded placebo-controlled clinical trial, we compared bilateral ultrasound-guided TAP blocks (2 x 20 ml 0.375% ropivacaine or 0.9% saline). All patients received a general anesthetic, then a bilateral TAP block was performed with ropivacaine or saline on each side prior to surgical incision. For the first 24 hours, breakthrough pain was treated with IV pentazocine or rectal diclofenac, with rectal diclofenac given for the next 24 hours upon patient request. Patients were postoperatively assessed by a

blinded investigator at 0, 4, 6, 12, and 24 hours to determine pain (none=0, mild=1, moderate=2, severe=3). The primary outcome measure was time to first analgesia request.
Results and Discussion: The patient baseline characteristics and surgical factors were not different between the groups. The TAP block with ropivacaine did not reduce postoperative pain scores at rest as compared to the placebo block. In addition, there was no significant difference between the groups for time to first analgesia request, pain medicine usage during the first 24 hours after surgery, and the incidence of PONV. There were no complications attributable to the TAP block.
Conclusion: Our findings demonstrated that a TAP block with ropivacaine conferred no benefit in addition to multimodal analgesia in women who underwent laparoscopic gynecologic surgery.

14AP5-2

Modeling the relation between morphine consumption and VAS score in patients receiving fentanyl during surgery

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Background: The possibility that the use of opioids during the intraoperative period might cause the development of hyperalgesia or tolerance is a problem in clinical anesthesia. The objective of the current work was to explore, in a routinely clinical scenario, the effects of the previous exposure to fentanyl in patient consumption of morphine and analgesic response.
Materials and Methods: The Ethics Committee of Clinical Investigation of Navarra (Spain) approved this randomized, triple-blind clinical trial (ANEFEN-2003-17). Fifty-four oncological patients, ASA II-III, underwent to open-colorectal surgery were randomized into three groups according to obtain a predicted plasma concentrations of fentanyl between 0.4-2 ng.mL-1. Venous blood samples, VAS score and morphine consumption were obtained at different moments during the first 24 post-operative hours. A population model describing the VAS vs morphine relationship was built first, and then the fentanyl-induced tolerance effects were evaluated. In the case of a significant fentanyl-induced tolerance development, the relationship between VAS and morphine would be modified in those patients associated with a greater exposure to fentanyl during surgery.
Results: Tolerance development was found to be non-significant (P>0.05), indicating that previous exposure to fentanyl was not associated with a decrease in the analgesic effects of morphine. The model developed for the VAS vs morphine exposure relationship described the VAS score vs time profiles adequately.
Conclusions: A novel approach has been used to study the effect of the fentanyl exposure during surgery, in which the VAS score vs the post-surgery morphine consumption relationship was established. Results from the current study indicated that therapeutic plasma levels of fentanyl (0.4-2 ng mL-1) did not induce tolerance to the analgesic effects of morphine.

14AP5-4

Effect of electromagnetic millimeter waves on experimentally induced cold pain - a crossover investigation in healthy volunteers

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Background and Goal of Study: Despite positive results in animal experiments, the clinical data on pain-relief effects of low-intensity electromagnetic millimeter waves (MW) are contradictory (1,2). The aim was to evaluate previously suggested hypoalgesic effect of MW (1) with sharp vs. broadband frequency in an experimental setting using Cold Pressor Test (CPT).
Materials and Methods: Experimental pain was induced in healthy volunteers using standardized CPT procedure. Skin of the lower part of sternum of each volunteer was exposed for 30 min to either source of MW with 42.25 GHz and power 30 mW cm^{-2} ("frequency" generator), 50-75 GHz with power 15 mW cm^{-2} ("noise" generator) or inactive device ("placebo" generator) in a random order. The active generators were masked in the box, used to keep volunteers and practitioners, who performed the investigation and handled the outcome data, blinded to the output of the devices.
Pain threshold and pain tolerance, measured in CPT, were the primary outcome. Heart rate, blood pressure changes in peripheral psychophysiology (RR, heart rate) between conditions and the incidence of subjective sensations (paraesthesia) during exposure were the secondary outcome measures. The quality of volunteers' blinding was also tested. The comparisons of outcome measures were performed among 4 conditions: i) baseline visit; ii) exposure to "frequency"; iii) "noise" or iv) "placebo" generator and analyzed using Friedman 2 way ANOVA and post hoc Wilcoxon signed rank test.
Results and Discussion: The data of 20 volunteers aged 27 ± 5 yrs (mean ± SD) were available for final analysis. Pain threshold, pain tolerance and diastolic blood pressure increased within the CPT model only under the exposure to "frequency generator" as compared to baseline and to "noise" generator ($p < 0.05$), but not vs. placebo. Other secondary parameters were comparable among 4 study conditions.
Conclusion(s): We could partly confirm previously suggested hypoalgesic effect of low-intensity electromagnetic millimeter waves. However this effect was indistinguishable from placebo in our investigation.
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14AP5-6

A vestibulo-vestibular sensory data mismatch promotes remifentanil-induced nausea

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Background and Goal of Study: Opioid-induced nausea and vomiting is a significant threat in anaesthesia. Remifentanil decreases the vestibulo-ocular reflex[1]. Therefore, an opioid-induced intersensory data mismatch has been suggested to cause nausea, in analogy to the pathophysiology of motion sickness. The aim of this study was to determine whether remifentanil-induced nausea is caused by a mismatch between otoliths and semicircular canals or by a mismatch between the visual and vestibular sensory input.
Materials and Methods: After IRB approval, remifentanil was administered intravenously at a rate of 0.15 $\mu g\ kg^{-1}\ min^{-1}$ in 14 healthy male volunteers in a cross-over design. After 30 minutes of infusion, subjects were bent forward and backward ten times with a frequency of 1 Hz. Before starting remifentanil (t0), before (t1) and after (t2) moving the subjects during remifentanil infusion, subjects rated nausea on a visual analogue scale (N-VAS) ranging from zero (no nausea) to ten (vomiting). To assess motion-induced nausea with and without deprivation of the visual sensory input, each subject was tested twice, with and without eye patches. Friedman Test and Wilcoxon Test were used for statistical analysis.
Results and Discussion: Median N-VAS in the eye patch group was 0 (Inter Quartile Range, IQR [0;0]) in t0 and t1. After movement of the subjects, N-VAS increased to 1.5 (IQR [0;3]) in t2 ($p=0.012$). In the group without eye patch, median N-VAS was 0 (IQR [0;0]) in t0 and 0 (IQR [0;1] in t1. After movement, N-VAS increased to 2.5 (IQR [0;5]) in t2 ($p < 0.001$). Movement-induced nausea during t2 did not significantly differ between subjects with eye patches and without ($p=0.31$). In accordance with earlier findings[1], nausea was induced during remifentanil infusion when subjects were bent. Reduction of the visuo-vestibular mismatch by wearing eye patches had no significant protective effect.
Conclusion(s): A sensory data mismatch within the vestibular system seems to promote opioid-induced nausea[1]. Our data demonstrate that a vestibulo-vestibular sensory data mismatch plays a major role in the generation of opioid-induced nausea while a visuo-vestibular mismatch is of minor importance and has no protective effect.
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14AP5-7

Preoperative small-dose ketamine (Ket) postpones, but dose not prevent, the onset of tourniquet-induced hypertension (TIH) and increase of low- to high-frequency ratio of heart rate variability (LF/HF)

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Background and Goal of Study: Satsumae et al. (1) reported that preoperative Ket >= 0.25 mg/kg, an NMDA receptor antagonist, prevented TIH under general anaesthesia (GA). We previously reported that remifentani (Rf) 0.3μg/kg/min (γ) prevented the onset of TIH, however Ket 0.5 mg/kg could not pre-

vent the onset of TIH in GA (2). The aim of this study is to investigate if small-dose Ket prevents the onset of TIH or not.
Methods: Among patients to whom 0.5 mg/kg Ket was given preoperatively, 8 patients (case 1-8) were included in this study, because tourniquet time was more than 60 min, and 7 patients towhom Ket was not given were included in this study. Anaesthesia: (1)spinal anesthesia with 0.5% isobaric bupivacaine 2 ml was performed at L3/L4.(2)femoral nerve block with 0.375% ropivacaine 20 ml was performed. (3)induction was pefromed with 0.4 mg/kg thiopental natrium and 50 mg rocuronium, and a laryngeal mask was inserted.(4)0.5 mg/kg Ket was given in case 1-8. (5)anaesthesia was given with 1% SeV and 50 % oxygen in air. Heart rate variability was measured for 5 min and LF/HF was calculated at 0, 30, 45, 60, 75, 80 (before deflation) min after tourniquet inflation by using CheckMy Heart® (DailyCare BioMedical Inc., Chungi, Taiwan).
Results: In case 1, 6, 7, and 8, LF/HF remained less than 3 during tourniquet inflation and TIH did not develop. In case 2, LF/HF increased more than 3 at 45 min and TIH developed at 75 min. In case 3, LF/HF increased more than 3 at 75 min and THI developed at 60 min. In case 4, LF/HF increased more than 3 at 80 min, however TIH did not develop. In case 5, LH/HF increased more than 3 at 80 min and TIH developed at 60 min. In 5 of 7 patients who were not given Ket, LF/HF increased to above 3 within 60 min and TIH developed within 60 min. In 1 of 7 patienst, LF/HF increased more than 3 at 85 min and TIH developed at 75 min. In 1 of 7 patients, LF/HF did not increase more than 3 during tourniquet inflation (100 min), however TIH developed at 45 min.
Discussion: In patients towhom Ket was given, LF/HF did not increase more than 3 at 60 min, except in case 2 and it took more than 60 min for the development of TIH. In these patients, the increase of LF/HF more than 3 and the development of TIH were postponed.
Conclusion: Preoperative small-dose Ket postpones, but dose not prevent, the onset of TIH and the increase of LF/HF.
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14AP5-8

Audit of critical adverse events associated with opioid administration in postoperative patients managed by an acute pain service

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Background and Goal of Study: Today postoperative analgesia is efficient and safe in majority of patients. Some audits however report incidence of critical events associated with the administration of opioids even when using systems of auto-controlled analgesia (Eckstrand et al, Patient Safety in Surgery 2009). The study assessed the incidence of such critical events in postoperative patients who benefited from an analgesic technique including opioids.
Materials and Methods: After IRB approval, a retrospective analysis of computerized data collected by the Acute Pain Service (August 2007-December 2011) was conducted and included patients who received intravenous opioid analgesia (Patient-controlled analgesia, PCA; continuous morphine infusion, CI) or epidural analgesia (PCEA) with an opioid in the mixture. Episode of deep sedation and respiratory depression which required medical intervention were considered as critical events. Statistical analysis used Chi-square tests, a P< 0.05 significant.
Results and Discussion: 15 642 patients were analysed including 1560 elderly patients (>75yrs)

	Deep sedation (n)	Respiratory Depression (n)
CI morphine (7%)	17	1
PCA intravenous (66%)	165 with 16 elderly	7 with 3 elderly
PCEA (20%)	4	1

[Incidence of critical events]

The majority of respiratory depressions (6/9 patients) occurred during the first 24h, average age 57 yrs (2-88 yrs), median BMI 25 (19-36). No death, no tracheal intubation were noted.
Conclusion(s): This retrospective analysis demonstrated an incidence of deep sedation (0.01%) and respiratory depression (0.0005%) similar to those reported in the literature (Ramachandran et al, J Clin Anesth 2011). Elderly patients represents a population at higher risk for respiratory depression (0.002%; p=0.049 with patients < 75 yrs).

14AP5-9

Efficasy and safety of surgical continuous rectus sheath block after major abdominal surgery

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Background and Goal of Study: Single shot rectus sheath block provides adequate analgesia after low abdominal and umbilical surgery [1, 2]. But the role of this technique in major abdominal surgery still unknown and debatable. The main goal of our study was to assess the efficacy and safety of continuous rectus sheath block with LA after major abdominal surgery.
Materials and Methods: We enrolled 78 adult patients after open gastric and colonic resection in a prospective, randomized study. All patients were randomized in to two groups. In the RSA (Rectus Sheath Analgesia) group (n=44), we used bilateral rectus sheath epidural catheter technique with infusion of 0.25% ropivacaine 5 ml/h through the elastomeric pump. In the SSA (Standard Systemic Analgesia) group (n=34) we used 20 mg of the trimeperidine every 4-6 h after surgery.
Pain scores were assessed by 100-point visual analog scale (VAS) at 3, 6, 12, 24, 48 and 72 h after surgery. In addition, the consumption of opioids and the incidence of opioid-related adverse effects and the recovery of bowel function were recorded. Data were compared using Students t-test and x2 test with Bonferroni correction.
Results and Discussion: VAS in coughing was significantly lower in the RSA group comparing with the SSA group at 3, 6, 12, 24 and 48 h after surgery (p< 0.05). The consumption of the trimeperidine at 24 h was significantly smaller in the RSA group (18.3±1.3) than in the SSA group (66.6±1.4mg, p< 0.05). We did not observe any episodes of an excessive sedation in all groups. In the SSA group, the incidence of nausea was 55.9%. This adverse effect was lower in the RSA group (11.4%, p< 0.05). An opioid-induced pruritis was mostly observed in SSA group (29.4%). No signs of systemic toxity of LA were found in RSA group.
Conclusion(s): After major abdominal surgery, rectus sheath analgesia with LA provides better postoperative analgesia comparing with the systemic analgesia. In addition, rectus sheath block after laparotomy reduces the consumption of opioids and declines the incidence of the adverse effects, therefore improving the quality of analgesia and postoperative comfort of patient.
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14AP6-1

Local infiltration analgesia in vaginal hysterectomy: a prospective randomized, double-blind, placebo-controlled study

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Background and Goal of Study: Hysterectomy is one of the most common operative procedures in Denmark with an annual rate of 5-6000 hysterectomies of which 34 % are vaginal hysterectomies (1). Generally postoperative pain following surgery for vaginal hysterectomy is treated with multimodal analgesia including opioids, which can cause many side-effects and delayed mobilization and rehabilitation. Local infiltration analgesia (LIA) is a well-known, simple, safe, and low-cost technique for postoperative analgesia after diverse surgery (2). The aim of the current study was to evaluate the analgesic effect of high-volume infiltration analgesia in vaginal hysterectomy surgery, along with a detailed description of the infiltration technique.
Materials and Methods: Randomized, double-blind, placebo-controlled study following the CONSORT criteria. Patients received high-volume (40 ml) ropivacaine 0.75 % (n=20) or saline (n=17) infiltration using a systematic technique ensuring uniform delivery to all tissues incised, handled or instrumented during the procedure. Main outcome measures were pain, nausea, vomiting and opioid requirements assessed for 32 hours as well as time spent in the post-anaesthesia care unit (PACU) and time to first mobilization.
Results and Discussion: Pain at rest was significantly reduced after 1, 4 and 8 hours with the local anesthetic infiltration technique (p≤ 0.001 - 0.01). Pain during coughing was significantly reduced after 1 and 4 hours (p≤ 0.001 and p≤ 0.003) while pain during movement was significantly reduced only after 4 hours (p≤ 0.02). Opioid requirements and time spent in the PACU were significantly reduced in the ropivacaine group (p< 0.001 and p< 0.001, respec-

tively) as well as the time to first mobilization (p< 0.001).
Conclusion(s): Systematic high-volume infiltration analgesia is an effective analgesic technique in patients undergoing vaginal hysterectomy and improves early recovery.
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14AP6-2

Epidural versus intravenous multimodal analgesia in hepatic resection surgery

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Background and Goal of Study: Incidence of Postop chronic pain (PCP) after hepatic resection is uncertain. Epidural analgesia (EP) is considered the gold standard despite unclear evidence of its benefit on outcomes as PCP. Addition of ketamine (K) to intravenous (IV) or EP analgesia is suggested to improve acute pain control and PPC incidence. Goal: to compare effectiveness and safety of IV with EP analgesia including K.
Materials and Methods: Prospective, randomized study of 44 adult pats submitted to hepatic resection.
Group IV 21 pats: IV K 0.5 mg/kg + morphine (M) perfusion 25 ug/kg/h before incision, M 50 ug/kg IV 20 minutes before end of surgery and IV PCA with M 1 mg/h + ketorolac 60 mg/day + K 125 ug/kg/h.
Group EP 23 pats: EP lidocaine 1% 6 ml + K 0.5 mg/kg + M 4-5 mg before incision, M 50 ug/kg IV before end of surgery and EP PCA: ropivacaine 0.15% + M 15 ug/ml + K 125ug/kg/h.
Variables: VAS, NPSI, Catastrophizing test and area of hyperalgesia (HA) with QST: VonFrey (VF) of 1, 6 and 10 g and vibration.
Times: 2h, 24h, 7 days (d) and 1 and 6 months (m) Postop Adverse effects were registered the first 7d. Sample size was calculated to obtain a reduction of the ratio HA area/incision area of 3 cm2 with treatment for each threshold. Statistical analysis: Epiinfo 3.2, type I error 5%.
Results: Group IVA was significantly older without influence on results. The rest of preop variables were similar in both groups. Postop VAS during the first week was low under 2,7 in both groups. At 1 and 6m VAS≥1 but inferior to 2 was found in only 2 pats of each group. NPSI in EP and IV respectively was 4.4±2.5 and 6±4.4 (x±SD) at 7d; and 0.9±1.2 and 0.7±1.8 at 6m. Only 2 pats of Group EP showed a small mechanical HA for VF 10g at 7d and 1m but not at 6m; the HA in those pats was 3.7±17 cm2 at 1m. Incidence of mild side effects: sedation 8.7% EP vs 4.8% IV, cognitive alterations 19% EP vs 0% IV and visual alterations 4.3 EP vs 9.5% IV. Postop hospital stay was 16.3±18.8d for EP and 13.3±12d for IV. There were no statistically significant differences between groups in any of postop variables at any time.
Conclusion: The small HA area found makes the sample insufficient. Both regimens containing K were highly effective to control immediate Postop pain. PCP symptoms or sensitive changes were not observed at 6m. Cognitive alterations were clinically more important in IV. EP K had no advantages in front of IV K associated to standard multimodal analgesia.

14AP6-3

Assessing postoperative pain with tramadol, ketamine and electroacupuncture as an adjunctive therapy in prostatectomy using NRS, PPI and SFMPQ scales: a randomised, controlled, single-blinded trial

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Background and Goal of Study: The goal of the study is to compare the efficacy of electroacupuncture (E/A) as an adjunctive therapy perioperatively in combination with tramadol plus ketamine for postoperative pain using pain scales such as Numerical Rating Scale (NRS), Present Pain Intensity (PPI), McGill scale (SFMPQ).
Materials and Methods: After the approval of the Scientific Committee of our Hospital and patients written consent, eighty patients ASA I-III who underwent radical prostatectomy were assigned to two groups: TK (n=40) Tramadol+Ketamine and TKE (n=40) Tramadol+Ketamine+E/A. Both groups received 1.5 mg/kg tramadol and a 10 mg ketamine bolus IV 30 min before the end of surgery. These drugs were instantaneous with the infusion of 0.15 mg/kg/h tramadol and ketamine, in subanaesthetic doses, via an adjustable flow disposable pump.
E/A applied at 100 Hz frequency at L.I.4 bilaterally during the closure of the abdominal walls for 30 min and at 4 Hz at ST36 and L.I.4 bilaterally just after extubation for 30 min. Postoperative pain was evaluated at 45 min, 2 h, 6 h, 12 h and 24 h using NRS, PPI and SFMPQ scales. Pain treatment was considered unacceptable if the NRS scale was ≥3 and the PPI scale ≥2. Additional analgesics were administered including tramadol following by morphine if the NRS scale did not decrease by at least 2 points after 30 min. Statistical analysis was performed with analogue analysis of variance (repeated measures ANOVA) with level of significance p < 0.05.
Results and Discussion: Pain scores on the NRS, PPI, SFMPQ scales were significantly lower in the TKE group (p< 0.001) at all assessments compared to the TK group.

TIME	MEAN ±SD p value	NRS rest TKE	NRS rest TK	NRS move TKE	NRS move TK	PPI TKE	PPI TK	SF_MPQ TKE	SF_MPQ TK
2 h	MEAN ±SD	1.2±1.2	2.9±1.3	2.2±1.3	3.9±1.5	0.5±0.7	1.5±0.7		
	p value	<0.001		<0.001		<0.001			
6 h	MEAN ±SD	0.4±0.8	1.6±1.4	1.1±1	2.5±1.3	0.1±0.5	0.8±0.7	2.5±2.6	6.7±5.2
	p value	<0.001		<0.001		<0.001		<0.001	
12 h	MEAN ±SD	0.1±0.4	0.7±0.7	0.6±0.7	1.7±0.9	0.5±0.2	0.4±0.5		
	p value	0.001		<0.001		0.018			
24 h	MEAN ±SD	0.1±0.4	0.5±0.6	0.4±0.6	1.2±0.8	0.±0.1	0.3±0.4	0.8±1,6	3.1±2.8
	p value	0.012		0.001		0.010		<0.001	

[Table 1. Pain scales (NRS rest-move, PPI, SF_MPQ)]

A statistically significant decrease in rescue analgesia was observed at 45 min in the TKE group (p≤0.001) compared to the TK group.
Conclusion(s): The addition of E/A application during perioperative treatment decreased postoperative pain in patients undergoing radical prostatectomy and confirmed it with the studied pain scales.

14AP6-4

The assessment of postoperative pain by finger photoplethysmography

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Background and Goal of Study: Photoplethysmography(PPG) is a non-invasive optical technique widely used in oxygenation monitoring and it associated with changes in blood volume in a peripheral vascular bed. Pain is a subjective experience and relies primarily on individual self-report. The timely assessment of acute postoperative pain is very important for pain management, especially for the patients recovering from anesthesia. The aim of the study was to assess postoperative pain by PPG measurements compared with visual analogue score (VAS).
Materials and Methods: 30 selected adult patients (ASA Ⅰ～Ⅱ) undergoing abdominal surgery with general anesthesia were enrolled. After entering Post Anesthesia Care Unit (PACU), baseline VAS score was measured at once. Mean arterial pressure (MAP), systolic blood pressure (SBP), diastolic blood pressure(DBP), heart rate(HR), and pulse oxygen saturation(SpO_2) were monitored too. PPG waveform from forefinger was acquired simultaneously by a pulse oximeter sensor (Nellcor Puritan Bennett Inc, Pleasanton, CA, USA) connected with a custom PPG signals detected device. Thereafter a dose of 0.1μg/kg sufentanil was given for analgesia. Both VAS score and amplitude of PPGW was measured respectively at 5, 10, 20, 30minutes after analgesia, and the vital signs were recorded too. The values of AC（Alternating current）and DC （direct current）component of PPGW were measured by Metalabs (Matchworks, USA).
Results and Discussion: After sufentanil administration, VAS scores decreased significantly(P< 0.05)，and both AC and AC/DC of PPGW increased significantly compared with the baselines. SBP, DBP, MAP, HR decreased significantly too. There were significant correlations between VAS scores and values of AC(r = -0.60 P< 0.01), or values of AC/DC(r= -0.74, P< 0.01). The correlation coefficient between VAS scores and HR was 0.38(P< 0.05), but there were no correlations between VAS scores and blood pressures(SBP, DBP, MAP). Acute pain can reduce the peripheral tissue perfusion by norepi-

nephrine release. Our results showed that the finger's PPG signals can react to this perfusion change timely, and the peripheral PPG signals are more sensitive than HR or blood pressure in postoperative pain assessment.
Conclusion Finger's PPG can be used to assess the postoperative pain intensity, and it is more sensitive than general vital signs.

14AP6-5

Comparison between systemic analgesia, continuous wound catheter analgesia and thoracic epidural in thoracic surgery - better analgesic management increases ventilator free days

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Background and Goal of Study: the aim of the study is to compare different postoperative analgesia regimens and to prove that successful analgesia improves patient comfort, decreases postoperative morbidity (pulmonary complications), optimises ventilation (evaluated by NIF measurement), and decreases mechanical ventilation duration.
Materials and Methods: Randomized controlled study. We included patients aged over 18, ASA II-III, who underwent thoracotomy and internal fixation with blades for posttraumatic multiple rib fractures with flail chest. We excluded patients with brain or spine lesions, severe blood loss or coagulopathy.Patients were randomized to one of three groups. For the first group (n=14) postoperative analgesia was only systemic with continuous infusion of Morphine using PCA .For the second group (n=13), a wound catheter was inserted and continous infusion of Ropivacaine 0.2% was administered.
For the third group (n=11), thoracic epidural was inserted before induction of anesthesia and continous infusion of Ropivacaine 0.2% was administered. Primary endpoint was level of analgesia - VAS evaluated at 0/1/3/6/12/24/48 h postoperative.Secondary endpoints - NIF (for patients who remained mechanically ventilated at least 24 hours), incidence of pulmonary complications (atelectasis, infection), and time on mechanical ventilation.
Results and Discussion: There was a significant difference in VAS at all points of measurement between the three groups. Values recorded were significantly lower in second and third groups (mean value at 1h 5.2±1/3.6±.1.2/ 2.8±1.2). 13 patients remained intubated and mechanically ventilated (5 from the first gr., 5 from second group and 3 from the third group). NIF values at 6h were higher in second and third groups (22±6/24±6.1 mbar)than in the first group (16±6 mm Hg), we had two cases of total atelectasia coming from the first group and mean duration of mechanical ventilation was significantly lower (22±2 h/ 24±2.2h)in the second and third groups compared with systemic analgesia group (37±5.1h).
Conclusion(s): Our results show the benefit of providing good analgesia for patients who underwent thoracic surgery - improved ventilator mechanics, better secretion clearance , lower rate of complications and shorter period of mechanical ventilation. Regarding analgesia level, both wound catheter and thoracic epidural had significant better results compared to systemic administration of Morphine.

14AP6-6

Postoperative pain after major abdominal surgery: is it gender related? An observational prospective study

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Background and Goal of Study: The perception of noxious stimuli may differ between the two genders. Mostly experimental studies have shown that male and female subjects differ in responses to mechanical or electrical stimulation. The aim of the present study was to assess pain intensity and postoperative analgesic requirements in male and female patients undergoing scheduled large bowel surgery.
Materials and Methods: After ethical approval, 65 patients, 31 men & 34 women, scheduled for major abdominal surgery were recruited in this prospective observational study. Anaesthesia and intraoperative analgesics were standardized in all patients. Postoperatively all patients had access to a 60 ml PCA pump containing 1 mg ml^{-1} morphine and 50 μg ml^{-1} droperidol. Primary outcome of the study was morphine consumption during the 48 h. Secondary outcomes were VAS score at rest and during cough. Morphine consumption and VAS scores at rest and after cough were recorded 2, 4, 8, 24 and 48 hours postoperatively.
Results and Discussion: Of the 65 patients recruited for the study, 30 women and 30 men aged 65±8.9 and 66±9.0 years respectively were included in the analysis. There was no difference in morphine consumption between the two groups (p=0.384). When morphine consumption was normalized for body mass index (BMI), the cumulative morphine consumed over the 48 hours was 1.38 ± 0.59 mg kg^{-1} m^{-2} in women and 1.47 ± 0.81 mg kg^{-1} m^{-2} in men and did not differ between the two genders (p = 0.567). Both genders exhibited similar VAS pain scores at rest and after cough (p=0.476, p=0.378 respectively).
Conclusions: Neither morphine requirements nor VAS scores during the first 48 hours differed between female and male patients undergoing major abdominal surgery. However, a limitation of our study may be that the female patients studied were postmenopausal so our results may not be applicable to menstruating women due to possible hormonal involvement in pain pathways and opioid efficacy. The variability in pharmacokinetics/pharmacodynamics, as patients with differences in absorption, distribution, metabolism and excretion of morphine were not identified, may be another limitation. In conclusion, under the present study design, we failed to demonstrate a difference in morphine consumption or pain intensity between the male and female elderly patients during the first 48 postoperative hours after major abdominal surgery.

14AP6-7

Combination of Intraperitoneal and Intravenous routes for pain relief in laparoscopic cholecystectomy

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Background and Goal of Study: *Background*: Laparoscopic cholecystectomy (LC) is the treatment of choice in treating gallbladder disease substituting the conventional open method of cholecystectomy.
However, while reduced postoperative pain is the most worthy achievement from the patient's point of view. LC is not a pain-free procedure. Postoperative abdominal and shoulder pain are the most common complaints after elective laparoscopic cholecystectomy. *Goal of Study:* The Goal of this study was to evaluate the analgesic affect of the intraperitoneal administration of bupivacaine compared to combination of intraperitoneal bupivacaine with intravenous Tramadol and intravenous Tramadol in patients undergoing LC. Incidence of PONV was also recorded.
Materials and Methods: For this study, 120 patients undergoing LCwere randomized in three equal groups. - Group A patients received 40ml of 0.25% bupivacaine intraperitonealy, group B received 40ml of 0.25% bupivacaine with 50 mg Tramadol with a continuous infusion rate of 5 mg/h, and group C Tramadol with an intravenous loading dose of 100mg and a subsequently continuous infusion of 12,5 mg/h for 24 hours was given. Intraperitoneal bupivacaine was administered 20 ml of 0.25% bupivacaine under direct vision into the hepato-diaphragmatic space, near and above the hepato-duodenal ligament and above the gallbladder and at the end of operation another 20 ml of bupivacaine was injected.
All patients were of similar age, sex and ASA risk .
Pain intensity was assessed in six time intervals after surgery; 2hr, 4hr, 8hr,12hr and 24hr and its evaluation was performed using VAS (Visual Analogue Scale). Postoperative nausea and vomiting (PONV) was rated on a 3-point scale (0_no PONV,1_Mild nausea, 2_Severe nausea, 3_Vomiting). If PONV scale was 2 or more, Ondansetron 4mg was given intravenously.
Results and Discussion: Parietal and visceral pain scores were lowest in the intraperitoneal Bupivacaine in combination with intravenous Tramadol group during the first postoperative hour Group B had significantly lower shoulder pain scores at 2, 4 and 8hrs. This difference is pronounced throughout the entire postoperative period (p< 0,001).
Conclusion(s): Pain management following elective LC is best achieved with combination intraperitoneal bupivacaine and intravenous Tramadol, achieving the least incidence of postoperative vomiting.

14AP6-8

Intraoperative dexmedetomidine - a new option for acute postoperative pain treatment? A meta-analysis of randomized controlled trials

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Background and Goal of Study: Due to its pharmacodynamic and -kinetic dexmedetomidine, the most selective α-2-adrenoreceptor agonist, might be an interesting therapeutic option for multimodal postoperative pain treatment. Therefore the aim of the present meta-analysis was to assess the efficacy and safety of intraoperative dexmedetomidine (DEX) compared to placebo or

opioids for acute pain treatment in adults undergoing surgery.
Materials and Methods: This meta-analysis was performed according to the PRISMA statement and the recommendations of the Cochrane Collaboration. The systematic literature search was performed in MEDLINE, EMBASE and CENTRAL. Following data extraction relative risks (RR; 95% confidence intervals (CI)) were calculated for dichotomous outcomes, while for continuous outcomes mean differences (MD; 95% CI) were estimated.
Results and Discussion: This meta- analysis finally included 29 randomized controlled trials including 1460 patients. Patients treated with DEX reported lower postoperative pain intensity ($MD_{1h\ postop}$: -1.59 U (NRS: 0-10) 95%CI: -2.37 - -0.82; p=0.000001) and showed a lower postoperative opioid consumption ($MD_{24h\ postop}$: -17.24mg; 95%CI: -24.38 - -10.10; p=0.00001) compared to placebo. Additionally the DEX group showed a lower RR for opioid related adverse events (e.g. $RR_{PONV\ (early)}$: 0.53 (95%CI: 0.37 - 0.76; p=0.0006). The most common adverse event in patients treated with DEX was intraoperative bradycardia with a RR of 2.66 (95%CI: 1.54 - 4.58; p=0.00004) compared to placebo. Due to limited included data only a very low number of outcomes for the comparison with opioids could be pooled.
Our data provide ample evidence that DEX administration compared to placebo is an effective intervention for postoperative pain treatment. The most common adverse effect was intraoperative bradycardia following DEX administration. Thus caution might be warranted in patients with a higher risk for a stroke or myocardial infarction; this should be investigated in large trials focusing on safety issues of intraoperative DEX coadministration. Evidence regarding the comparison of DEX with opioids is currently less clear and renders further research.
Conclusion(s): Adults treated with intraoperative dexmedetomidine infusion reported lower postoperative pain intensities, consumed less postoperative opioids and showed less opioid-related adverse events compared to placebo.

14AP6-10

Retrospective study comparing continuous preperitoneal versus epidural local anesthetics infusion for abdominal surgery

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Background and Goal of Study: Pre-peritoneal catheters (PPC) for local anesthetic infusion have been associated with shorter length of stay (LOS)1. We compare the analgesic efficacy and complications of PPC versus thoracic epidural (TE) in midline laparotomy.
Materials and Methods: Age, gender, surgical procedure, emergency of surgery, 24, 48 and 72 hours pain scores, supplementary analgesia, side-effects(nausea-vomiting and local anesthetics toxicity), complications (peristalsis recovery, wound infection), and LOS of patients who underwent midline laparotomy throughout one year were retrospectively reviewed.
Numeric rating scale (0-11) was utilized to measure pain. Pain scores were subsequently classified into severe (10-7), moderate (6-4), mild (3-1) and no pain (0) categories.
All the PPC elastomers delivered 5 ml h^{-1} 0,375% levobupivacaine. TE elastomers contained 0,125% levobupivacaine that was infused at a variable rate of 5-12 ml h^{-1}. Intravenous paracetamol 1gr/6 h, and dexketoprophen, 50 gr/8h were prescribed. Tramadol was administered on patient request.
Differences in pain category frequencies were tested with Pearsons $\chi 2$. T Student was used to work out difference in hospital LOS.
Results and Discussion: Two hundred twenty-seven laparotomies were reviewed. 50,7% patients received epidural, 28,6% intravenous PCA with morphine, and 20,7% PPC. Infusion times for TE and PPC ranged from 24 to 96 hours. Urgent surgery was significantly more frequent in PPC group (45% vs 12,8%) The reasons to use PPCs were contraindication or technical impossibility to place an epidural catheter in 70%, and laparoscopy conversion to open surgery in 30% of the cases.
Both techniques showed similar effectiveness for postoperative pain management. Zero pain was more frequent in TE. No patient in either group had severe pain 48 h after surgery, however tramadol was demanded 6% more frequently by patients carrying PPC.
Complication rate was similar in both groups (21,3% vs 26%).
LOS was longer in PPC group (15,8 vs 12,7 days).
Conclusion(s): PPC was an effective alternative analgesic approach for those patients in whom epidural catheter insertion is either impossible or contraindicated. A bigger sample size, enrolling a greater percentage of scheduled procedures would be needed to confirm the impact on LOS.
References:
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14AP6-11

Efficacy of ketorolac vs. tramadol in the treatment of postoperative pain in orthognatic surgery

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Background and Goal of Study: The first objective of this study was to assess analgesic efficacy of ketorolac and tramadol administered IV in treatment of postoperative pain. Secondary objectives were the evaluation of the incidence of side effects and patient satisfaction.
Materials and Methods: After their informed consent, 64 patients ASA I-II, aged 18- 65 years, undergoing orthognatic surgery, were enrolled in this double blind, randomized clinical study. The patients were randomly allocated in two equal groups: group KTR n=32 received ketorolac (Eumat, Epifarma S.r.l.) 30 mg IV and group TMD n=32 tramadol (Tramadol Basi, Laboratórios Basi -S.A.)100 mg IV. The time of the first administration of both drugs was at the time of skin closure and repeated every 8 hrs in first 24 hrs postoperatively. Morphine Sulphate 3-5 mg IV was used as a rescue analgesic. Analgesic efficacy was assessed using a visual analog scale VAS from 1-10, in 2(T0),4(T1), 6(T2),8(T3),12(T4),and 24 (T5)hours from the end of surgery. The side effects: nausea, vomiting, allergic reactions, itching, headache, disorientation were assessed and recorded at T0, T1, T2,T3,T4 and T5.Patient satisfaction was assessed through Satisfaction Rating Scale -SRS (0=not satisfied,1=not very satisfied,2=quite satisfied, 3=satisfied,4=very satisfied).
Results and Discussion: There were no significant differences between the groups with respect to demographic data and duration of anesthesia. Good postoperative analgesia was recorded in both groups. There is no difference between K RT and TRD groups in the pain scores measured, except at the T1.VAS score (KTR vs. TRD) were (4.1vs 5.0, p=NS at T0, (2.8 vs. 5.9, p< 0.05) at T1, (2.2 vs. 2.6, p=NS) at T2, (2.0 vs. 2.5, p=NS) at T3, (2.7 vs. 2.4, p=NS) at T4, (1.1 vs. 1.2, p=NS) at T5.Only a 3 patients in TRD group at T3 required morphine administration to achieve adequate analgesia.
Side effects were reported in 54% of patients of TRD group and in 8.0% of patients of KTR group (p < 0.005). Treatment with ketorolac was considered satisfactory by patients average score with the SRS > 3 at T0, T1, T2, T3, T4, and T5, whereas with tramadol SRS was >3 at T0, T1, and < 2 at T2, T3, T4, and T5 (p< 0.05).
Conclusion(s): Ketorolac and tramadol produced comparable effective postoperative analgesia, but ketorolac showed significant advantage over tramadol considering side effects.

14AP7-1

Effect of oral pregabalin on opioid-induced hyperalgesia in patients undergoing laparo-endoscopic single-site urologic surgery

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Background: Pregabalin is an antiepileptic drug that is effective for treating postoperative pain, neuropathic pain, anxiety, and hemodynamic instability. The aim of this study was to investigate the effect of a single preoperative dose of pregabalin in patients with opioid-induced hyperalgesia (OIH).
Materials and Methods: Ninety ASA I-II patients undergoing laparoendoscopic single-site urologic surgery were randomly assigned to one of the following three groups that received either pregabalin or placebo 1 h before anesthesia and an intraoperative remifentanil infusion. Group plL received placebo and 0.05 μg/kg/min remifentanil, group plH received placebo and 0.3 μg/kg/min remifentanil, and group prH received 300 mg pregabalin plus 0.3 μg/kg/min remifentanil. The primary endpoint was pain intensity upon movement 1, 6, 12, and 24 h after surgery. Secondary endpoints were the area of hyperalgesia and mechanical hyperalgesia threshold 24 h after surgery, time to first postoperative analgesic requirement, and cumulative postoperative volume of morphine administered via a patient-controlled analgesia (PCA) pump over 24 h.
Results and Discussion: The time to first postoperative analgesic requirement in group plH was significantly shorter than that in group plL. The injected PCA volume was significantly greater in group plH than that in the other two groups. Postoperative pain intensity in group plH was significantly greater than that in the other two groups at 6, 12, and 24 h after surgery. The mechanical hyperalgesia threshold and the area of hyperalgesia around the surgical incision 24 h after surgery in group plH differed significantly from those in the other two groups, which were not significantly different. Adverse effects were comparable among groups. Taken together, pregabalin alone

suppressed central sensitization and spinal neuronal hyper-excitability rather than acting as an analgesic.
Conclusion(s): High-doses remifentanil induced hyperalgesia, including increased pain intensity, increased area of hyperalgesia, and decreased mechanical hyperalgesia threshold. These effects were attenuated by oral administration of a single preoperative dose of pregabalin (300 mg) in patients undergoing laparo-endoscopic single-site urologic surgery.
References:
Engelman E, Cateloy F. Efficacy and safety of perioperative pregabalin for post-operative pain: a meta-analysis of randomized-controlled trials. Acta Anaesthesiol Scand 2011; 55: 927-43.

14AP7-2

Epidural analgesia is not superior to systemic postoperative analgesia with regard to establishing chronic or neuropathic pain after thoracotomy

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Background and Goal of Study: To assess prospectively the incidence of chronic and neuropathic pain in patients undergoing anteroaxillary thoracotomy with postoperative epidural analgesia or controlled-release oxycodone pain regimen.
Materials and Methods: 76 patients who underwent anteroaxillary thoracotomy were enrolled in our observational study. 40 patients received postoperatively a standardized oral analgesic protocol with controlled-release oxycodone and IV non opioid (CRO Group), and 37 patients received epidural analgesia with ropivacaine+ sufentanil (EDA Group) and IV non opioid. The painDETECT questionnaire was completed from the patients with one of the authors on the 7th postoperative day and six months postoperatively. Statistical analysis was performed by using SPSS 20.0 statistical package. Differences between groups were analyzed by using the Mann-Whitney-U test and differences in proportions were statistically evaluated by using chi^2 test. Statistical significance was determined at the $p < 0.05$ level.
Results: The data of 59 patients were eligible for statistical analysis, 28 patients in the CRO Group and 32 patients in the EDA Group. 17 patients did not reach the 6-months interval (12 drop outs n the CRO Group and 5 drop outs in the EDA Group). 22 patients in the CRO Group and 24 patients in the EDA Group had a numeric rating scale score (NRS) = 0 after 6 months. 6 patients in the CRO Group and 5 patients in the EDA Group had a NRS 1-3 6-months postoperatively. No patient in the CRO Group and 3 patients in the EDA Group had 6-months postoperatively a NRS 4-6. Neither in the CRO Group nor in the EDA Group we could detect a neuropathic pain 6 months postoperatively corresponding to a painDETECT score > 18. Overall, with regard to NRS, there was no statistical difference between the two groups ($p = 0.13$). 25 patients in the CRO Group and 29 patients in the EDA Group showed 6-months postoperatively a painDETECT score < 13 (definitely no neuropathic pain), and 3 patients in each group had a 6-months painDETECt score 13-18 (p = not significant), implicating that a neuropathic component cannot be excluded definitely.
Conclusions: The incidence of chronic postthoracotomy pain and neuropathic pain can be minimized by anteroaxillary surgical approach and consequent postoperative pain regimen. Epidural analgesia is not superior to systemic postoperative analgesia with regard to establishing chronic or neuropathic pain after thoracotomy.

14AP7-4

Ropivacaine versus levobupivacaine continuously delivered on preperitoneal catheter for acute pain management after abdominal hysterectomy

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Background and Goal of Study: Acute postoperative pain after abdominal hysterectomy is a major clinical problem, that is very challenging to treat. The objective of our study is to investigate the effectiveness and safety of two local anesthetics in continuous preperitoneal infusion, through a multi-perforated catheter, to detect the appropriate alternative for the best quality of analgesia early, after abdominal hysterectomy.
Materials and Methods: 78 ASA I-III women (35-65 years) scheduled for abdominal hysterectomy under standard general anesthesia have been enrolled to a prospective, double-blind trial. They have been randomly assigned to receive through a preperitoneal catheter, either 0.25% levobupivacaine (Group L, n=40) or 0.5% ropivacaine (Group R, n=38) as a bolus of 5 ml at the end of surgery, followed by continuous administration of 5 ml/h during first 24h postoperatively. Patients have received 1g paracetamol x4, respectively 50mg diclofenac x3 and as rescue medication, iv morphine (VAS≥4). Pain intensity at rest (VAS) has been assessed at 4h, 8h, 12h, 24h postoperatively. Time to first demand for rescue analgesia, morphine consumption, potential side effects and patient satisfaction have been recorded. Student t-test and x2 test have been used for statistical analysis ($p < 0.05$).
Results and Discussion: Patients in group R have experienced significantly less pain ($p < 0.05$) along the study, excepting the last time point. At 24h postoperatively VAS scores have been comparable, although a slight advantage maintains in group R ($p=0.08$). Time to first demand for rescue analgesia has been statistically longer in group R ($p < 0.05$). Consumption of rescue medication has been significantly reduced in group R ($p < 0.001$). No clinical evidence of side events has been observed. A significantly higher satisfaction rate has been documented in group R ($p < 0.05$).
Conclusion(s): Preperitoneal administration of 0.5% ropivacaine according to our protocol, during 24h after abdominal hysterectomy is more effective than 0.25% levobupivacaine in terms of a significantly better control of acute postoperative pain, less rescue analgesics and greater patient satisfaction. These clinical advantages of ropivacaine are completed by its safety. Thus, 0.5% ropivacaine infused through a preperitoneal catheter should be a good choice, as part of multimodal approach of acute postoperative pain, after abdominal hysterectomy.

14AP7-5

Preemptive analgesia for pain after tonsillectomy using ropivacaine local injection and continuous remifentanil administration

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Introduction: Tonsillectomy is a relatively minimally invasive surgical procedure. However, its postoperarive pain is severe so it often prevents ingestion of water and meal and good sleep. That would reduce the patients' satisfaction.
Although the concept of preemptive analgesia is known, there are few reports of its effect for the postoperative pain of tonsillectomy.
In the present study, we investigated the effects of preoperative subcapsular ropivacaine injection and continuous administration of remifentanil started before surgery on postoperative pain.
Method: Fifty patients (16-62 years old) scheduled to undergo tonsillectomy for chronic tonsillitis were randomly divided into the local anesthesia group (n=17), who were given subcapsular 0.75% ropivacaine injection (1cc per one side) before surgery, the remifentanil group (n=16), who were given continuous remifentanil infusion at 0.1-0.2 mcg/kg/minute started before surgery, and the control group (n=17), who received neither medication. Sevoflurane and fentanyl were used for anesthesia maintenance in all of the groups. The severity of pain was evaluated in 11 ranks using verbal rating scale (VRS) from the day of surgery to postoperative day 3 at 3 points per day. In addition, we compared the total dose of additional analgesics (NSAIDs) among the groups. For statistical analysis, Student's t-tent was used. A value of $p < 0.05$ was considered to indicate a significant difference.
Results: The patient characteristics were not different among 3 groups. There was no significant difference among 3 groups in the mean VRS of operation day, POD2 and POD3, but only the mean VRS of POD1 in the local anesthesia group and remifentanil group were lower than that of the control group. The total dose of additional analgesics was also lower in local anesthesia group as compared the others. (Table1 and Figure1,2).
Conclusion: Our results suggested that preemptive analgesia with preoperative local anesthesia using 0.75% ropivacaine and remifentanil started before surgery are effective for patients undergoing tonsillectomy.

14AP7-6

Efficacy of preoperative nefopam on acute postoperative pain control after gynecological laparoscopy

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Background and Goal of Study: In this study we have tested whether nefopam, intravenously injected during induction of anaesthesia, could improve the quality of acute postoperative pain management in patients undergoing non-oncologic gynecological laparoscopy.
Materials and Methods: After local institutional approval and written informed consent, 104 women, ASA I-III (21-55 years), scheduled for non-oncologic gynecological laparoscopy have been included into a prospective double-blind, placebo-controlled trial. Patients have been randomly allocated to receive intravenously 20 mg nefopam (group N, n=53) or saline (group S, n=51) during the induction of anaesthesia. Standard general anaesthesia has been used in all subjects. Acute postoperative analgesia protocol has been based on PCA morphine (bolus of 1 mg, lockout period of 10 minutes) and iv paracetamol (1g x4).
Primary objectives have been acute postoperative pain at rest and during slow mobilization (VAS) evaluated at 1, 2, 4, 8, 12, 24h after procedure, time to first bolus request and total morphine consumption during follow-up period. The incidence of nausea/vomiting and volume of blood loss have been controlled as secondary objectives. For statistics student t-test has been used ($p < 0.05$).
Results and Discussion: Groups have been homogenous concerning demographics, complexity and duration of intervention. Acute pain has been statistically better controlled in group N until 8h postoperatively for resting pain ($p < 0.001$), respectively until 4h postoperatively for pain at mobilization ($p < 0.05$). For the following intervals VAS scores at rest and at movement have maintained lower in group N versus group S, without statistical value. First demand on PCA has been later in group N ($p < 0.05$). Total morphine consumption has been found statistically reduced in group N ($p < 0.001$). A clinically and statistically relevant reduction of nausea/vomiting incidence has been recorded in group N ($p < 0.05$). We have detected no difference regarding early postoperative blood loss.
Conclusion(s): A single preoperative dose of nefopam, intravenously administered in gynecological laparoscopy seems to act as a valuable adjuvant of postoperative analgesia protocol with PCA morphine and paracetamol. Thus, nefopam effectively improves acute postoperative pain control during first 24h post-procedure, reduces opioid requirements and morphine associated side-effects, without any serious impairment.

14AP7-7

Multimodal analgesia - a standard of care in severe surgical thoracic trauma patients?

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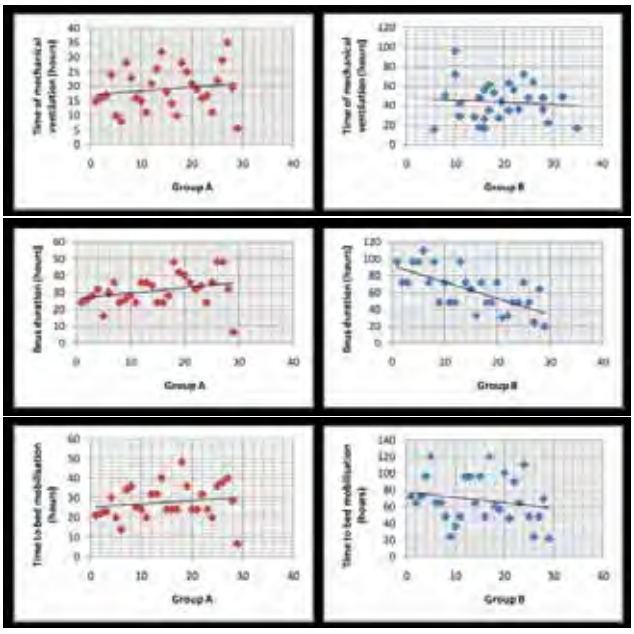
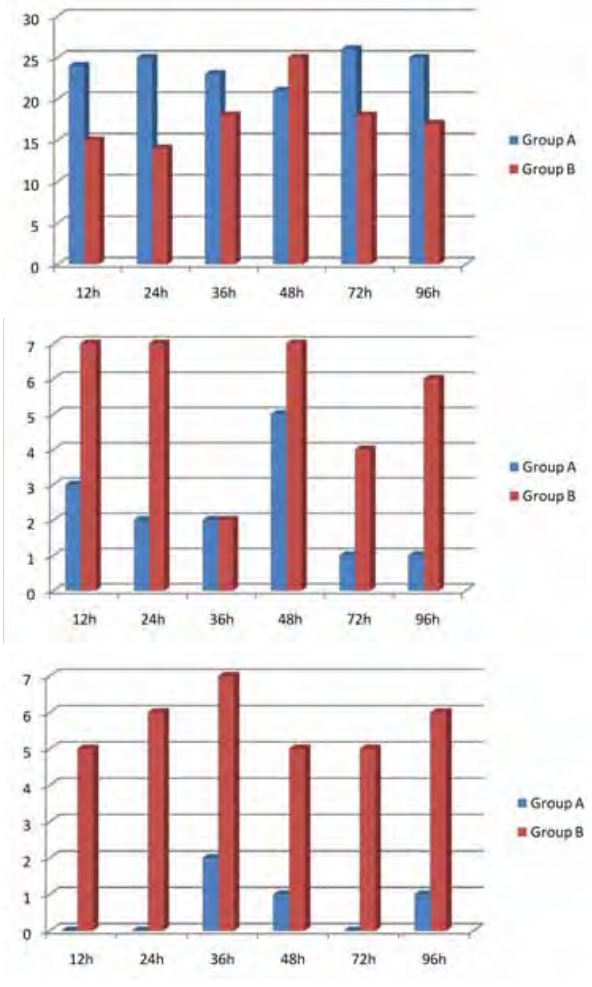
Background and Goal of Study: Surgical patients with severe thoracic trauma (flail chest, multiple rib fractures) experience severe pain, dificult to treat, with important consequences on gas exchanges, time of ventilatory support, clearance of secretions, time to mobilisation and ICU stay, chronic pain development.
Prospective, observational study; compares the efficacy of a multimodal analgetic regimen (sufentanyl + ropivacaine via thoracic epidural catheter + ketorolac i.v.) vs. a standard monomodal morphine i.v. regimen
Materials and Methods: 54 patients, 20-78 years old admitted in ICU with surgical stabilization of flail chest after severe thoracic trauma were assigned in 2 groups:
Group A: multimodal analgetic regimen (sufentanyl 0,5 μg/ml + ropivacaine 0,2% via thoracic epidural catheter, 4-6 ml/h + ketorolac 15 mg i.v. every 8 h), for 5 days; extraanalgesia : at VAS 30-60 bolus 2-3 ml via catheter, at VAS >60 morphine 5 mg s.c.
Group B: monomodal analgesia - i.v. morphine 2 mg/h, continuously; extraanalgesia at VAS 30-60 morphine bolus 2mg i.v. each 3-4h, at VAS > 60 morphine bolus 5mg i.v. each 3-4h.
VAS score at rest and at mobilisation, duration of mechanical ventilation, time to early mobilisation, ileus duration, VAP incidence and chronic pain development were assessed in both groups

Results and Discussion:



[Results-1]



[Results 2]

Conclusion(s): By blocking at different level the pain pathways, the multimodal regimen is more efficient than monomodal therapy in terms of pain management, allowed a more efficient breathing and coughing, early weaning and mobilisation, increased the clearance of lung secretions and improved the oxygenation. By inhibiting the transcriptional changes in dorsal

horn neurons and the central sensitisation pathways, chronic pain development dramatically decreased in group A. Unfortunately, no significant difference in VAP incidence.

14AP7-8

Analgesia Nociception Index (ANI) for detection of noxious stimulation during sevofluran-remifentanil anaesthesia

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Background and Goal of Study: Assessment of nociception - anti-nociception balance during anesthesia is still a clinically challenging issue and measurement has not yet been fully established in anaesthesia practise. A new variable, the Analgesia Nociception Index (ANI) (MetroDoloris, Loos, France) derived by heart rate variability of the ECG has been developed to measure analgesia during unconscious state of anaesthesia.
The aim of the present study was to examine the ability of ANI, in comparison to previously described surgical pleth index (SPI; 2), to detect standardized noxious stimulation during sevoflurane anaesthesia and various remifentanil concentrations.
Materials and Methods: After Ethics approval and informed consent, in this prospective study 25 patients were anaesthetised using sevoflurane until Bispectral Index (BIS) - value of 30-60. A laryngeal mask (LMA) was inserted and anaesthesia was continued with remifentanil effect-site concentration (Ce_{remi}) of 0, 2 and 4 ng·ml^{-1}. Tetanic stimulation (STIM) was applied at least 5 minutes after changing remifentanil concentration. ANI, SPI, BIS, heart rate (HR) and mean arterial pressure (MAP) were obtained in each patient before and after LMA insertion and each STIM. Statistics were performed using Wilcoxon rank test (correction for multiple comparisons).
Results and Discussion: ANI significantly ($p < 0.05$) indicated noxious stimulation with median change [IQR] of -20 [-10 - -54] during LMA insertion as well as -49 [-36 - -62] and -24 [-6 - -34] during respective STIM at 0 and 2, but not at 4 ng·ml^{-1} Ce_{remi} (-11 [4 - -29]). On the other hand, SPI was significantly changed at all examined stimulations with median change of 23 [12 - 38], 26 [19 - 37], 7 [4 - 15], 3 [2 - 8] during respective LMA insertion, 0, 2 and 4 ng·ml^{-1} Ce_{remi}. Neither BIS, HR or MAP indicated inadequate anti-nociception by significant change during stimulations.
Conclusion(s): ANI and SPI, but not BIS, HR and MAP enabled reflection of noxious stimulation during sevoflurane anaesthesia and varying remifentanil concentrations. Therefore, these variables may be suitable for guidance of nociception - anti-nociception balance during anaesthesia.
References:
1. . Jeanne M et al. *J Clin Monit Comput* 2012;26:289-94 2. Huiku M et al. *Br J Anaesth* 2007;98:447-455
Acknowledgements: Monitors were gratefully supplied by MetroDoloris (France) and GE Healthcare (Finland).

14AP7-9

Audit of perioperative pain management and outcome in elderly patients with hip fracture

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Background and Goal of Study: Aging of the population is increasing in developing countries. Perioperative pain management remains a persistent problem, particularly for elderly (Thielke et al. J Am Geriatr Soc 2012; 60:1393-1400). Hip fracture is associated to severe acute pain which may prevent rapid mobilization and thereby increase patient's morbidity and mortality. The present study is an internal audit of perioperative hip fracture management.
Materials and Methods: After IRB approval, retrospective analysis of medical records from 100 consecutive patients admitted for hip fracture (June-December2011) was performed from emergency department (ED) admission until discharge.
Evaluation focused on medical history-specifically mental status, pain evaluation and treatment. Descriptive statistics and correlations were used, $P < 0.05$ significant.
Results and Discussion: 79 completed records were analyzed: median age 84yrs (IQR 76-88), 73% women, 39 gamma nails, 40 hip replacements. Lengh of hospital stay ws 8.5 days (IQR 7-11). Mortality rate within 6 months: 18 patients (23%). Dementia was correlated with mortality within 6 months ($r=0.33; P=0.003$) but not with PACU confusion/delirium.

	Emergency Department	PACU Recovery room	Ward
Pain assessement (n)	Not reported	76 (96%)	16 (20%) day1; 13 (17%) day2
Pain scores(VAS,0-10)	Not reported	3 (IQR 0-5)	5 (IQR4 - 5) day1; 4 (IQR3 - 5.3) day2
Confusion/Delirium(n)	13 (16%) advanced dementia	7 (9%)	1? Not reported
Iliofascialblock(n) Paracetamol (n); Tramadol (n); Piritramide (n)	25 (32%); 70 (89%); 35 (44%); 6 (7%)	29(37%,anesthesia); 79 (100%); 12 (15%); 44 (56%)	NA; 79 (100%); 79 (100%); 16 (20%) PCA

[Perioperative management]

Conclusion(s): Audit pointed out several points to improve as the lack of objective pain assessement both in ED and ward while only 16% of patients had documented advanced dementia at admission. Also, 9% of patients presented delirium in PACU with no documented ward followup. Analgesia in ED and ward was suboptimal, usind mainly tramadol which is not adapted in case of severe pain and may worsen delirium in elderly (Rudolph et al. Arch Intern Med 2008;168:508-13).

14AP7-10

Does neuromuscular blockade affect postoperative pain?

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Background and Goal of Study: Neuromuscular blocking agents are part of a balanced anesthesia regimen and are commonly administered to facilitate tracheal intubation and muscle relaxation during surgery. However, there is no evidence that neuromuscular block per se improves patient care in terms of postoperative pain. The purpose of this study is to investigate whether the reduced use of neuromuscular blocking agents for abdominal hysterectomy increases the postoperative consumption of analgesics.
Materials and Methods: 44 patients ASA I-II, aged 32-58 years old scheduled for abdominal hysterectomy were randomly assigned into the following groups. Group M (n = 21) received for induction propofol 2.5 mg/kg, fentanyl 3 μg/kg and rocuronium 0.6mg/kg while anaesthesia was maintained with 1-1.2 minimum alveolar concentration of desflurane and nitric oxide, morphine 0.1 mg/kg and bolus doses of rocuronium so that $TOF < 1$. Group N (n = 23) received similar induction and maintainance but with no addititonal rocuronium so that $TOF > 3$. For postoperative analgesia both groups received iv morphine by PCA pump for 24 hours (bolus 1mg, lockout 7min, no background infusion). Pain assessment was performed at rest and cough 1, 3, 6, and 24 hours postoperatively by Visual Analogue Scale (VAS 0-100). Morphine consumption and side effects were also recorded at the same intervals.For statistical analysis we used student t-test.
Results and Discussion: In group N morphine consumption was greater compared to group M (14.1 vs 11.8 mg, $p > 0.05$). Pain scores during rest and cough, the incidence of nausea, vomiting and sedation were similar in both groups.
Conclusion(s): Although the 24 hour morphine consumption in group M is reduced this wasn't statistically significant. Perhaps a larger number of patients would be necessary to confirm this difference.

14AP8-1

Neuropathic pain in humans is associated with elevated TNF-α concentrations in blood and cerebrospinal fluid

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Background and Goal of Study: Animal studies suggest pro-inflammatory cytokines are implicated in the generation of neuropathic pain (NP). To date, no clinical use is found for cytokines in the diagnosis of NP. We investigated if TNF-α can be used as a biomarker for NP in humans.
Materials and Methods: The Ethics Committee of the Ziekenhuis Oost-Limburg approved the study. TNF-α concentrations were determined by ELISA (Abazyme®, Needham, USA. Detection range: 2,4 -500 pg/ml) in cerebrospinal fluid (CSF), serum and plasma (S&P) from patients with NP (NP-group), nociceptive pain (CSF-controls) and pain free volunteers (S&P-controls).
The NP-group consisted of patients suffering from failed back surgery syn-

drome with predominant radicular pain.
The neuropathic nature of the pain was confirmed with a DN4 questionnaire (cutoff ≥ 4). The NP-group was age and gender matched with CSF-controls on one hand and S&P-controls on the other hand. CSF-controls were patients with nociceptive knee or hip pain (DN4 score < 4) scheduled for arthroplasty under spinal anesthesia. S&P-controls were pain-free volunteers. Patients and controls with conditions known to alter CSF, S&P concentrations of TNF-α were excluded. All samples were collected between 8 and 12 AM to minimize effects of a circadian rhythm. A Wilcoxon matched-pairs signed rank test was used to compare data between NP-group and CSF- and S&P-control groups. A Spearman correlation was performed to evaluate a relation between S&P- and CSF-concentrations of TNF-α in the NP-group. Data are presented as mean±SEM.
Results and Discussion: Over a 3-year period 20 NP-patients were included. 12 NP-patients (7M/5F, age 53±4y) were matched with CSF-controls and 13 NP-patients (5M/8F, age 46±2y) were matched with S&P-controls. TNF-α concentrations were significantly higher in S&P and CSF of NP-patients compared to controls (100.4±86.26 pg/ml *vs*. 1.5±0.2pg/ml, $p=0.001$; 120.2±103.2pg/ml *vs*. 2.0±0.6pg/ml, $p=0.002$ and 15.4±2.1 *vs*. 11.0±1.0, $p=0.02$ respectively). There was a significant correlation between S&P-concentrations of and CSF-concentrations of TNF-α ($r=0.86$, $p< 0.0001$ and $r=0.77$, $p< 0.0001$ respectively)
Conclusions: TNF-α is elevated in blood and CSF of patients suffering from neuropathic pain. Whether this constitutes cause or effect needs further elucidation. These initial results suggest a role for TNF-α as biomarker in NP.

14AP8-2

Serum brain-derived neurotrophic factor levels are decreased in patients suffering from neuropathic pain

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Background and Goal of Study: Different animal models of neuropathic pain (NP) implicate brain-derived neurotrophic factor (BDNF) in their pathophysiology. Recently, human trials showed that BDNF modified the effect of gender differences on heat and pressure pain thresholds in healthy volunteers. We investigated if BDNF-concentrations in serum and plasma differ between patients suffering from NP and pain-free controls.
Materials and Methods: The Ethics Committee of the Ziekenhuis Oost-Limburg approved the study. Blood platelet count in whole blood (flowcytometry) and BDNF-concentrations in serum and plasma (S&P) (ELISA, R&D systems® Europe, Abingdon, United Kingdom. Detection range: 20-4000 pg/ml) were determined in patients suffering from failed back surgery syndrome with predominant neuropathic radicular pain (DN4 questionnaire ≥ 4, NP-group). The NP-group was age and gender matched with pain-free volunteers (S&P-controls). BDNF stored in platelets was calculated as follows: serum BDNF - plasma BDNF / blood platelet count (attogram/platelet). Subjects with conditions known to alter S&P concentrations of BDNF were excluded. All samples were collected between 8 and 12 AM to minimize effects of a circadian rhythm. A Wilcoxon matched-pairs signed rank test was used to compare data between the NP-group and S&P-controls. Data are presented as mean±SEM.
Results and Discussion: Over a 3-year period 13 NP-patients (5M/8F, age 46±2y) were matched with S&P-controls. BDNF-concentrations in the serum of the NP-group were significantly lower compared to S&P-controls (6158±2067 pg/ml vs. 16853±2260 pg/ml, $p=0.007$ respectively) whereas in plasma there was only a trend towards lower BDNF-concentration in the NP-group (1262±277.8 pg/ml vs. 1629±112.7 pg/ml, $p=0.06$). BDNF stored per platelet was significantly lower in the NP-group compared to S&P-controls (22.8±11.7 ag/platelet *vs*. 61.6±8.4 ag/platelet, $p=0.016$)
Conclusions: Serum BDNF-concentration and platelet BDNF content in patients suffering from NP are markedly lower compared to pain free controls. Whether the lowered BDNF-serum and -platelet concentrations play a role in the pathophysiology of NP warrants further research, as does the role of BDNF as a possible biomarker.

14AP8-4

Analgesia for thoracotomy in a cancer center (epidural vs patient-controlled analgesia)

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Background and Goal of Study: Thoracotomy is recognized as being one of the most painful surgical procedures, involving muscle layers, rib and nerve resection and continuous motion as the patient breathes[1]. Pain relief is essential to keep the patient comfortable and to minimize pulmonary complications[1].
There are a variety of modalities for treating postoperative pain[2], but thoracic epidural analgesia (EA) has been considered the *gold standard*[1]. Our goal is to compare the pain scores at 24 hours and patients' expectations concerning postoperative pain, in patients undergoing thoracotomy with EA or patient-controlled analgesia (PCA).
Materials and Methods: In a retrospective study we analyzed data from our Acute Pain Service's (APS) database about 122 patients undergoing thoracotomy from May 2011 to November 2012.
The analyzed parameters were: gender, ASA status, type of anesthesia, analgesic strategy, dynamic and at rest pain scores at 24h and patients' expectations.
Results and Discussion: The majority of patients were male (59.02%) and classified as ASA II (58.20%). General anesthesia was done in 80 patients and combined anesthesia in 42.
Continuous perfusion analgesia by a thoracic epidural catheter was performed in 47 patients, whereas PCA was used in 75. All the patients were followed by our APS, the majority during 3 to 5 days.
Pain scores at rest at 24h revealed that the majority (91.49 %) of the patients in the EA group had none or mild pain (numeric rating scale (NRS) 0-2) but, in the PCA group, only 68.00% of the patients had none or mild pain ($p < 0.01$).
Regarding dynamic pain, all the patients had higher levels of pain, described as moderate or intense (NRS 3-10), mainly in the PCA group (86.70% of the patients) than in the EA group (57.45%) ($p < 0.01$).
Patient's expectations regarding postoperative pain were described as better than expected in 53.19% patients in the EA group, and 33.33% in the PCA group ($p < 0.03$).
Conclusions: Regarding analgesic strategy the preferred method is EA, as shown by the statistically significant results. Moreover the patients' expectations concerning postoperative pain were also statistically significant between the two groups. The dynamic pain is of utmost importance in the evaluation of pain levels.
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14AP8-5

Postoperative analgesia for opioid-dependant cancer patients

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Background and Goal of Study: The number of cancer patients under opioid treatment is increasing and their perioperative pain control is a challenging task. There is no established guideline of postoperative pain management in these patients, and we, anaesthesiologists, prescribe opioids mostly based on anecdotal reports and our personal experiences.
We tested our protocol for postoperative pain control in opioid-dependent patients.
Materials and Methods: We have been using our institutional pain management protocol for chronic opioid dependant-cancer patients. With approval of IRB, we conducted retrospective chart review in opioid-dependant adult cancer patients having undergone surgery.
In brief, our pain management protocol consisted of the following policies such as:
1) Maintenance of preoperative baseline opioids,
2) Epidural analgesia if applicable,
3-A) Additional opioid by epidural morphine 3 - 4 mg/day or intravenous fentanyl patient-controlled analgesia (IV-PCA) at basal rate of 0.4 - 0.6 mcg/kg/hr in patient receiving preoperative smaller-dose opioids (less than 210 mg/day of oral morphine equivalents),
3-B) Additional opioid by 30% of baseline opioids in patients receiving preoperative larger-dose opioids (more than 210 mg/day).
To evaluate the validity of our protocol, we defined as an unsuccessful pain control when patients received rescue-opioid more than twice or needed to

increase the basal dose within the first 2 postoperative days.
Results and Discussion: Between April 2008 and September 2012, 56 cases out of 74 opioid-dependant patient surgery cases completed the protocol. No severe opioid-related adverse events and symptoms suggesting opioid withdrawal were documented. Patients received wide-range of preoperative baseline opioids (15 to 1800 mg/day, median: 60 mg/day of oral morphine equivalents).
Pain management was unsuccessful in 22 patients according to our definition. Our protocol tended to succeed in patients with epidural analgesia (78% vs. IV-PCA 48%, p=0.02), and those who had smaller-dose of opioids preoperatively (65% vs. larger-dose 46%, p=0.21).
In most of the unsuccessful pain controlled cases, the pain could be controllable with increase of the basal rate of IV-PCA. In very high dose opioid dependant patients, we might need to modify the protocol.
Conclusion: Our current pain management protocol is clinically acceptable.
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14AP8-6

The role of interventional pain treatment in gynecologic cancer: neurolysis and spinal analgesia

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Background and Goal of Study: Most patients (>90%) with cancer pain achieve good pain relief using traditional analgesic treatments. However, remaining 5 to 10% patients suffers from severe and refractory cancer pain. Especially, pain in gynecologic cancer can sometimes be severe and often impairs their quality of life. When conservative pharmacologic pain treatment fails to achieve adequate pain relief, interventional techniques are warranted. We retrospectively evaluated 189 individuals whom were entrusted to Pain and Palliative Care Team (PCT) in our hospital. Aim of our study is to evaluate the role of interventional approaches in gynecologic cancer pain.
Materials and Methods: The chart of 197 patients with gynecologic cancer pain during the period of 2009 to 2012 (45 months) were reviewed. Interventional pain treatment was considered and done by board pain specialist in palliative care team. Sympathetic neurolysis, spinal neurolysis (phenol), epidural and intrathecal analgesia with implanted port was performed in 57 cases. Patient background, given opioid dose, pain scores(NRS), and performance status was obtained and evaluated, pre/post interventional treatments.
Results and Discussion: 81 ovary-, 57 cervical-, 30 uterus-, 9 vulvovaginal-,6 retroperitoneal cancer, and 14 others were consulted to PCT for additional pain treatment and 25.9%, 28.1%, 36.7%, 33.3%, 33.3%,28.6% of the patient required interventional pain treatement, respectively.
Outcome differed betweent patients due to various progression of the disease and symptom severity. In 57 cases of interventions, epidural analgesia was the most favored procedure(34/57) and NRS also decreased from 6.14 to 1.81 (p< 0.01) NRS improved significantly in other procedures such as, Sympathetic neurolysis 4.54 → 2.82, spinal neurolysis; 5.00 → 2.375, and intrathecal analgesia 6.16 → 1.66, respectively.
Additionally, daily given dose of opioid and adjuvant drugs significantly decreased after the procedure.
Conclusion(s): Intrathecal or epidural opioids in combination with local anesthetics provide effective analgesia with minimal side effects. Sympathetic blockade of the superior hypogastric nerve plexus seemed to be more effective with combination of inferior mesenteric plexus block for pelvic pain. Although indications are narrow, primary physician should be aware of these available procedures and should consult pain specialist before elevating opioids and adjuvants.

14AP8-7

Evaluation of analgesic and hypnotic effects of remifentanil by in vivo patch-clamp recordings

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Background and Goal of Study: Remifentanil is clinically used as a strong analgesic drug. However, it is unclear how they affect pain transfer to the brain. We previously reported the way to analyze hypnotic and analgesic effects of propofol on the brain by in vivo patch-clamp recordings. Using the same method, we aimed to examine the effect of remifentanil on the response of mechanical stimuli to the skin in the primary somatosensory cortex (SI).
Materials and Methods: Sprague-Dawley rats (n=6, 3-4 weeks old) were anesthetized with urethane (1.5 g / kg). In vivo whole-cell patch-clamp recordings were performed from SI neurons which responded to the mechanical stimuli to the receptive field of the hind paw area. Remifentanil (1μg / kg) was administered intravenously to the rat after starting recordings. First, we confirmed the effect of remifentanil on the consciousness of rats by observing the oscillation of membrane currents whose frequency was synchronized with that of electroencephalogram before and after administration of this agent. Next, we evaluated the analgesic effect by analyzing the responses of SI neurons evoked by pinch stimuli to the hind paw on the contralateral side.
Results and Discussion: Remifentanil didn't decrease the frequency of oscillation suggesting its poor hypnotic effect. One minute after administration of remifentanil, the baseline holding currents were not significantly changed, but the barrage of excitatory postsynaptic currents evoked by the stimuli was completely abolished. These results revealed that remifentanil inhibited the pain perception in the SI.
Conclusion(s): The current study suggests that remifentanil blocks pain transfer to the brain without affecting the condition of consciousness.

14AP8-8

The pupillary dilatation reflex can be used to improve immediate postoperative pain management

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Background and Goal of Study: Rapid control of acute postoperative pain at the time patients recover consciousness and the ability to feel noxious stimuli is a critical step in the global process of postoperative pain managementThe evaluation of pain intensity during the immediate postoperative period may be difficult in some circumstances.The pupillary dilatation reflex (PDR) has been successfully used to assess the analgesic component of a balanced anesthetic regimen and we hypothesized that PDR might be useful in detecting pain and titrating analgesia after surgery in patients in whom direct communication is difficult.
Materials and Methods: After hospital ethical committee approved the study and written informed consent was obtained, 70 patients (American Society of Anesthesiologists physical status I-III) scheduled to undergo general surgical procedures were included in this prospective observational study conducted between 1 January and 30 June 2012, in Constanta County Emergency Hospital.Postoperative pain intensity was assessed by using a simple five-item verbal rating scale (VRS). After patients awoke from general anesthesia, those experiencing VRS more than 1 received intravenous 2-mg boluses of morphine as titration, with 5-min intervals between two injections, until pain returned to VRS of 1 or fewer.Patients experiencing an initial VRS = 0 or VRS = 1 did not receive morphine titration.Before and after intravenous morphine titration, the PDR induced by a standardized noxious stimulus was measured with a portable pupillometer.A receiver-operating curve was built to estimate the accuracy of PDR in objectively detecting patients requiring morphine titration.
Results and Discussion: On the initial evaluation, a correlation was found between VRS and PDR (ρ = 0.76 [0.73-0.89], P < 0.0001).In the 37 patients that had a VRS more than 1, PDR before and after morphine titration was respectively 35% (31-40) versus 16% (9-21); P < 0.0001.The PDR threshold value corresponding to the highest accuracy to have VRS more than 1 was 21%, with 93% and 95% sensitivity and specificity, respectively.
Conclusion(s): A PDR value >21% is associated with a high probability to have VRS more than 1, and therefore to require morphine titration. In the immediate postoperative period, the PDR is significantly correlated with the VRS. The pupillometer could be a valuable tool to guide morphine administration in the immediate postoperative period.

14AP8-9

Quality assessment of postoperative pain management following adult cardiac surgery

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Background and Goal of Study: Postoperative pain relief is one of major concerns for patients undergoing cardiac surgery. The objective of this study was to determine the incidence and risk factors of moderate to severe pain and analgesic- related side effects in adult during 24 hours following cardiac surgery.
Materials and Methods: We conducted a retrospective cohort of patients aged >18 years who underwent median sternotomy for elective cardiac surgery at Chiang Mai University Hospital from January 1, 2008 to December 31, 2010. Pain intensity was assessed by a numeric rating scale(NRS) every 2 hours postoperatively.
Demographic data, type of operation (coronary bypass graft, valve surgery), duration of surgery and side effects including nausea, vomiting, sedation score $\geq$3 and respiratory rate < 10 /min were recorded.
Results and Discussion: Two thousand and fifty four patients were included in this study. Morphine infusion at dose 1-2 mg/hr and fentanyl infusion at dose 10-20 μg/hr were used in 97% and 3% of patients, respectively. A small bolus dose of opioids was prescribed for supplement when patient had moderate to severe pain. Incidence of moderate to severe pain was 40.2%, 41.3%, 36% and 23.2% at 6, 12, 18 and 24 hour postoperatively.
Among factors including age group, gender, type of operation and duration of surgery, only young age group (18-40 years) was the risk factor of developing moderate to severe pain (RR=1.51; 95%CI: 1.06-1.38). Only 58%, 65% and 42% of patients who had moderate to severe pain received bolus dose at 6, 12 and 18 hour postoperatively. Nausea and /or vomiting, sedation score $\geq$3 and respiratory rate < 10 /min occurred in 31.6%, 1.2% and 1.9% of patients, respectively. Respiratory depression significantly occurred in patient aged > 50 years.
Conclusion(s): Postoperative pain management after adult cardiac surgery provided sufficient analgesia for only about 60%.
Prophylactic antiemetic, frequent assessment, patient controlled analgesia technique, adequate monitoring respiratory depression could improve the quality of pain control and minimize side effects.

14AP8-10

Incidence of chronic pain after ingunial hernia repair: results of 2 years follow-up

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Background and Goal of Study: Chronic pain (CP) after inguinal hernia repair is reported by 5-30% of adult, but it is unknown whether the pain is a result of surgery or can be attributable to other factors such as preoperative and postoperative pain, physical, and psychosocial status. Therefore, the aim of the present study was to determine the risk factors and incidence for CP after inguinal hernia repair.
Materials and Methods: The study population comprised all patients in our research and teaching hospital who underwent a inguinal hernia repair between 2011 and 2012. At 24 hours post surgery VAS was measured. A telephone interview was undertaken between 1, 3 and 6 months after surgery, recoding: pain or discomfort, need of analgesic drug, VAS and neuropatic pain symptoms. CP was defined as significant pain persisting after 3 months and VAS>3. Statistical analysis was performed with a Student's t-test and Chi-squared (P values< 0.05).
Results and Discussion: Questionnaires were performed the 204 patients. 87% were men and 13% women. Mean age 59±11years. 78.2% of patients had preoperative pain and 5.2% recurrent hernia. Regarding anaesthesia, 93.7% patients underwent regional anaesthesia and 6.3% underwent general anaesthesia. The incidence of postoperative pain, after three month of the surgery, was 18% (mild to moderate). None of the patients had severe CP. In 48% of patients with CP had neuropatic characteristics.
Conclusion(s): The prevalence of CP pain after inguinal hernia repair was of 18%, similar to that previously reported. It's important to consider the presence of recurrent hernia and preoperative pain as a predictive factor of pain. Risk factors for CP reported in the literature (e.g. anaesthesia, gender, type of surgery and use of mesh) did not inluence CP in this study.
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Education, Research and Presentation

15AP1-1

What do non-anaesthiologists really know about spinal anaesthesia?

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Background: There are limited data on non-anaesthesiologist's knowledge in anaesthesia and more precisely spinal anaesthesia. This study aims to compare knowledge on spinal anaesthesia (SA) among cardiologist (C) and internal medicine physicians (IM) working in general universitary hospitals, either in tertiary referral hospital (TH) or a secondary hospital (SH).
Materials and Methods: We performed a transversal study based on a questionnaire proposed to C and IM working in a TUH and a LH. We assessed: work experience in operating room environment (OR), years of experience (< 5 or >5 years), practice of preanaesthetic evaluations (PAE), assumed and real general knowledge on SA, haemodynamic changes after SA, contraindications of SA, hypertensive, antiplatelet and anticoagulation management previous to SA and mortality associated with SA. We compared variables using X^2 Fisher tests and p< 0,05 was considered significant.
Results and Discussion: 51/61 distributed questionnaires were collected (53% in TH and 47% in SH). C and IM had comparable experience (p=1.0). C had a tendency to higher OR in TH (p=0,05) and C were more likely to perform PAE in SH (p=0,005). 78% of physicians assumed they had knowledge on SA, with no significant differences for specialty (p=0,72) and for workplace (p=0,50). 65% of physicians had >50% and 19% >75% correct answers on the topics assessed. Physicians in TH ranked higher in general knowledge (p=0,02), antiplatelet and anticoagulation (p=0,04) and tended to show major knowledge of contraindications of SA (p=0,06) with no differences in knowledge of hemodynamic variations after SA (p=0,25), antihypertensive management (p=0,22) and mortality (p=0,50). Those who assumed to have knowledge on SA ranked higher than those who didn't only for contraindications of SA (p=0,01). Only 4% of physicians knew the mortality rate associated with cardiac arrest after SA.
Conclusions: In our country IM and C are sometimes asked to perform PAE before surgery. These physicians frequently prescribe anticoagulants and antihypertensive drugs. For that reason, they should have sufficient knowledge on anesthesia techniques as well as interactions of these drugs in relation to SA. Although a high number of physicians assume they have knowledge on SA, they showed deficient knowledge when questioned. Physicians working at a TH had higher knowledge.,. Anaesthesia continues to be a great unknown among other specialties, and mortality is greatly underestimated.

15AP1-2

Scientific activity and attendance to congresses and courses of residents of anaesthesia and intensive care: the experience of a university hospital

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Background and Goal of Study: During the formative period of anesthesia residents (AR), clinical knowledge and abilities are acquired, as well as scientific and research skills. In our center, residents are expected to attend congresses and courses during their training as part of their initial formation. This descriptive study was realized among second (R2), third (R3) and fourth (R4) year AR in our university hospital to analyze their scientific activity (SA)

and the number of days spent outside the hospital to attend congresses and courses (DCC) in 2012.
Materials and Methods: The DCC of 29 AR in 2012 was collected from Lya2®, a workforce management program used in our department. An analysis of anesthesia residents SA was performed, based on a systematic report of publications in scientific journals, posters presented in congresses and active research projects in 2012, either as author or co-author. Data were analyzed for SA and DCC depending on the year of residence. $p < 0.05$ was considered significant.
Results: AR had 3.0±3.6 DCC in 2012 (R2: 1.4± 1.2 DCC, R3: 3.1±4.9 DCC and R4: 4.1±3.7 DCC; p=NS). 25% of AR did not request DCC (20% R2, 20% R3 and 30%R4; p=NS). No R2 had ≥5 DCC, versus 10% R3 and 50% R4. 1 resident had ≥10 DCC. Concerning SA, 90% R2, 30% R3 and 60% R4 were actively working in one or more research projects (p=NS): 32 posters (R2=4, R3=23 and R4=5) were presented in national or international meetings. 12 papers were published or accepted for publication in scientific journals indexed in Pubmed® (R2=2, R3=9 and R4=1) and 47 active research projects were reported (R2=23, R3=14 and R4=10). SA is higher for R2 and R3 compared to R4 (p=0,001). Resident's SA was correlated to the number of DCCs (r^2=0,69; p< 0,0001 and r^2=0,73; p< 0,0001 respectively).
Discussion and Conclusion(s): In 2012, SA and DCC were constant among AR with no major difference depending on the year of formation, however, R2 and R3 are more involved in SA. Last year residents were the less active, probably due to time spent for the preparation of the European Diploma in Anaesthesiology and Intensive care. This survey didn't include courses performed outside the work times, which may limit our study. We believe that there should be a positive feedback between SA and DCC, so that the motivation of residents to be involved in research projects allows them to increase their scientific level.

15AP1-3

Assessment of patient's anxiety and need for information by trainees in anesthesiology during the preoperative visit

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Background and Goal of Study: The management of postoperative pain still remains a challenge in around 30% of patients. Preoperative patients' anxiety level and information requirement may help to predict postoperative pain severity (1). The Amsterdam Preoperative Anxiety and Information Scale (APAIS) is a useful tool which the French version has been recently validated (2). The present study is aimed to evaluate whether trainee anesthesiologists (TAnes) assess correctly patients' anxiety and need for information during the preoperative visit in a University teaching hospital.
Materials and Methods: After obtaining IRB approval, all patients (>18y) completed the APAIS French version (2) before attending the preoperative visit. Immediately after patient's visit, TAnes (blinded to patient's questionnaire) filled in a modified version of the French APAIS using the same questions as patients but reflecting their thoughts about patient's anxiety (score 2-20) and information requirement (score 2-10). Statistical analysis to compare APAIS scores, assessed by 1rst year TAnes (1YTAnes) and those by older TAnes, used unpaired t-tests and Pearson's correlations, $P < 0.05$ being significant.
Results and Discussion: From 436 questionnaires (51% women, men 49%, median age 54 y (18-91)) collected during 3 weeks, 382 were usable (200 in 1YTAnes, 182 in older TAnes). There was no difference regarding the characteristics of patients assessed by 1YTAnes (n=12) and older TAnes (experience 3±2 years training;n=19) regarding sex, age, ASA score, APAIS anxiety score (10±5) and information need (6.5±3). Globally, patients' anxiety and need for information were correctly assessed by TAnes (r=0.377 and r=0.258; P< 0.001). Regarding TAnes'scoring, younger TAnes considered patients as more anxious and needing more information (inverse correlation between training experience and APAIS scores) than older TAnes did. Whether assessment of patient's anxiety was correct independently of training experience, 1YTAnes evaluation of patient's need for information did not correlate with patients'reports (r=0,105, P=0,138 vs r=0.278, P< 0.001 in older TAnes).
Conclusion: In contrast to the evaluation of patient's information requirement (lack of experience), patient's preoperative anxiety is rather well assessed by young TAnes although this higher empathy might be a risk of overpremedication.
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15AP1-4

Evaluation of stress among Kosovar anaesthesiologists

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Background and Goal of Study: Anaesthesiology is considered a stressful occupation. Our aim in this study was to assess stress among Kosovar Anaesthesiologists and to identify which are the most often stressors.
Materials and Methods: From March until June 2012 anonymous self administered questionnaires were sent to anaesthesiologists in Kosova. The survey contained standardized questions about demographic items, working environment, factors causing stress, general health experience- health behavior as well as their opinion regarding of being proactive about wellbeing of Anaesthesiologists in level of our Association.
Results and Discussion: The total number of respondents was 60. Response rate was 74.1%.From total respondents number 63.3% were male and 26.7% female. Out of which, seniors were 78.3% and trainees 21.7 %. Approximately two thirds work in academic hospital and in regional hospitals works 36.7 %. On question "Do you feel stress these days" 16.7 % of respondents answered yes, 66,7 % answered to some extend. Identified stressors were as follows: the lack of medicaments (that we would define as lack of working conditions) 48.3 % continuously and 31.7 % very often.
Work on call causes stress too often for 25.0 % and for 23.0 % constantly. Inter-collegial relationship causes stress too often for 15 % and 21.7 % constantly for our respondents. Most common symptoms of stress were irritability in 20 % and to often emotional exhaustion 16.7 %. 96,7 % respondents suggested our Association to become proactive for professional welfare in Kosova.
Conclusion(s): In this study we concluded that stress conditions were prevalent amongst Kosovar Anaesthesiologists. We also identified some of the main stress factors. This opens the pathway for the resolution of this problem, since some stressors, although impossible to eliminate can be attenuated by the development of coping mechanisms. This survey is just the beginning. Kosovar Association of Anaesthesiologists is requested to look into the matter and to take it further on the larger scale.

15AP1-5

Case reports: should we do away with them?

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Background and Goal of Study: There has been a gradual decline in the number of case reports published in leading medical journals in recent years. Since case reports are not highly cited they have an adverse effect on the journal impact factor.
On the other hand sharing new experiences, challenges, or discoveries with colleagues is essential for medical community (1). Should case reports be eliminated from the journals or published only in journals devoted to case reports?
Methods: Web of Science database was searched, between 2005-2009, with terms: "anesthesia", "anesthesiology" and "case report" yielding 25969, 9532 and 661 publications respectively. Since some reports contained large number of cases, only those involving up to three cases (n=425) were evaluated by the authors with respect to their type, contribution to knowledge and/or practice (Likert scale) (2) and times they were cited.
Results: Distribution of answers to the statement "Case has added to my knowledge and/or improved my practice" was; 3% (strongly disagree), 10.5% (disagree), 33.2% (neither agree nor disagree), 39.3% (agree) and 13.7% (strongly agree). Average citations per item was 4.43 (1883/425), 7.32 (4838/661) and 7.82 (74529/9532). As to the types of the reports; 50% unexpected event in the course of anesthesia, 31% unusual and instructive cases, 9.6% novel/unique anesthetic techniques, 6% novel use of equipment, 1.6% new information on diseases of importance to anesthesiology and 1% scientific observations.
Discussion: Case reports have been an important source of clinical guidance and scientific insight, and play an important role in medical education. They can published quickly, providing publication opportunity for juniors and for clinicians who may not have the time or finance to conduct large scale research. On the other hand some argue, that case reports are irrelevant in current medical practice and education, being at the bottom of the hierarchical ladder of medical evidence (4). We conclude that case reports should not be done away with but be published in websites and journals like the venue to be launched in 2013 by the International Anesthesia Research Society (3), devoted entirely to them to meet the need for the publication of interesting cases.

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15AP1-6

Current status of anesthesia research

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Background and Goal of Study: Anesthesiology embraces several fields as surgical and critically ill patients, emergencies or pain management. Thanks to this feature is an ever evolving specialty, so it has a large research output. In order to know the evolution of publications in anesthesia we conducted a literature search of PubMed publications.
Materials and Methods: We searched in the PubMed database from 2000 to 2011 using key words to find the number of anesthesia publications, depending on particular topic to evaluate.
Results and Discussion: During the searched period were a total of 8.691.434 posts; 94.847 (1.09%) related to anesthesia. Despite increasing absolute number of anesthesia publications, there was a decline in recent years respect the total volume.
When applying "Clinical Trial" filter showed a similar decline, being these 4.65% in global and 17.62% in anesthesia. Clinical Trials production has always been much higher in anesthesia regarding global.
If we analyze the study type mostly are clinical trials (40.89%), secondly randomized clinical trials (30.22%) and in third place are systematic reviews (25.42%). The volume of Clinical Trials may reflect the influence of the research model of Evidence-Based Medicine.
In Clinical Trials most topics are pain (39.26%), intravenous anesthesia (25.77%), general anesthesia (22.47%) and local anesthetics (20.33%). Issues as preanesthesia (2.97%) or complications (3%) are underdeveloped. Most are related to the treatment (82.61) and diagnosis (68.3%). The minority are prognosis publications (20%).
As for objective noting that most are related to efficiency (16.97%) and effectiveness (5.56%), very little to economic analysis, being negligible percentage linked to the cost-utility (0.01%) and cost-effectiveness (0.38%).
Conclusion(s): Anesthesia publication is high compared with other specialties. Most publications are clinical trials and randomized clinical trials, unfortunately non-systematic reviews still occupy an important place, which may reflect the lack of application of scientific method.
Primarily focus is on treatment studies especially for assessing effectiveness. Areas with greater weight are pain, general anesthesia or intravenous anesthesia among others.
In the future is expected to increase significantly the number of publications of economic analysis, because the current volume of publications of this type is very low and technological development of our specialty and its costs are rising.

15AP1-7

Burnout syndrome incidence among anaesthesiology residents in Catalonia

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Background and Goal of Study: The Burnout Syndrome (BS) is preconditioned by demographics, economics, social and professional factors affecting in general medical doctors and particularly medical trainees. The objectives of this study were to evaluate the BS incidence among Catalan residents of Anaesthesiology and to analyse social-demographic characteristics that may lead to its development.
Materials and Methods: This is an observational, cross-sectional and prospective study of Anaesthesiology residents performing their training during the academic year 2012-2013 in Catalonia. An anonymous and voluntary questionnaire called Maslach Burnout Inventory (MBI) was used in order to analyse three dimensional descriptions of BS: emotional exhaustion, depersonalization and personal accomplishment.
According to the definition, BS is present when the questionnaire final score has more than 26 points for emotional exhaustion and more than 9 points for depersonalization. Statistical analysis was performed using SPSS (version 17.0, IBM®). All data were analysed by the same principal investigator and are presented as percentages and/or absolute numbers, being $p < 0.05$ significant.
Results and Discussion: A total of 141 Catalan residents (response rate 56.35%) answered the questionnaire: 37.6% of them were R1 (first year residents), 25.5% R2, 34.8% R3 and only 2.1% R4; 60.3% were women, 64.5% residents with partner and 89.3% residents without children. The survey was carried out during theoretic classes offered by the Catalan Society of Anaesthesiology that were mostly visited by R1, R2 and R3 residents. 46.8% of the responders showed a high level of emotional exhaustion and depersonalization (49.6%). The BS was present in 64% of the Catalan trainees, 71.9%, reported feeling fulfilled in their work. There was no relation between the different variables and the hospital category. We observed statistically significant differences between R1 residents and R3 regarding emotional exhaustion: 34% (R1) versus 60.4% (R3) ($p = 0006$) and depersonalization: 35.8% (R1) versus 62.5% (R3) ($p = 0.011$).
Conclusion(s): Currently, 2 out of 3 Catalan residents of Anaesthesiology present BS signs. However, our residents feel fulfilled in their daily work. Analysing BS dimensions deeply will help us to understand better the underlying causes and to design corrective measures in the future in order to minimize the BS side effects.

15AP1-8

Prevalence of burnout in Polish anaesthetist nursing professionals

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Background and Objectives: Burnout is a psychological response to chronic work-related stress of an interpersonal and emotional nature and nursing is one of the most stressful occupations. Therefore cases of burnout were expected to be found. The aim of this study was to identify the prevalence of burnout in a sample of Polish nurses and to assess the psychometric properties of the Polish version of the SBI.
Materials and Methods: Non-randomized cross-sectional study was carried out. Data were gathered through an anonymous, self-administrated questionnaire. The instrument is composed of 20 items distributed in four dimensions: Enthusiasm towards the job, Psychological Exhaustion, Indolence and Guilt and measures two Burnout profiles: profile 1 and profile 2. The sample consisted of 161 nurses of Anesthesia and Intensive Therapy Departments in Polish hospitals between 24 and 60 years of age, 158 of which were women and 3 men. The psychometric properties were examined through the following analyses: confirmatory factor analysis (CFA) and reliability (Cronbach's alpha).
Results and Discussion: The four-factor model obtained an adequate data fit for the sample. The four subscales exhibited high reliability, with Cronbach's alphas exceeding the critical value of 0.70. The levels of burnout were evaluated by the *Spanish Burnout Inventory*, *(SBI).*
The percentage of participants who indicated very high levels of burnout was 22,36%, 18,63% of which fell into Profile 1 and 3,73% into Profile 2 characterized by the feeling of guilt.
Conclusions: Results also show that the four-factor model of the SBI possesses adequate psychometric properties for the study of burnout in the Polish cultural context. Based on psychometric considerations, participants who fit Profile 2 of burnout should receive some psychological treatment so as to avoid the impairment of their work and prevent depression development[1].
Further studies on the influence of work conditions on the burnout development in anaesthesiologists are planned to be expanded.
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Acknowledgements:I Would like to thank to Dr Pedro Gil-Monte from the University of Valencia for making available the SBI questionnaire and for his help in the statistical analysis.

15AP2-1

Dedicated airway laboratory - a useful educational resource for video-laryngoscopy training

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Background: Video-laryngoscopes are new intubation devices, which improve an indirect view of the upper airway. In difficult airway management, they improve Cormack - Lehane grade 1 and achieve the same or a higher intubation success rate in less time, compared with direct laryngoscopes 2. We

assessed the usefulness of a dedicated airway laboratory in improving this skill amongst trainee doctors at University Hospitals Coventry & Warwickshire (UHCW)
Methods: Trainee anaesthetists were asked to fill a questionnaire before and after a completing 6 month period of training at UHCW. We have an airway laboratory where trainees can spend half a day attending lecture followed by practise session on mannequins and simulation. The training is run by a team of experienced anaesthetists with special interest in 'Airway management'. Training and education is provided with the use of Pentax AWS, C-MAC, Glidescope, AirTraq and McGrath video-laryngoscopes. Trainees were asked if the "laboratory session" affected their skill and confidence levels. They were also asked to provide details of their various sources of training besides the Airway Laboratory in these 6 months.
Results: 14 trainees were surveyed, whose experience ranged between 4-12 years.One trainee was an Airway Fellow. Only one trainee had no experience of using video-laryngoscopes prior to the survey. At the end of six months, 11 trainees (78%) recorded an increase in their confidence level. 2 trainees said that their confidence remained unchanged. Amongst the devices, Pentax AWS was found to be the most popular choice (42%), followed by C-MAC (35%), Airtraq (14%) and Glidescope (14%). Airway laboratory was found to be the single most important tool that helped the trainees (64%). Conferences and courses helped 42% trainees and training by colleagues contributed 35%.
Conclusion: Video-laryngoscopy is a skill which is likely to become essential in the practice of modern day anaesthesia. Airway fellowships offer a great breakthrough in teaching and training, but may not be a feasible option for all. The reduction in training hours and fewer opportunities make it increasingly difficult for a trainee to acquire the necessary skills. Dedicated 'Airway Laboratories' offer an excellent alternative for the trainee to achieve competency and in enhancing confidence without compromising patient safety. We recommend that investing in an Airway laboratory can contribute significantly in anaesthetic training.

15AP2-2

Validation of a checklist for assessment of nasotracheal intubation performance

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Background and Goal of Study: Nasotracheal intubation (NTI) is an important procedure, the performance of which should be objectively assessed in anesthesia training. The current best evidence for a gold standard for assessment of procedural skills in anesthesia consists of a combination of previously validated checklists and global rating scales (GRS) used prospectively by a trained observer for a procedure performed in an actual patient. However, the evaluation of NTI performance has been difficult due to the lack of validated evaluation tools for this procedure. The goal of this study was to develop a checklist to assess NTI skills of trainees and to determine its validity and reliability.
Material and methods: A 19-item binary checklist was developed using the Delphi method by repeated revisions of experts. Each item represents a step in patient assessment, decision making and intubation process and is scored as pass or fail. 18 junior and 16 senior trainees were enrolled in a prospective study. Their previous NTI experience was assessed by a questionnaire. Junior trainees (JT) were defined as in their 1st year of anesthetic training and had performed less than 10 NTI independently. 3rd year trainees formed the senior-trainee (ST) group with experience of more than 10 independent NTI. Two expert observers blinded to trainee experience independently evaluated the NTI performance using the checklist and GRS. The checklist construct validity was established by its ability to distinguish between varying levels of training and its correlation with GRS. Independent samples t-test was used to check the statistical difference between two groups. Interrater reliability was assessed by kappa statistics.
Results and Discussion: 22 sessions by JT and 31 sessions by ST were evaluated over 4 months' period. The performance of ST was significantly better than that of JT by the assessment using GRS ($P=0.002$) and checklist (mean±SE=15.6±0.2 and 8.9±0.2, respectively, $p< 0.001$). There was significant correlation between checklist and GRS scores ($r = 0.76$, $p< 0.001$). The overall interrater reliability both for GRS and checklist was near-perfect ($k = 0.85$, $p< 0.001$ and 0.82 $p< 0.001$, respectively). Feedback from examiners was positive regarding the ease and practicality of checklist use.
Conclusion: The investigated checklist is valid and reliable as it reliably discriminated between different levels of training and can be adopted into the anesthesia training curriculum.

15AP2-3

High fidelity simulation training for the primary FRCA OSCE, UK

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Background and Goal of Study: High fidelity simulation is used as an assessment component in the Primary FRCA Objective Structured Clinical Examination (OSCE) in the UK. Simulation training is becoming well-established in anaesthesia, as an educational tool (1), allowing the development of technical and non-technical skills (2).
The use of simulation for assessment, in an OSCE setting is a compensatory summative assessment model, shown to be reliable and valid in assessing management of a critical incident (3). In the Primary FRCA OSCE, candidate performance, in the simulator station, is marked against a checklist to give a score out of 20, reflecting competence.
Evidence shows that performance following simulation training will improve following a period of reflective debriefing (4), leading us to investigate if pre exam simulation training with structured debriefing could improve scores in subsequent simulation sessions.
Material and methods: Over a period of 18 months, 40 anaesthetic trainees in SE Scotland attended a simulation training session, 4 weeks prior to the Primary FRCA exam, divided into groups of 5. In each group, individuals completed simulated scenarios in turn, whilst being observed by other candidates. Each candidate was awarded a mark out of 20 by 2 independent researchers, based on a checklist, followed by a structured reflective debriefing session. Marks were recorded in each group, and examined to see if scores improved as each session progressed.
Results: In total 40 candidates completed 40 scenarios. In scenario 1, the average score was 50%, increasing to 96% by scenario 3. The final scenario had an average mark of 98%. Candidates in scenario 1 performed a structured A to C approach to the critically unwell patient, in 20% of cases. Following a structured debrief, 83% of candidates performed a structured A-C assessment from scenario 3 onwards. Candidates scored an average of 80% for knowledge, with no significant differences as scenarios progressed.
Discussion: Although candidate knowledge was consistently scored highly, critical incident management improved with simulation training and debriefing, reflected in the improvement of overall scores.
In order to prepare for a practical OSCE exam, simulation training with structured reflective debriefing is necessary to improve performance. For performance to be optimal, theory learned needs to be practiced in the examination setting.

15AP2-4

Ultrasound-guided infraclavicular axillary venipuncture is more easily learned than anatomic landmark guided subclavian venipuncture during simulation training

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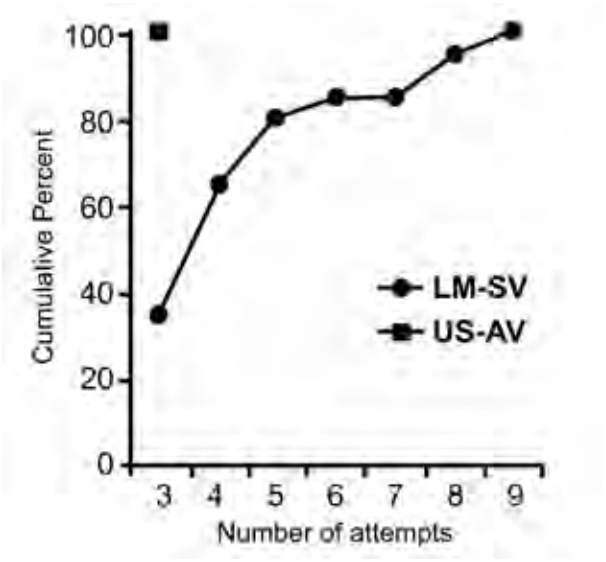
Background: Ultrasound-guided axillary venipuncture (US-AV) and landmark guided subclavian venipuncture (LM-SV) are both important in critical care, because the clinical efficacy of ultrasound guidance is still debated. Education of residents and medical students should include both techniques. The aim of this study is to compare the learning of these techniques in a simulation environment.
Materials and Methods: This study was approved by the research ethics review committee. Trainees included residents and medical students. Trainees were educated using the "Videos in Clinical Medicine" for LM-SV, or a dedicated slide series for US-AV, using the long-axis in-plane with needle-guide technique (3-step method).
After the lecture, trainees attempted to perform venipuncture using either technique in a mechanical simulator. The procedure time from the initial skin puncture to detecting back flow of water inside the vein was measured. A procedure time over 3 minutes, arterial puncture, or pneumothorax was counted as a failure.
The end-point for each trainee was 3 successive successful venipunctures without a failure. A trainee who reached the end-point was considered as having acquired adequate skill. Statistical analysis of the procedure time comparing the techniques was done using the Mann-Whitney U test.
Results and Discussion: Twenty trainees (13 residents and 7 medical students) participated in this training. The percentage of the trainees who acquired the skill compared to all trainees is shown in Figure 1, according to number of attempts.



[Fig. 1 The cumulative percent of trainees who met the training goal according to the number of attempts with each of the two techniques used, Landmark (LM-SV) and Ultrasound guided (US-AV) vein catheterization.]

Adequate skill for the US-AV approach was achieved within three tries, but up to nine attempts were needed for LM-SV. The performance time for the second attempt comparing the techniques was statistically different (P=0.01), but the first and third were not significantly different (median: LM-SV 1st try 23.5sec., 2nd try 14 sec., 3rd try 6 sec., US-AV 1st try 15.5sec., 2nd try 11 sec., 3rd try 8.5 sec.). One arterial puncture occurred during an LM-SV approach. No pneumothoraces occurred during the simulation. **Conclusion(s):** US-AV using the 3-step method was more quickly learned than the LM-SV method in a simulation model.

15AP2-5

What can bring high-fidelity simulation training in basic life support?

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Background: The use of innovative methodologies, including high fidelity simulation, robotic simulation, virtual simulation contributes to the acquisition of professional skills. Given the different educational and economic implications we should now optimize the best method to achieve specific learning objectives.
Goal of Study: Analyze the suitability of two different types of simulation, high versus low fidelity, to achieve the proposed competence in basic life support (BLS).
Materials and Methods: Experimental, uncontrolled pre-test and post-test, using questionnaires.
Comparison of two clinical simulation models, high (HFS) versus low fidelity (LFS) for the acquisition and persistence of skills in BLS.
Trial subjects were students of 1st and 2nd degree UC Nursing School (n=119). All students performed a pretest, before receiving a 100-minute session on theoretical foundations of SVB, and practice with simulators of 2 hours, divided into groups of 20, with an instructor ratio: 1:10 and dummy student: student ratio of 1:5, using two simulation models LFS and HFS. The experimental group also received a 2-hour seminar on HFS methology. A week later they took posttest I, and six months later, the posttest-II was distributed for completion.
Results: The pretest results (n=119) were 9.96±2.64 for UC1, and 11.61±3.15 for UC2 ($p < 0.01$). After theoretical and practical teaching, the posttest I results of these two groups (n=113) increased to 15.08±1.80 for UC1 and 14.91±1.97 for UC2 (ns). Finally, six months latter posttest II was performed (n=111) and the result was 14.34±2.64 for UC1 and 16.53±1.85 for UC2 ($p < 0.001$).
Discussion: As expected, all the students got a better note in posttest I, indicating a gain on concepts acquisition after the learning process.
We found no differences in the acquisition of skills regarding the simulation model, where UC1 students were trained with LFS and UC2 were trained with HFS.
However, after 6 months, the results of the post II indicate that the concepts acquired with the model LFS tend to decline (UC1) while the acquired through HFS remains (UC2), which could be explained by the different methodologies associated with high fidelity (display case, the realization of different scenarios SVB, debriefing and discussion)
Conclusion(s): The acquisition of BLS skills can be achieved both with HFS and LFS, although the participation of HFS favors the persistence of knowledge.

15AP2-6

High fidelity simulation in Spain: from dreams to reality

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Background: Clinical simulation has emerged as a new method of learning and assessment
By using innovative methodologies such as robotics simulation, Virtual Simulation, Scenic simulation is it possible to achieve different skills (technical and non-technical) for patient care in a safe environment.
Goal of Study: To describe the current state of high-fidelity clinical simulation in Spain.
Materials and Methods: Descriptive observational study in which information is collected in order to describe the current map of the centers with high fidelity simulators (HSF) in our country.
Information search was performed using a convergent strategy:
- Internet search on existing simulation centers in our country
- Consultations on the SEDAR website, SESAM and SESSEP
- E-mail questionnaire and interviews in nursing and medical schools.
- Information to commercial enterprises Laerdal® and METI®
- Stays and contacts with simulation centers.

Results: According to available data (July 2012), there are 72 centers in our country which featured high-fidelity simulators. 43 HFS belong to universities and 29 are in non-university centers. Regarding the HFS located in universities, 18 are in medical schools, 23 nursing schools and 2 are joint facilities, while those related to non-university centers are distributed in Hospitals(15), Emergency Services(4), Training Centers(4), 2 are linked to the Health Departments, and the rest belong to Scientific Societies(1), Medical Colleges(1) and Mutual Insurance companies(2).
Only 23 (32%) use HFS in training programs integrated in the curriculum of the health sciences, mainly those associated with universities.
Very few centers have full dedicated faculty members (9/12%) for teaching with HFS, concentrated in non-university or private universities. Regarding teaching methodology, the debriefing is used by 34 centers (47%), of whom 28 (39%) rely on the videotape. Finally, simulation is used as an evaluation tool (summative or formative) in 19 (25%).
Conclusion(s): The slow initial development of simulation has increased exponentially in the last five years, with the acquisition of 58 new HFS(80% of total). HFS is mostly related to universities (60%) than hospitals(21%). Nursing schools(23) outweigh the medical schools(18), calling attention the fact that are not shared.
Most teachers have partial dedication to the simulation, and few universities have full dedicated teachers responsible for developing this methodology.

15AP3-1

Trainees knowledge and experience of organ retrieval anaesthesia

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Aims: Knowledge and experience in anaesthesia for organ retrieval is a requirement for the completion of training (CCT) in anaesthesia. However, there is minimal formal training in this field, and trainees experience varies greatly. The aim of this survey was to assess trainees knowledge and experience of anaesthesia for organ retrieval, to help us assess if further training would be beneficial.
Methods: We conducted an electronic questionnaire of South East School of Anaesthesia (SESA) trainees covering: trainees formal training and experience in the peri-operative management of organ retrieval patients; the timings of these cases; level of supervision; knowledge of anaesthesia for organ retrieval.
Results: We received 52 responses, 51.9% from Specialist Training years 5/6. Although 75% had no formal training in the perioperative management of patients for organ retrieval, 86.5% had been involved in at least 1 case. The cases often occur outside normal working hours (88.6% 0800-1800) with

the level of supervision mainly distant (60%). Of those receiving supervision (direct / indirect) the supervisor was a consultant in 76% cases.
Most trainees recognise the need for an anaesthetist in theatre for Donation after Brain Death (DBD) organ retrieval (71.2%) but not for Donation after Cardiac Death (DCD) organ retrieval (55.8%). The common reason trainees gave for these cases occurring outside normal working hours, was to minimize the impact on daytime theatre lists. However, 12 trainees stated organ retrieval cases are lower priority than "living" cases.
All trainees felt anaesthetic management during organ retrieval in DBD donar patients was important, and 49 (94%) felt that an update session on the management of all organ retrieval patients would be beneficial. The 3 trainees who felt it wouldn't be beneficial already had experienced formal training.
Conclusions: Although knowledge and experience of organ retrieval anaesthesia is a requirement for CCT, most trainees have received no formal training in this field. The majority of these cases occur outside routine working hours, so it is important to ensure our trainees have the relevant supervision and skill set to deal with these. Together with our trainees we feel a regular formal update session in the management of organ retrieval patients would be beneficial. We are now setting up a teaching program to update our trainees, and plan to repeat this questionnaire after this process has been completed.

15AP3-2

Assessment of obstetrical anesthesia training of residents in Catalonian, Spain

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Background and Goal of Study: Obstetrical Anesthesia has presented changes regional anesthesia has increased against general anesthesia that has decreased. General anesthesia is used only for emergent c-section cases. The important decrease of c-sections under general anesthesia could produce an important deficit of residents training. The aim of the study was to know the state of practical training in obstetrical anesthesia of the residents of Catalonian (Spain).
Materials and Methods: Residents who assisted to Difficult Airway Management Course of the "Societat Catalana d'Anestesiologia, Reanimació I Terapia del dolor" (SCARTD) answered a questionnaire specially designed for this purpose.
Data recorded: Year of residency (3rd or 4th), hospital data (size and availability of obstetrical department), type of training in obstetrics anesthesia, time of rotation, number of procedures of epidural analgesia and c-section with regional and general anesthesia and finally self-evaluation of training with a Likert scale.
Descriptive statistical analysis. We used X^2 to know relationships between variables and the Tau-B of Kendall to know linear relationships between variables.
Results and Discussion: Eighty-three residents answered questionnaire. Thirty-one residents were on his 4tr year. Fifty-tree came from big hospitals. Obstetrical rotation was 3 or 6 months for 63% of residents. The 84% had realized more than 100 epidural analgesia procedueres. Only 12 had carried out more than 10 c-sections under general anesthesia and 7 had performed more than 10 emergent c-section under general anesthesia. The 49'9% considered his training in general anesthesia like poor o very poor.
Conclusion(s): We concluded time of training was correct and similar to other European countries, training in regional anesthesia is correct and well-evaluated, but training in general anesthesia is poor and bad-evaluated. The number of c-section under general anesthesia has decreased and the most part of cases are emergent, it could produce a poor training that could suppose an increased risk for patients. Options to resolve this problem could be simulation, case discussion and special programs for obstetrical anesthesia learning, like other rare situations.
References:
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15AP3-3

Preparation to the European Diploma of Anaesthesia-Part 1 in Madrid-Spain: is a course necessary and worth it?

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Background and Goal of Study: Nowadays the preparation of the European Diploma of Anaesthesia-Part1 (EDA-1) is an important challenge in Spain, since the number of medical specialist willing to move to another country is increasing. In Madrid Since 2008 a course has been organized to help and motivate future candidates to prepare the exam. We have assessed the impact of this course on the final level of preparation of candidates.
Materials and Methods: All the candidates of the EDA-1 2012 training course were included in this study. During the first class of the preparation program, trainees answered a pre-course set of 20 MCQs (PRT) covering the 5 topics of the training (physiology, pharmacology, physics, general anaesthesia and specialized anaesthesia). The same 20 MCQs were repeated after the last class (POT) and the results were analyzed and compared. After completion of the training, candidates were asked to communicate their results of EDA-1 exam to evaluate the impact of the course on their final results. Quantitative data were analyzed with ANOVA or t test as appropriate, and a Spearman correlation was searched between POT results and final EDA-1 exam results. $P < 0,05$ was considered significant.
Results and Discussion: In 2012, 65 candidates participated in the trainning. 36 and 17 candidates answered PRT and POT questions respectively. Mean marks increased during the training (PRT: 58,6 ±14,7% , POT: 67,7±6,1% , $p=0,01$). Comparing the evolution of the 5 topics marks, though all grades were higher, only pharmacology (PRT: 56,4% ±20,3% , POT: 69,2±11,6%, $p=0,02$) and physics (PRT: 55,7 ±17,7% , POT: 68,5±12,6%, $p=0,01$) were significantly higher at the POT. 15 candidates of 2012 course presented to EDA-1 exam and 9 (60%) succeeded. POT global marks were correlated to EDA-1 paper A results ($r=0,893$, $p< 0,01$) , POT marks in clinical sciences correlates to EDA-1 paper B results ($r=0,735$, $p=0,04$), and POT general marks tends to correlate to EDA-1 exam pass ($r=0,684$, $p=0,07$).
Conclusion(s): Introducing PRT and POT questions in the training seems an efficient tool to assess the progression of candidates. The correlation between POT grades and EDA-1 results could help us to coach better the candidates: those with more difficulties should be advised to study more until the exam. The impact of this training on the EDA-1 results in Madrid is probably underestimated because candidates sometimes don't present the exam the same year they follow our course.

15AP3-4

Anaesthesiology residents survey on airway management training in Catalonian teaching hospitals

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Background and Goal of Study: Airway management (AM) is one of the domains of specific core competencies included in the ESA training guidelines in which residents are expected to acquire the highest level of expertise and autonomy. In order to achieve this goal and reduce variability among different institutions, the Catalan Society of Anaesthesiology (SCARTD) is designing a common training program in AM for residents in anaesthesiology
The goal of this study is to assess the type and level of actual training in AM for residents in Catalonian teaching hospitals.
Materials and Methods: An anonymous survey was distributed among 3rd and 4th year residents attending annual AM courses of the SCARTD. The survey focused on demographic data, airway evaluation, use of guidelines, type, number and length of training sessions received, availability and experience in different techniques recommended in local AM guidelines. A global score of training was included.
Results and Discussion: A total of 76 surveys were collected, 48 corresponding to 3rd-year and 28 to 4th-year residents (80% and 46% of all 3rd and 4th year residents, respectively). The overall filling ratio was 90%. Results were similar for both groups. Mean global score was 7/10, showing a high self-perception of training. Most residents declared to routinely evaluate the airway (72%) and to follow AM guidelines (78%). All residents received theory and practice courses and case discussion seminars, but 30% had never participated in simulation sessions. The reported experience in different techniques varied widely among centers.
Although the necessary equipment was available in most hospitals, 50% of residents rated as insufficient their training in tube exchangers, intubating laryngeal mask, fiberscope and surgical airway.

Conclusion(s): Overall self-reported perception of training in AM by residents was high and compliance with airway assessment and management guidelines was acceptable. The survey revealed a considerable variability among institutions in residents practice. Training of specific techniques on AM should be emphasized to improve the last year residents' autonomy.

15AP3-5

Portuguese National Pedagogical Plan in Anaesthesiology - training impact assessment for 2nd year residents (module 2)

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Background and Goal: In order to overcome the shortcomings present in medical teaching of Anaesthesiology, and including simulation as a reference pedagogical tool, the Biomedical Simulation Centre of Coimbra University Hospitals, Portugal (BSC) has made available to all medical residents of Anaesthesiology a National Pedagogical Plan (NPP). It consists in four modules arranged according to the curricular objectives defined by the specialty college board. This study analyses the impact of a training course with simulation in the second year of the Medical Residency in Anaesthesiology, addressing technical and non-technical skills according to curricular demands.
Method: Confidential surveys were conducted to first year residents from different hospital institutions who attended Module 2 of the NPP of BSC before and after the training course. Each question had an answering option of a scale from 0 to 10, in which 0 corresponds to a null value and 10 to the maximum answer.
Results and Discussion: 12 surveys were validated. The medical residents' self-assessment on their training has improved 15% in a context of difficult airway approach, 5% in advanced life support (ALS), 14% in emergences in the clinical practice and decreased 9% in crisis resource management (CRM). Concerning the self-evaluation on their experience, it has improved 17.5% in a context of difficult airway approach, 2.5% in ALS, 17.5% in emergences in the clinical practice and 2.5% in CRM. Regarding the preparation to a solution of crisis there was a decrease of 5%. The trainings considered more important to improve the care giving to patients were ALS (mentioned by 45% of the trainees), CRM (78%) and teamwork (93%).
Conclusions: The improvement in the self-assessment, related to the training and experience in the thematic areas addressed in this module, namely difficult airway approach and emergence situations contextualised according to the demanding level of the second year Anaesthesiology residents, emphasises the impact of this simulation-based training.
From the results obtained, the mentioned decrease concerning the training in context of crisis resource management and its preparation to the solution of those same crisis resources should be emphasised. These results bring to light the way that a simulation-based training allows technical components to improve and to overcome shortcomings related with non-technical skills, such as teamwork or communication.

15AP3-6

Portuguese national pedagogical plan in anaesthesiology residency - training impact assessment for 1st year residents (module 1)

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Background and Goal of Study: In order to overcome the shortcomings present in medical teaching - in particular in the teaching of Anaesthesiology - and including simulation as a reference tool, the Biomedical Simulation Centre of Coimbra University Hospitals in Portugal (BSC) has made available to medical residents of Anaesthesiology a National Pedagogical Plan (NPP). This Plan consists in four modules arranged according to the curricular objectives defined by the college board of Anaesthesiology. This study intends to analyze the impact of a training course with simulation in the second month of the Medical Residence in Anaesthesiology, addressing technical and non-technical skills essencial to the first year of residency.
Materials and Methods: We conducted a confidential survey to first year residents from different hospital who attended Module 1 of the NPP before and after the training course. Each question had an answering option scale from 0 to 10, in which 0 corresponds to a null value and 10 to the maximum answer.
Results: 24 surveys were validated. After the program, resident's self-assessment of training has improved 7% in difficult airway approach, 44% in advanced life support (ALS), 37% for critical events and 21% for crisis resource management (CRM). Resident's self-assessment of experience has improved 19% in difficult airway approach, 33% in ALS, 23% for critical events and 14% for CRM. Resident's self-assessment of performance has improved 9% in difficult airway approach, 23% in ALS, 23% for critical events and 33% for CRM.
Discussion and Conclusion(s): The increase in the average of answers which concern the improvement of training and experience related to the thematic areas addressed in Module 1 of the National Pedagogic Plan of BSC, namely ALS and emergence situations contextualized according to the demanding level of the first year of the Medical Residence in Anaesthesiology emphasizes the impact of this simulation-based training. The lack of training related to crisis resource management which is included in the NPP of BSC in a more advanced training phase is also shown.

15AP3-7

Fundaments of Portuguese National Pedagogical Plan in medical residency in anaesthesiology

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Background: It is known that 70 to 80 % of adverse effects in medical practice occur due to human error. Error results mainly from lack of teamwork, a delay in setting priorities and insufficient situation awareness. The need to complement the traditional teaching with non-technical skills training is consensual. The aim of this study is to verify if the first year residents in Anaesthesiology recognise shortcomings concerning technical and non-technical skills in medical teaching and if they consider teamwork practice as a crucial aspect in the clinical evolution of the patient.
Methods: We conducted a confidential survey to residents from different hospitals in Portugal by the end of the first month of their residency. The survey addresses medical error, lack of technical knowledge and the importance of non-technical skills.
Results and Discussion: 54.2% mentioned being many times in situations in which they were not able to control without help and 79% assert that ask for help many times. 54% refer that make errors a few times and 42% many times. 92% disagree on having difficulty in assuming their errors and 71% agree that they do not feel ready for the responsibility they have. 97% are not ashamed of asking for help. 96% say not having enough knowledge and enough practice and all declare not having enough experience. All recognised that behavioural issues are crucial in critical situations, that teamwork practice with simulation is an important complement to the residency programme, that it improves their clinical practice and has repercussions on the evolution of patients.
Conclusion: Entering a specialty as Anaesthesiology and into account the high percentage of residents who up to the moment have already faced situations that could not control and the high percentage that recognise having made errors, it is obvious the importance given to non-behavioural issues. Those issues are recognised as crucial regarding the clinical practice and as having direct repercussions on the evolution of patients. We can conclude that it is essential, in the initial phase of the training in Anaesthesiology, a teaching which addresses technical and non-technical skills in order to fill the gaps present in an initial phase of this specialty. The simulation-based trainings, such as the Portuguese National Pedagogical Plan of the Biomedical Simulation Centre of Coimbra University Hospitals-CHUC, is an example of how these shortcomings can be totally overcome.

Patient Safety

17AP1-1

Do we know the drugs we use? - a survey amongst anaesthetists and surgeons about local anaesthetics and their toxicity

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Background: Local anaesthetics (LA) are commonly used in the theatre environment by surgeons and anaesthetists. Whilst a rare occurrence, LA toxicity can be potentially fatal and occurs if drug dosages exceed the maximum safe limit or if inadvertently administered into a vessel. Knowledge of LA pharmacology is an essential component of the anaesthetic and surgical curriculum. Every professional administering LA should be aware of maximum recommended doses and treatment of their toxicity (1).
Materials and Methods: We conducted a paper-based questionnaire within the Southern Health and Social Care Trust. This was completed by all anaesthetists and surgeons present on the 28th February 2012. Participants were asked questions on the pharmacology of LA drugs and maximum doses of the commonly used agents lidocaine and levobupivacaine, plain and with adrenaline 1:200.000. Further questions included recognition of the clinical signs and symptoms of toxicity, the recognised treatment algorithms and availability of intralipid.
Results: We received replies from 17 anaesthetists and 16 surgeons. In general, anaesthetists were more accurate than surgeons with the maximum doses of commonly used LA . More surgeons correctly stated the maximum dosage of levobupivacaine (69%) compared with lidocaine (56%). However, only 19% of surgeons knew the correct dosage of lidocaine plus adrenaline 1: 200 000, a combination commonly used in our trust. 76% of anaesthetists and 38% of surgeons knew the correct maximum dosage of levobupivacaine that can be administered to a 70kg person. The signs and symptoms of LA toxicity were known by all in the anaesthetic group. 44% of surgeons were unsure of these signs. Encouragingly, there was a wide understanding of the treatment of LA toxicity and the use of intralipid amongst both groups. However, many anaesthetists (41%) and surgeons (81%) were unsure of the location of intralipid within our trust.
Conclusions: Our survey showed that current knowledge of maximum LA doses and signs of toxicity remain unacceptably low. Despite the availability of standardised guidelines for the management of LA toxicity, further education is required and we are currently implementing LA teaching sessions in our trust. AAGBI guidelines on LA toxicity and location of intralipid are now easily visible in every operating theatre.
References:
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17AP1-2

Implementation of a structured information transfer checklist improves postoperative data transfer after congenital cardiac surgery

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Background and Goal of Study: During one hospital stay, a patient can be cared for by five different units. With patient transfer from one unit to another, it is of prime importance to convey a complete picture of a patient's situation to minimize the risk of medical errors and to provide optimal patient care. This study was designed to test the hypothesis that implementation of a standardised checklist used during verbal patient handover could improve data transfer.
Materials and Methods: A prospective interventional study was conducted in a cardiac centre of a university hospital. Forty-eight patients younger than 16 years undergoing heart surgery were included. A standardised checklist was developed containing all data that according to the investigators should be communicated during handover of a paediatric cardiac surgery patient from the operating room to the intensive care unit. Data transfer during the postoperative handover before and after implementation of the checklist was evaluated. In both arms, duration of handover, number of interruptions, number of irrelevant data and number of confusing information were noted, and assessment of the handover process by intensive care unit medical and nursing staff was quantified. Comparison between the pre- and post-intervention arm was performed with Mann-Whitney U test for continuous data and with the chi-square test for categorical data. P-values < 0.05 were considered significant.
Results and Discussion: After implementation of the information transfer checklist, the overall data transfer increased from 48% to 73% ($p< 0.001$). The duration of data transfer decreased from a median of 6 min (range 2-16 min) to 4 min (range 2-19 min) ($p=0.04$). The overall handover assessment by the intensive care nursing staff improved from 81 to 88 points after implementation of the checklist ($p< 0.004$)
Conclusion(s): Implementation of an information transfer checklist in postoperative paediatric cardiac surgery patients resulted in a more complete transfer of information, with a decrease in the handover duration.

17AP1-3

Surgical space conditions during low pressure laparoscopic cholecystectomy with deep versus moderate neuromuscular blockade

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Background: Low pressure laparoscopic cholecystectomy (LC) is associated with significant less postoperative pain. However, the impact on surgical conditions has not been adequately described- but deep neuromuscular blockade may be beneficial. This study compared surgical space conditions using either deep, continuous muscle relaxation or moderate blockade during low pressure (8 mmHg) LC. We hypothesised that a deep neuromuscular blockade would be associated with a higher proportion of optimal surgical space conditions enabling the use of low pressure.
Material and methods: In this observer- and patient-blinded study 48 patients undergoing elective LC were randomized to either deep neuromuscular blockade (post-tetanic count 0-1) (group D) or moderate neuromuscular blockade (train of four $\geq$ 1) (group M). Patients received anaesthesia with propofol, remifentanil and rocuronium. Neuromuscular monitoring was performed with acceleromyography in accordance with Good Clinical Research Practice. Pneumoperitoneum was obtained with insufflation of CO_2 to 8 mmHg. In case of inadequate surgical conditions pneumoperitoneum was increased to 12 mmHg. The primary outcome was surgical space conditions assessed by two experienced surgeons using a 4-step scale (1= optimal conditions; 4= poor conditions) when conditions were most inferior. Secondary outcomes included the proportion of procedures completed at pneumoperitoneum 8 mmHg and surgical space conditions upon dissection of the gallbladder (Numeric Rating Scale (NRS) 0-100).
Results: Optimal surgical space conditions was seen in 7/25 (28%) patients allocated to group D and in 1/23 (4%) patients allocated to group M when conditions were most inferior ($P = 0.028$; x^2-test). LC was completed at pneumoperitoneum 8 mmHg in 15 (60%) and 8 (35%) patients in group D and M, respectively ($P = 0.081$; x^2-test).Surgical space conditions during dissection of the gallbladder were 20 [10-50] (median [25-75% range]) in group D and 30 [10-50] in group M ($P = 0.58$; Mann-Whitney U test).
Conclusion: Deep neuromuscular blockade was associated with optimal surgical space conditions in a significantly higher proportion than moderate muscle relaxation during low pressure LC when conditions were most inferior. However, in this study a high proportion of procedures required an intra-abdominal pressure of 12 mmHg in order to secure optimal surgical conditions.
Aknowledgements: We wish to thank Aleris-Hamlet Hospital, Soeborg, Denmark.

17AP1-4

Microbiological isolates from identification badges in the intensive care and operating theatre environment

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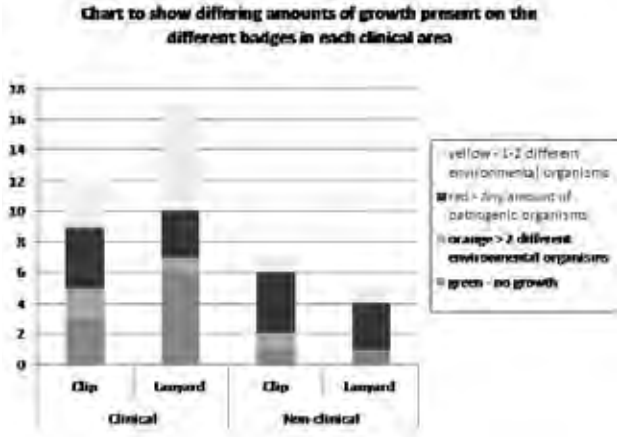
Background: The wearing of staff identification (ID) badges is mandatory in all hospitals, including our institution. Observations made noted personnel wearing badges on a lanyard did not always tuck them away when handling patients or during practical procedures. This suggested IDs could become contaminated with bacteria from infected surfaces as demonstrated in studies from Canada[1]and Australia[2], and then be transmitted to patients. The aim was to assess the risk of transmission of bacteria from IDs to patients and to see

if guidelines should be introduced as to the cleaning of them for staff. There are currently no guidelines in existence at our institution. We set a standard of zero bacterial isolates present on each ID.

Methods: Approval was gained from our Audit Committee. Data was captured in one day from IDs of staff present in theatres and ICU. A control group was formed of non-clinical staff within the same departments. Each ID was sampled using a sterile MWE TRANSWAB®. Gloves were worn and were changed between each badge being swabbed. IDs were held up for swabbing by the owner of that badge. They were then sent to microbiology, plated onto blood agar and incubated aerobically at 37°C for ≥48 hours.

Results:



[Variation in bacterial growth rates]

Conclusion: The ID position has no bearing on the degree of colonisation. The longer the ID is worn the greater the chance that colonisation may occur but again this is not born out by our results. We performed a badge cleaning audit, where we swabbed a further 5 IDs at random and then cleaned with a Sani-Cloth®DUO wipe, the swab post cleaning revealed no bacterial growth present. This showed that a quick clean with a wipe will eradicate any bacteria present.

Encouragingly from this study no multi-drug resistant (MDR) bacteria have been isolated from IDs. However lanyards may act as a vector to infection. Based on this information we plan to remove lanyards from the clinical setting and commence an ID cleaning policy.

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2. What's hanging around your neck? Pathogenic bacteria on identity badges and lanyards. Kotsanas et al. *Med J Aust* 2008:7;188(1):5-8

17AP1-5

Checking of anaesthetic equipment: an audit of practice

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Background and Goal of Study: Checking of anaesthetic equipment is essential for patient safety. New guidelines for checking anaesthetic equipment were published by the Association of Anaesthetists of Great Britain and Ireland (AAGBI) in June 2012.[1]

We performed an audit of current practice in our organisation to see where improvements could be made.

Materials and Methods: Over a two day period all Anaesthetists and Operating Department Practitioners (ODPs) in our 22 operating theatre complex were asked to complete the survey.

Participants were asked if they were aware of the new guidelines from the AAGBI and whether they had incorporated the changes into their practice. Notable additions to the anaesthetic machine check are the two bag test and recording of the check.

Results and Discussion: 84% of the 17 ODPs and 20 Anaesthetists surveyed were aware of the new guidelines. Despite this only nine participants (24%) did the two bag test in the anaesthetic room and operating theatre, and only one participant, an ODP, did the two bag test between patients. During the audit we identified that only two anaesthetic machines had logbooks and most theatres did not have two reservoir bags in them.

These simple barriers were preventing individuals carrying out the new guidance even if they wished to. Both of these issues have been rectified. We presented the new guidelines and the results of the survey to the Anaesthetists and ODPs.

Conclusion(s): This survey highlighted that successful implementation of new practice regarding checking anaesthetic machines requires technical and adaptive changes. The technical challenges were simple barriers that were overcome by having AAGBI 2012 guidelines in all theatres, and having two reservoir bags and a machine check logbook in all anaesthetic rooms. The adaptive changes often take longer and require a cultural shift where it is expected that the checks are carried out. These measures will recalibrate the system before an adverse event happens and prevent drift towards the "normalisation of deviance". We plan to re-audit this in January.

References:

1. Association of Anaesthetists of Great Britain and Ireland. Checking Anaesthetic Equipment 2012. *Anaesthesia* 2012; **67:**660-68

17AP1-6

A nomogram to calculate physiological and operative severity score for the enumeration of mortality and morbidity (POSSUM)

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Background and Goal of Study: POSSUM is a well validated model to predict surgical morbidity and mortality[1]; but is difficult to calculate. Software and mobile phone 'apps' can perform the calculations, but access to these may be limited (e.g. by infection control policies); and unrecognised keystroke errors frequently occur during data input.

Nomograms are low cost graphic devices which rapidly perform repeated calculations. Unlike electronic methods, nomograms provide a permanent record of the calculation; and are *declarative* - i.e. readily allow reverse and "what-if" calculations to check data entry and explore effects of perturbation of one or more input variables.

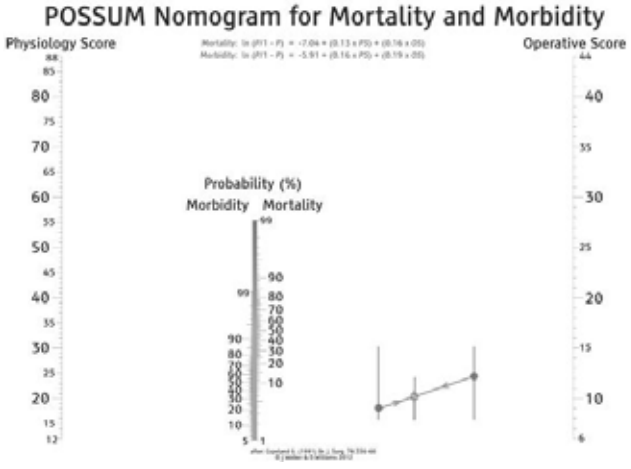
Materials and Methods: Our nomogram consists of two sections: a tally sheet to calculate Physiological and Operative scores (PS, OS), and an alignment chart to calculate morbidity and mortality (Fig 1).

The latter was designed using standard methods[2] and drafted with aid of software (Pynomo).

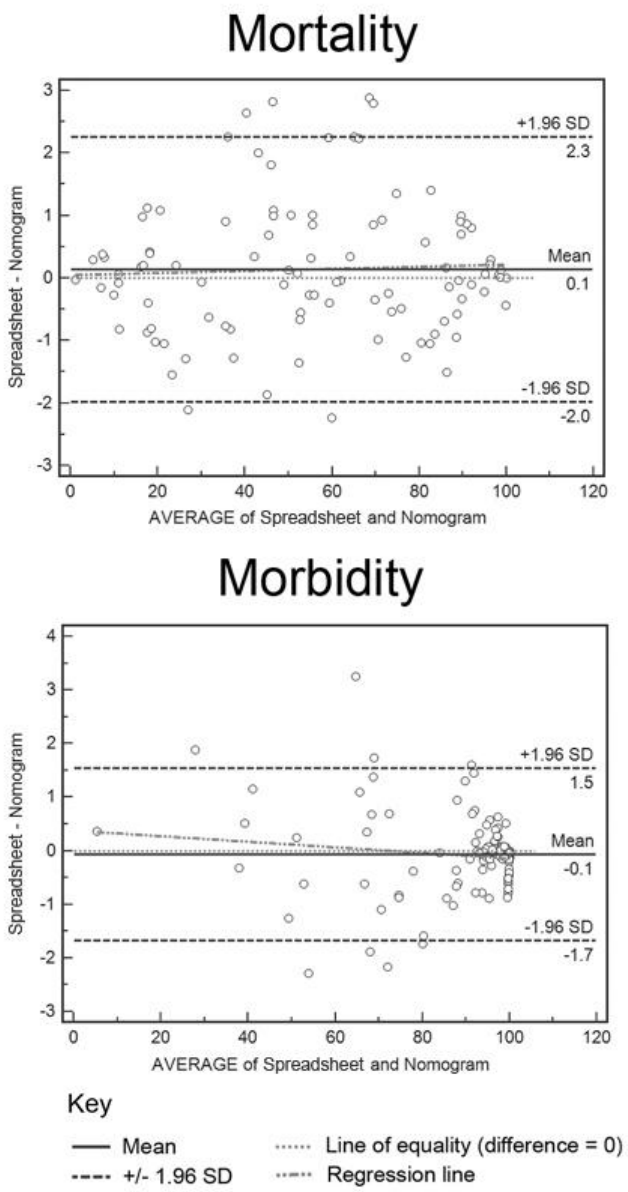
It was validated by using a spreadsheet (Excel, Microsoft, WA) to randomly generate 100 sets of simulated values for PS and OS. Predicted morbidity and mortality were then calculated in each case using both the nomogram and the spreadsheet; and Bland-Altman (BA) analysis[3] was performed.

Results and Discussion: The BA plot showed very close agreement between spreadsheet and nomogram (Fig 2). Bias of the nomogram was 0.07% for morbidity and 0.14% for mortality, with limits of agreement -1.5% to +1.7% and -2.3 to +2.0% for morbidity and mortality respectively.

Conclusion(s): POSSUM calculations are complicated and difficult to perform without software. Our nomogram provides an accurate, cheap alternative which has both practical and didactic value.



[Fig 1. The POSSUM Nomogram]



[Fig 2. Bland-Altman plots]

References:
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17AP1-7

Causes of conflicts in the operating room

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Background and Goal of Study: Our daily practice in the operating room (OR) is
characterised by a deep interaction between different professional categories that may lead to conflicts. The aim of this study was to analyse the main causes of conflict to prevent and/or minimize them.
Materials and Methods: Using a voluntary and anonymous questionnaire 40 nurses, 40 anaesthesiologists and 40 surgeons of our tertiary university hospital were asked to indicate how often they live conflicts in the OR and to rank from 6 to 1 transversal and specific causes previously defined. Recorded variables were: gender, age, professional category (anaesthesiologist (A), surgeon (S) and nurse (N)) and professional experience. Additional comments were encouraged to be added. Results are presented as percentages, means or absolute values.
Results and Discussion: 120 questionnaires were recorded and analysed (40 of each group). Mean participants age was 36.9 years (22-62), 74.2% of the responders were women (n=89): 90% N, 80% A and 52.5% S ($p < 0.001$). The top 3 transversal causes that globally seemed to cause more conflicts were: lack of teamwork (4.18), lack of communication (3.97) and apathy and laziness of staff(3.94). Lack of teamwork was the most conflicting issue for nursery (4.60), statistically different compared to anaesthesiologists and surgeons (A: 3.95, S: 4.00; p=0.044). On the other hand, physicians considered apathy and laziness of staff as the most important factor (A: 4.45, S: 4.23) compared to nursery (N: 3.15; p=0.001). Regarding to specific aspects, anaesthesiologists highlighted the "waiting for surgeon" time between surgeries (4.15), surgeons remarked the incorrect functioning of equipment (4.98) and for nursery the fact of not being considered for
decision-making (4.45). 41% of the participators suggested additional aspects such as wasting time on administrative tasks, lack of punctuality or too much noise in the OR.
Conclusion(s): The questionnaire was very well accepted and generated discussion among our staff members. Teamwork was the most significant factor in causing conflicts. 41% of the responders added additional aspects and comments that should be taken into consideration in order to design corrective measures for prevention and/or reduction of conflicts in the OR.

17AP1-8

Factors affecting acid base status during hepatectomy in cirrhotic patients

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Objective: To study acid base changes during hepatectomy in cirrhotic patients and their relations to intra-operative variables and different preoperative scoring systems used to asses hepatic patients.
Methods: After obtaining approval of the Ethics & Research Committee of the National Liver Institute - Menoufya University & written informed patient consent, 80 patients scheduled for hepatectomy for hepatocellular carcinoma were included in the study. Anesthesia was induced with propofol, fentanyl & rocuronium then maintained with desflurane & 50% O_2 in air. Samples for arterial blood gases and serum lactate were withdrawn from a left radial artery catheter just before the start of resection of liver parenchyma & immediately after its completion. All intraoperative events got recorded including hemodynamics, any hypotension episodes, all fluids & blood products infusions & any $NaHCO_3$ administration.
Results: No differences were found in study parameters between Child class A & B patients except for the preresection lactate ($p = 0.002$). On the other hand patients with MELD score < 11 had higher pre-resection HCO_3 (24.39 ± 0.86 vs 23.66 ± 0.95 mmol/L, $p = 0.004$), higher BE ($p = 0.002$), and lower lactate ($p = 0.001$) than patients with MELD score ≥ 11. These findings were true also for patients with MELD-Na score < 11 as they had higher pre-resection HCO_3 ($P = 0.001$), higher BE ($p = 0.001$), & lower lactate ($p < 0.001$) than patients with MELD-Na score ≥ 11. All patients had significant decrease in: pH (7.37 ± 0.39 vs 7.34 ± 0.33, $p < 0.001$), HCO_3 (24.25 ± 0.92 vs 22.16 ± 1.24 mmol/L, $p < 0.001$), BE (-0.74± 0.89 vs 2.78± 1.14, $p < 0.001$), and significant increase in lactate (13.58± 2.68 vs 32.95± 5.89 mg/dl, $p < 0.001$). These changes were augmented by intraoperative RBCs & FFP transfusion, using Pringle maneuver, but type of hepatectomy had significant effect only on HCO_3 & BE. Again these changes in pH, HCO_3, BE & lactate were more obvious in patients with preoperative MELD score ≥ 11, this was also true in patients with preoperative MELD-Na score ≥ 11 only with HCO_3, BE, & lactate but not with pH.
Conclusion: Changes occurred in acid base status during hepatectomy in cirrhotic patients are affected by the preoperative condition of the patient (MELD &MELD-Na scores) as well as by intraoperative transfusion of blood products, use of Pringle maneuver & to a lesser extent by major versus minor hepatectomy.

17AP1-9

Active smokers and passive exsmokers have increased risks of postoperative morbidity after major elective surgery: a prospective cohort study

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Background and Goal of Study: Although active smoking is a preventable cause of perioperative complications, the effect of passive smoking on postoperative outcomes is unknown. We hypothesized that patients exposed to environmental tobacco smoke (ETS) at work or at home before surgery would have similar risks of postoperative morbidity to current smokers.
Materials and Methods: We studied 587 adults undergoing major elective general, orthopaedic, urology and cardiac surgery from January 2011 to September 2012. The patient's smoking history was obtained by questionnaire and by measuring the adjusted urinary concentration of cotinine before surgery. Patients were classified into five groups: Never smoker without ETS, exsmoker without ETS, passive never smoker, passive exsmoker and current smoker. Postoperative morbidity was measured on the third day after surgery using the reliable and valid Postoperative Morbidity Survey (POMS) questionnaire (1). The outcome assessor was blinded to the cotinine concentration results. The association between smoking status and postoperative morbidity was assessed using a modified Poisson regression for estimating the relative risk (RR) and 95% confidence interval (95%CI).
Results and Discussion: The incidence of POMS-defined morbidity was 29% (95%CI: 26%-33%). The most common morbidity was gastrointestinal (unable to tolerate an enteral diet due to nausea, vomiting and abdominal distension, required antiemetics); an incidence of 19% (95%CI: 16%-23%). After adjusting for age, gender, ASA physical status and surgical specialty, smoking status was associated with POMS-defined morbidity (P=0.04). Current smokers and passive exsmokers were more likely to experience postoperative morbidity.

Smoking status group (%)	RR (95%CI)	P value
Never smoker with no ETS (43)	1.00	
Exsmoker with no ETS (19)	1.06 (0.68-1.65)	0.81
Passive never smoker (13)	1.28 (0.89-1.83)	0.18
Passive exsmokers (7)	1.83 (1.17-2.86)	<0.01
Current smoker (18)	1.50 (1.04-2.16)	0.03

[Relative Risk Postoperative Morbidity]

ETS = environmental tobacco smoke
Conclusion: Current smoking and exsmokers exposed to ETS before surgery have a higher risk of short-term postoperative morbidity.
Reference:
Grocott MPW et al. The postoperative morbidity survey was validated and used to describe morbidity after major surgery. J Clin Epidemiol 2007;60:919-28.
Acknowledgements: Study funded by a grant from the Health and Health Services Research Fund, Hong Kong

17AP1-10

The risk factors of medical device related (MDR) pressure ulcers at the nostril in oral maxillofacial surgery

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Background and Goal of Study: Medical device related (MDR) pressure ulcers have occurred postoperatively[1]. There are few reports about MDR pressure ulcers in head and neck region. We have experienced MDR pressure ulcers at the nostril in 16 cases for 3 years. They all occurred in prolonged cases, at least 8 hours. In this study, we investigated risk factors of MDR pressure ulcers on the nostril in oral maxillofacial surgery retrospectively.
Materials and Methods: We checked the anesthesia records of patients, over 20 year-old, ASA-PS I or II, who underwent oral maxillofacial surgery from April 2010 to September 2012. We investigated patient's background (gender, age, height, weight), airway management and duration of anesthesia, and investigated these factors again focusing on prolonged cases over 8 hours.We checked the anesthesia records of patients, over 20 year-old, ASA-PS I or II, who underwent oral maxillofacial surgery from April 2010 to September 2012. We investigated patient's background (gender, age, height, weight), airway management and duration of anesthesia, and these factors again focusing on prolonged cases over 8 hours.
Results and Discussion: Seven-hundreds-twenty-six cases were suitable for this study. There were significant differences in gender and duration of anesthesia between patients with and without MDR pressure ulcers at the nostril. Sixteen of 726 cases (2.2%) had postoperative MDR pressure ulcers, and 15 of 16 cases (93.8%) were male, while 384 of 710 cases (54.1%) were male (p=0.0037). Remaining one case was female. Duration of anesthesia was 945±341 minutes in 16 cases with pressure ulcers at the nostril, while it was 345±218 minutes in 710 cases without pressure ulcers (p=0.0001). Pressure ulcers in 11 cases with nasotracheal intubation were caused by the nasotracheal tube, and pressure ulcers in 5 patients with tracheotomy were caused by the nasogastric tube. The prolonged cases over 8 hours were 87 cases, and 48 cases were male (55.2%). Gender still remained as a risk factor associated with MDR pressure ulcers on the nostril (p=0.0041).
Conclusion(s): Gender and duration of anesthesia were suggested as risk factors of medical device related (MDR) pressure ulcers at the nostril in oral maxillofacial surgery.Gender and duration of anesthesia were suggested as risk factors of medical device related (MDR) pressure ulcers at the nostril in oral maxillofacial surgery.
References:
1. Black J et al. Int Wound J. 2010 :358-65.

17AP2-1

Gender differences in the effect of anesthesiology on death during surgical procedures

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Background and Goal of Study: Data from the Anesthesia Business Group (ABG) national registry of clinically enhanced administrative data were analyzed to determine the effect of type of anesthesiology on death during a surgical procedure. Eight sites of the ABG registry from 2007 - 2010 were included in the analyses of death in the operating room. Differences in the effect of anesthesiology for men and women were considered.
Materials and Methods: 1,083,057 cases were considered from these eight sites, with 429,621 (40%) men and 653436 (60%) women. Overall, 115 (0.011%) deaths occurred in the operating room. Of these, 57 were men (death rate 0.013%) and 58 were women (death rate 0.0089%). Multiple logistic regression analysis was used to identify significant predictors of death for men and women. Predictors include age, American Society of Anesthesiology physical status (ASAPS) classification, Clinical Classification Software (CSS) ICD-9 diagnostic categories, place of service (inpatient vs. outpatient/ambulatory), and Anesthetic Type (General vs. others).
Results and Discussion: After adjusting for the effects of ASAP classification, place of service and anesthetic type, age and CSS ICD-9 diagnostic categories were not significant predictors of death for either males or females. Risk of death increased in a near linear fashion with increasing ASAPS classification for both males and females. Inpatients, when compared to outpatients in both an ambulatory facility and hospital, were more likely to die during surgery for both men and women, with the effect of inpatient surgery being greater for men than for women. Men demonstrated a borderline significant effect of anesthesia type (p = 0.0524), while women demonstrated no significant effect due to anesthesia type.
Conclusion(s): After adjusting for the effects of age, ASAP classification, and CSS ICD-9 diagnostic categories, place of service and anesthetic type are significantly associated with death rates for men. Similarly, after adjusting for the same covariates, place of service, but not anesthetic type, is significantly associated with death rate for women.
Acknowledgements: The Doctors Company Foundation.

17AP2-2

Poor quality of recovery and quality of life 3 months later

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Background and Goal of Study: The quality of recovery score (QoR-40) is a patient-rated questionnaire used to evaluate the health status and degree of recovery after anaesthesia and surgery [1,2]. The aim of our study was to test if patients with poor quality recovery 24 hours after surgery have lower quality of life (QoL) 3 months later, using QoR-40.
Methods: Prospective study approved by the institutional ethics committee and written informed consent was obtained. All consecutive adult Portuguese-speaking patients submitted to elective non-cardiac and non-neurological surgery were eligible to the study, during a 6-week period of time. 221 patients were enrolled to the study. Demographics data and perioperative variables

were recorded. The validated QoR-40 Portuguese version was used to measure health status 24 hours after surgery (T1) and 3 months after surgery (T2). QoR-40 contains five sub-scales: Physical Comfort (PC), Emotional State (ES), Patient Support (PS), Physical Independence (PI), and Pain (P) [1]. Poor quality of recovery (PQR) was defined for patients with a QoR-40 score lower to the mean QoR score at T1 minus 2 standard deviations. Descriptive analyses of variables were used to summarize data and non-parametric test were performed for comparisons.
Results and Discussion: Quality of Recovery was evaluated at T1 and T2 in 114 patients. Mean T1 QoR-40 score was 169.5 ± 27.0 and PQR patients were defined if QoR-40 score was lesser than 115,5. PQR occurred in 11 patients (9.7%). Global median scores for PQR patients were lower at T1 (107 vs. 175, p< 0.001) and at T2 (116 vs. 185, p< 0.001). According to the various QoR-40 sub-scales, at T1 PQR patients showed lower median scores for ES (20 vs 39, p< 0,001), PC (25 vs 52, p< 0,001) and P (10 vs 30, p< 0,001) and similar results for PI and PS (p>0,05). At T2 the same previous pattern was followed: PQR patients had lower median scores for ES (20 vs 39, p< 0.001), PC (28 vs 57, p< 0.001) and P (9 vs 33, p< 0.001) and no differences in the other sub-scales (p< 0,05) .
Conclusion: Patients with PQR 24 hours after surgery have lower QoR-40 scores 3 months later, which indicates lower QoL. The results suggest that patients with PQR require more effective interventions, particularly in the more affected dimensions, in order to improve their early recovery and, therefore, its QoL 3 months later.
References:
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17AP2-3

Anaesthesia-related cardiac arrest and mortality: a study of 42,221 anaesthetics over 6 yr from a Brazilian tertiary teaching hospital

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Background and Goal of Study: Two previous studies in our institution demonstrated intraoperative anaesthesia-related mortality ranging between 0.85 and 1.12 per 10,000 anaesthetics.[1,2] This survey evaluated the incidence and causes of cardiac arrest (CA) and death related to anaesthesia in a Brazilian tertiary teaching hospital between January 2005 and December 2010.
Materials and Methods: There were 42,221 consecutive anaesthetics in the study period. The incidence of CA and death during anaesthesia was prospectively identified from an anaesthesia database of operating room and post-anaesthesia care unit CA and death. Collected data included patient demographics, surgical procedures (elective, urgent or emergency), ASA physical status classification, anaesthesia provider information, type of surgery, surgical areas and outcome. All CA and death were reviewed and grouped by cause into one of four groups: totally anaesthesia-related, partially anaesthesia-related, totally surgery-related or totally patient disease/condition-related.
Results and Discussion: One hundred eleven CA (26.3 per 10,000 anaesthetics) and 72 deaths (17 per 10,000 anaesthetics) were found. The major incidence of CA were children under 1 yr and the elderly (P=0.02), ASA physical status of III or poorer (p=0.02), emergency surgery (p=0.02) and general anaesthesia (p=0.03). Sepsis with multiple organ dysfunction syndrome was the main cause of CA, followed by ruptured aneurisms (p< 0.03). The majority of the perioperative CA and death were patient disease/condition-related (p< 0.0001). There were 5 partially anaesthesia-related CA without anaesthesia-related mortality (p< 0.0001). The main causes of anaesthesia-related CA were respiratory events.
Conclusions: Anaesthesia-related CA and death were 1.2 and 0.0 per 10,000 anaesthetics, respectively. All anaesthesia-related CA were related to airway management. The expressive decrease in mortality incidence indicates that anaesthesia safety in all ages has dramatically improved over the past two decades in our institution following a global trend.
References:
1. Braz JRC, Silva ACM, Carlos E et al. Rev Bras Anestesiol. 1999;49:257-62.
2. Braz LG, Módolo NSP, Nascimento Jr P, et al. Br J Anaesth. 2006;96:569-75.
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17AP2-4

Intraoperative conscious events and quality of life

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Background and Goal of Study: Awareness is a rare complication in general anesthesia that may be associated with development of psychological disorders and emotional disturbances with possible negative impact in health-related quality of life (HRQOL). The aim of our study was to evaluate quality of life in patients with intraoperative conscious events (awareness or dreams).
Materials and Methods: Observational prospective study approved by the Centro Hospitalar São João Ethics Committee. Written informed consent was obtained. Inclusion criteria included all adult Portuguese-speaking patients, submitted to scheduled surgery under general anesthesia (non-cardiac surgery, non-obstetrics and non-neurosurgery), during a 6-week period of time.118 patients were included. HRQOL was assessed by SF-36 Health Survey (SF-36) before surgery and 3 months after surgery. We applied Brice interview at the time of discharge from the post-anesthesia care unit (PACU), 24 hours after surgery and through a telephonic interview one month after surgery. Demographic data, perioperative variables, length of hospital and recovery room stay and mortality were recorded. Descriptive analysis of variables was used to summarize data and non- parametric tests were used.
Results and Discussion: From the total 8 positive Brice questionnaires (6,8%), 7 (5,9%) were regarding dreams under general anesthesia and 1 (0,9%) was regarding awareness.In the group of patients with intraoperative conscious events (awareness or dreams), there were no differences in HRQOL comparing each of SF-36 domains before and 3 months after surgery.The group of patients without intraoperative conscious events (awareness or dreams) had better scores for 7 domains 3 months after surgery: physical functioning (median 80 vs 78, p=0.004), limitations caused by physical problems (median 69 vs 50, p=0.025), bodily pain (median 77 vs 61, p< 0.001), vitality (median 50 vs 42, p< 0,001), social functioning (median 88 vs. 75, p=0.020), role limitations caused by emotional problems (median 100 vs. 75, p< 0,001) and mental health (median 68 vs 56, p< 0,001).
Conclusion(s): The health-related quality of life after surgery improved in patients without intraoperative conscious events (awareness or dreams), while it was similar in the group of patients with intraoperative conscious events (awareness or dreams).

17AP2-5

Causes and outcomes of professional liability claims in anaesthesia

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Background: Over the last 26 years 7,535 malpractice claims were handled by the Professional Liability Service (PLS) of the Barcelona's College of Physicians. Adverse events in anesthesia are a main concern among specialists, with relevant issues regarding liability and patient safety.
Materials and Methods: We retrospectively analysed the anaesthesia malpractice claims handled by the PLS between 1986 and 2011. The aim of this study is to analyse the causes, the severity of complications (according to the National Patient Safety Agency scale) and the indemnity payment of claims related to adverse events in anaesthesia
Results: 334 anaesthesia malpractice claims were analyzed (13 claims/year). Anaesthesia was the sixth speciality in terms of professional liability claims. 53% of the procedures were related to private medicine. 62% of the procedures were lawsuits whilst 38% were out of court procedures. 24% of claims ended with professional liability. 41% of civil court procedures and 33% of out of court procedures were settled with an indemnity payment, whilst only the 11% of the procedures at criminal courts ended with an award. General anaesthesia was the most frequently claimed (51%), followed by regional anaesthesia (28%), obstetrics anaesthesia (10%), reanimation (5%), others (5%) and pain (1%). Most of the claims were related to procedures at in the theatre room (75%) and obstetrics area (12%). Most frequently claimed events were: General anaesthesia: dental damage (n=56), cardiac arrest (n=21) and bronchospasm (n=17). Spinal anaesthesia: nerve injury (n=33), meningitis (n=6) and anaesthetic local reabsorption (n=4). Peripheral nerve anaesthesia: peripheral nerve injury (n=10), eye perforation (n=2) and phrenic paralysis (n=2). Obstetric anaesthesia: nerve injury (n=7), foetal death (n=4) and postdural puncture headache (n=4). Others: surgery complications (n=38), blood transfusion error (n=7) and anaphylactic shock (5). The severity of complications' outcomes were: death (26%), severe (34%), moderate (22%) and low (18%). Specialities most frequently involved were: orthopaedic surgery, gen-

eral surgery and obstetrics and gynaecology. Mean indemnity payment was 74,878 € (Max: 763,733 €; Min: 81 €).
Conclusion(s): Anaesthesia accounted for 4.4% of the total amount of claims. Anaesthesia complications' outcomes claimed are severe in a high percentage (60%). Nevertheless, professional liability was found to exist only in 24.3% of the claims.

17AP2-6

Evaluation of scores and postoperative mortality and morbidity in 223 patients with colorectal cancer

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Background and Goal of Study: The objectives of the study were to validate the risk-adjustment models Charlson, ASA, POSSUM, P-POSSUM and CR-POSSUM score for predict the postoperative morbidity and mortality in colorectal cancer resections and to improve the surgical outcomes with the hemodynamic optimization in the Critical Care Units.
Materials and Methods: From January 2010 to December 2010, we collect retrospectively all the patients who required laparoscopic or open (emergency / elective) resection for colorectal cancer in our institution, as the information about pathology, type of anastomosis, duration of surgery, postoperative length of stay, complications and surgical reintervention. The operative score (ASA), the weighted Charlson Comorbidity Index, the parameters for calculating morbidity and mortality predicted by the POSSUM, P-POSSUM and CR-POSSUM scores were collected and analyzed.
Results and Discussion: There were 223 patients (51,1%women, 48,9% men), of mean age 70 years. Rectum cancer was the most frequent (26,9%). 91 % were elective surgery and the open procedure prevail in 65,5% of all the cases. There were 6 (2,7%) ASA I, 97 (43,5%) ASA II, 109 (48,9%) ASA III and 11 (4,9%) ASA IV score patients. The overall observed morbidity rate was 46,2%, including mayor and minor complications, and 30-day mortality was 5,38%. Charlson index, POSSUM, P-POSSUM and CR-POSSUM score, predicted the morbidity and mortality, showing better correlation at major scores for Charlson index ($p < 0,001$). The observed complication rate was not significantly different to the rate predicted by the POSSUM scoring system. For predicting postoperative mortality, CR-POSSUM was superior to POSSUM.
Conclusion(s): The morbidity and mortality in colorectal cancer surgery is related with the comorbidity index (Charlson) and POSSUM scores (physiologic state of the patient). The patients with a predicted mortality POSSUM > 10% should be admitted to Critical Care Units for hemodynamic optimization. A better approach in this group of patients and the implementation of multimodal rehabilitation programs could improve their outcomes.

17AP2-7

Meningococcal septicaemia with four limb amputation: is life worth saving?

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Background: Meningococcal disease continues to be a clinical and public health problem. It is knowned for its propensity to attack the young and healthy. Meningococcal septicaemia is associated with rapidly progressive shock and coagulopathy, which can be extremely difficult to manage. Estimations of mortality for meningococcal septicaemic shock can reach 80%.[(1)]
We present a case of meningococcal septicaemia, which was complicated with *purpura fulminans* and ended up in the amputation of all four limbs.
Case report: Previously healthy 43 years old female, was transfered to our burn unit after a month stay in an ICU, with a meningococcal sepsis diagnosis which quickly progressed to septic shock, with the need of high doses of vasopressor and inotropic support. She presented with distal ischemic lesions in all four limbs and generalized bullous lesions.
The patient stayed in our unit for 4 months, during which, she presented with respiratory complications requiring invasive ventilatory support, renal complications requiring hemofiltration, cardiovascular complications in the context of heavy bleeding with severe arrhythmias, and numerous bacterial infections requiring multiple and prolonged antibiotic therapy.
She was submitted to twelve surgical interventions, ending up with the amputation off the upper and lower limbs.
The patient was discharged from the unit to follow an intensive rehabilitation program, including psychiatric support.
Discussion: Those who develop *purpura fulminans*, with severe peripheral ischemia and gangrene, may require amputation of limbs and digits.
When limb ischemia develops in a critically ill patient, suffering from shock and multipleorgan failure, family and clinicians, often face the difficult decision of whether or not to continue aggressive intensive care for the patient who may survive with multiple mutilating amputations.
In our case, the patient reported that it was worthwhile to go through this whole process, even though she had been extensively mutilated.
This case demonstrates that burn units are of utmost importance because they enable a multidisciplinary approach, integrated with the operating rooms that provide intensive care to these patients in need of multiple surgical interventions.
References:
1. Kvalsvig, AJ, Unsworth DJ. The immunopathogenesis of meningococcal disease. J Clin Pathol 2003; 56:417-422
Learning points: More studies focusing subsequently everyday life of this patients, are needed.

17AP2-8

Morbidity and mortality in 456 patients treated with bariatric surgery

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Background and Goal of Study: Bariatric surgery is considered to be safe, but not without risks for considerable morbidity and potential mortality. Different studies published a mortality range of 0% to 1.5% Morbidity occurring during the immediate postoperative period typically falls into one of four categories: wound, gastrointestinal, pulmonary, and cardiovascular complications. We reported our major morbidity and mortality in post-operative period, until discharge.
Materials and Methods: This is a monocentric retrospective study. We analyzed patients submitted to laparoscopic bypass surgery in a hospital with experience in bariatric surgery over a period from January 2011 to November 2012.
Results and Discussion:

Age (mean)	40,9 years
Gender (Female:Male)	400(87,7%): 56(12,3%)
ASA	II 103(22,6%) III 353(77,4%)
Comorbidities	Hypertension n =180 (39,5%) OSA n=31 (6,8%) COPD n=47 (10,3%) Diabetes n= 74(16,2%) Hyperlipidemia n=150 (32,9%) Venous stasis n=45(9,9%) Tabagism n= 52(11,4%) Others n=15 (3,3%)

[Patients Demographic Data]

Congestive heart failure	1 (0,2%)
Pneumonia	2 (0,4%)
Pulmonary embolism	1(0,2%)
Respiratory failure	1(0,2%)
Pulmonar atelectasis	1(0,2%)
Renal failure	2(0,4%)
Self-limited bleeding	6 (1,3%)
Hemorrhagic shock	3 (0,7%)
Peritonitis	3 (0,7%)
Septic shock	2(0,4%)

[Major Morbidity]

The rate of major morbidity in the period until discharge was 4,8% (n=22), mainly due to surgical conditions. The mortality rate was 0.2% (n = 1), following septic shock, with multiple organ dysfunction.
Conclusion(s): The observed low mortality rates and moderate level of complications are similar to findings in other studies. Rates of postoperative complications can be reduced with proper preventative measures. The anesthetic team plays a key role in this process.

17AP2-9

Quality of life in patients with cognitive decline after major surgery

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Background and Goal of Study: Postoperative cognitive decline (PCD) is a decline in cognitive function from preoperative levels that may have a negative impact in quality of life. The aim of this study was to evaluate the incidence of PCD patients admitted in the Post-Anesthesia Care Unit (PACU) and its influence in quality of life.
Materials and Methods: Observational, prospective study conducted in patients aged above 45 years, admitted in the PACU after elective surgery. Patients submitted to cardiothoracic and neurosurgeries and those incapable to give informed consent were excluded.
Forty one patients were included. Cognitive function was assessed using the Montreal Cognitive Assessment (MOCA) and quality of life was assessed using SF-36 Health Survey (SF-36). Evaluations were performed preoperatively (T0) and 3 months after surgery (T3). A change of at least 2 points in MOCA scores between T0 and T3 was considered as cognitive impairment (CI). Descriptive analyses of variables were used to summarize data and non-parametric tests were performed for comparisions (Wilcox signed rank tes and the Mann Whitney U -test).
Results and Discussion: The incidence of CI 3 months after surgery was 24% (n=10). At T0 no differences emerged for the MOCA scores between patients with and without CI. At T3 median MOCA scores were lower in patients with CI (20 *vs.* 25, p=0.009). Postoperatively and comparing to preoperative MOCA scores, CI patients had worse scores in their median MOCA (20 *vs* 25, p=0.001) while patients without CI had better scores (25 *vs* 21, p>0.001). When comparing the median scores for each of SF-36 domains there were no differences between CI and without CI patients.
Comparing each of SF-36 domains (at T0 and T3), patients with CI had similar scores for every of the 8 SF-36 domains, while patients without CI had median better scores for only 6 domains: physical problems (50 *vs.* 63, p=0.021), bodily pain (62 *vs* 74, p=0.010), general health perception (57 *vs* 65, p=0.021), social functioning (75 *vs* 100, p=0.035), emotional problems (67 *vs* 92, p< 0.001) and mental health (52 *vs* 68, p< 0.001); they had similar scores for vitality and physical function domains.
Conclusions: In patients without CI we verified an improvement in cognitive performance 3 months after surgery while amongst patients with CI there was a significant reduction. Patients with CI obtained no improvement in all SF-36 scores but patients without CI improved in almost all SF-36 scores.

17AP3-1

A simple but dramatic ventilator failure

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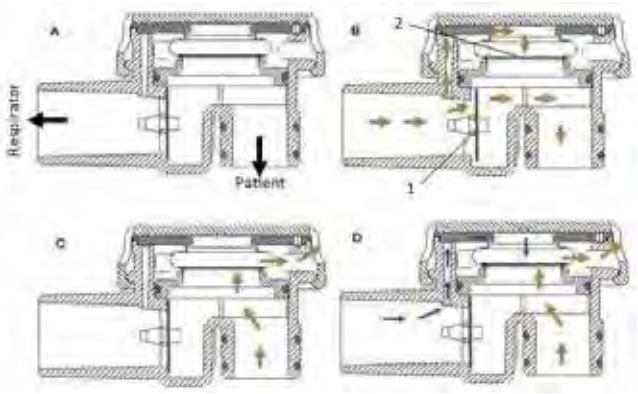
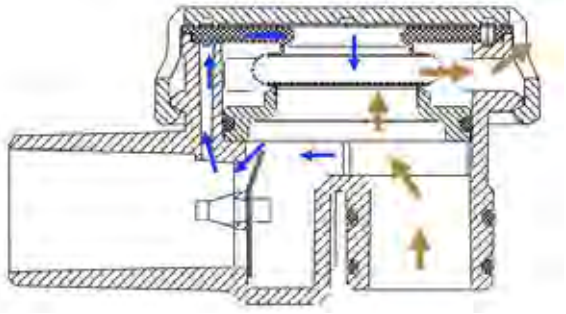
Background: Ventilator failures are widely reported in the literature mainly those of the anesthetic stations but not those of transport ventilators.
Case report: After an eventful coronary bypass graft, the patient was transferred to his bed and airway connected to a transport ventilator (Oxylog 2000, Draeger) with reusable tubing. Immediately after, a first cardiac arrest occurred leading to chest reopening and ECC restart without evident abnormalities.
The patient was again transferred to his bed. A second cardiac arrest after connecting the Oxylog 2000 was associated to a 20 cmH_2O end tidal positive pressure despite a 5 cmH_2O initial setting. The proper diagnosis of gas tamponade and lung hyperinflation due to ventilator dycfunction was made. The Oxylog was thereafter exclude from equipment for analysis.
Discussion: An inspiratory failing valve induced the unsuitable high PEP. Normally, at inspiration (Pic.1.B), the pressure gradient between ventilator's pneumatic circuit and patient's airways allows the inspiratory valve
(1) opening and the expiratory valve
(2) closure.
At expiration (Pic.1.C) the pressure difference closes the inspiratory valve and opens the expiratory one. The ventilator can create a PEP (Pic.1.D) by generating a continuous flow opposed to expiratory valve opening.



[Picture 1]

In this case report (Pic.2), the tight of the inspiratory valve was defective at expiration leading to a continuous gas inflow directly from respirator to patient via the unclosed inspiratory valve. In doing so, a higher PEP than that initially set was generated increasing at each insufflations leading to gas tamponade and cardiac arrest.



[Picture 2]

When analyzing the root cause of this accident, verification of the respirator and check list before use ware lacking.
Learning point: Ventilator failure described here was caused by valve dysfunction and lack of maintenance and verification.

17AP3-2

Life threatening anaphylactic reaction to patent blue dye

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Background: Few cases of anaphylactic reactions to patent blue dye are reported worldwide, even with an estimated incidence rate of 0.9%[1]. We describe a case of a severe anaphylactic reaction to patent blue dye. Medical personnel involved in blue dye administration should have competent personnel and facilities to deal with such situations.
Case: A 60 year-old female, ASA III, with a breast tumor, was admitted to the operating room to be submitted to an elective tumorectomy with sentinel lymph node biopsy under general anesthesia. Two grams of cefazolin were administered 15 minutes before the surgical incision. The anesthesia induction was uneventful. Nearly 15 minutes after blue dye injection the patient developed a sudden and sustained hypotension with hypoxia and a generalized rash. The patient was treated with adrenaline infusion, anti-histaminic and corticoids with good results. She was admitted on the ICU and recovered from the episode.
Discussion: An anaphylactic reaction is a difficult diagnosis during anesthesia and determining the causal agent is often impossible. In our case, anaphylaxis was the most probable cause for the shock and blue patent dye the most probable agent, although the IgE and tryptase tests were negative.
It's not clear if anaphylaxis to patent blue is common enough to justify its screening in routine pre-operative tests.
Reference:
1. Barthelmes L, et al. Adverse reactions to patent blue V dye -The NEW START and ALMANAC experience. Eur J Surg Oncol. 2010 Apr;36(4):399-403
Learning points: Blue patent anaphylactic reactions are not very rare, and can be deadly.

17AP3-3

Pneumothorax following endoscopic rectum perforation

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Background: Pneumothorax is a rare consequence of colonic perforation that is mainly related to defects in the sigmoid colon.
Case report: A seventy-five year-old woman was scheduled to undergo endoscopic resection of a 35 mm rectal polyp. She had a history of diabetes, hyperlipidemia and hypertension, and was allotted to ASA III class.After monitorization, she was administered 1,2 mg kg^{-1} intravenous bolus of propofol. Deep sedation was maintained with 10 mg kg^{-1} h^{-1} perfusion. During the procedure, perforation was detected. Treatment with clip-loop was unsuccessful, and the endoscopy was terminated when subcutaneous emphysema was identified.In the recovery room, she complained of severe chest pain. Pneumomediastinum could be observed in the chest x-ray, but 120 min later a 30% occupying left pneumothorax was evident on the scanner. The pneumothorax was drained by inserting a chest tube before surgery. General anesthesia was provided with 2 mcr Kg^{-1} fentanyl and 1,6 mg Kg^{-1} propofol. Spontaneous ventilation was maintained through a laryngeal mask with 1,3 MAC sevoflurane.
On trans-anal exploration, a defect on the anterior wall of the rectum stretching up to 4 cm from the anal edge could be observed. After checking the integrity of the vagina the wound was sutured. The patient was uneventfully discharged 7 days after the endoscopy.
Discussion: Up to 50% of patients with bowel perforation do not have symptoms during the procedure[1], and painless or even asymptomatic pneumothorax is also documented in the literature[2,3]. Early recognition and treatment improve outcome, therefore, assessment and detailed discharge criteria in the recovery room are mandatory.Advanced age, female gender, therapeutic endoscopy, previous pelvic or abdominal surgery and co-morbidity are associated with higher risk of perforation. Endoscopies, requiring high insufflation gas pressure, and some of the above mentioned factors should lead us to suspect this event[1,2]. Chest x-ray is diagnostic in up to 87% of the cases; however tomography is a more reliable tool[1].
References:
1. Kipple JC. AANA J 2010; 78:462-72-Marwan K et al. Ann R Coll Surg Engl 2007;89:1-23-Zeno BR. Am J Med Sci 2006; 332: 153-9
Learning points: This case shows that low rectal defects do not preclude subsequent pneumothorax.
A lapse of time must be expected before gas in the pleura can be radiologically confirmed. This complication should be anticipated if we are to proceed with surgery.

17AP3-4

Quality of obligatory routine data in anesthesia information management systems: review of 104,447 cases

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Background and Goal of Study: According to the regulations it is required before each anesthesia to check the anesthesia machine and breathing circuit alarm and identify the patient. This has to be noted in the anesthesia record. The goal of this study was to examine the number of records in an anesthesia information management system (AIMS) with negative answers on these three subjects.
Materials and Methods: All anesthesia records from both hospitals of the Hadassah Medical Organizationfrom 2/2007 to 7/2012 were retrieved from the AIMS (MetaVision, iMDsoft, Tel-Aviv, Israel). Data were analyzed anonymously.
Results and Discussion: A total of 104,447 anesthesia records were included. In 19 (0.02%) cases anesthesiologists stated that the anesthesia machine was not checked and in 22 cases (0.02%) patient was not identified. The third question on the breathing circuit disconnection alarm was added in 2/2011 and included in 27,853 anesthesia records. In 6 (0.02%) cases anesthesiologists reported not having checked the breathing circuit disconnection alarm.
According to international and national guidelines it is not acceptable, to perform anesthesia without functional equipment and without identifying the patient. It comes to no surprise that in 99.98% of all anesthesia records anesthesiologists entered that the machine and the breathing circuit disconnection alarm were checked and that the patient was identified. It can be assumed that the cases with negative answers are related to very urgent cases (where there was no time to check the equipment) or to data entry errors.
Conclusion(s): The results of this study raise the questions on how valuable from a medical and medico-legal point of view are mandatory routine data retrospectively entered into electronic health records that can be defined as a sine qua non in patient treatment (for example no anesthesiologist will give anesthesia without identifying the patient and checking the equipment). The transition from retrospective charting of routine data items to the prospective use of check-lists like in aviation (by at least two persons) should increase safety and the value of AIMS data.

17AP3-5

Intraoperative awareness detected using Brice interview

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Background and Goal of Study: Awareness is a rare and stressful complication in general anesthesia. It is difficult to identify and one of the difficulties relays on the inability to distinguish it from dreaming around the time of surgery. The aim of our study was to detect awareness using the Brice interview.
Materials and Methods: Observational prospective study approved by the Centro Hospitalar São João Ethics Committee. Written informed consent was obtained. Inclusion criteria included all adult Portuguese-speaking patients, submitted to scheduled surgery under general anesthesia (non-cardiac surgery, non-obstetrics and non-neurosurgery), during a 6-week period of time. We applied Brice interview in 118 included patients at the time of discharge from the post-anesthesia care unit (PACU), 24 hours after surgery and through a telephonic interview one month after surgery. Demographic data, perioperative variables, length of hospital and recovery room stay and mortality were recorded. Descriptive analysis of variables was used to summarize data and the Mann-Whitney U test, Fisher's exact test or Chi-square test were used.
Results and Discussion: From the total 8 positive Brice questionnaires, 7 were regarding dreams under general anesthesia and 1 was regarding awareness. The incidence of dreams was 6.41% in females and 7.32% in males. There were no differences between groups concerning to age distribution, site of surgery, duration of surgery and anesthesia, time until discharge from PACU and from the hospital and mortality. There were no differences regarding benzodiazepines use pre-operatively and type of anesthetic maintenance (endovenous vs inhalatory).
Conclusion(s): Awareness is a rare anesthetic complication. In our study we found a positive case and we had 7 positive Brice questionnaires regarding dreaming, which may be linked to light anesthesia or totally unrelated to awareness according to the current literature. In any case, it may confound the identification of awareness cases.
References:
1. Br J Anaesth 1970; 42: 535.
2. Acta Anaesthesiol Scand. 2002 Apr;46(4):345-9.

17AP3-6

A rare complication following general anaesthesia for gynaecological laparotomy: postoperative visual loss due to bilateral occipital lobe infarction

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Background: Postoperative visual loss (POVL) is a rare, unexpected and devastating complication, and may occur during non-ocular surgery, especially cardiac and spine surgery (1-2). We present a case of POVL due to bilateral occipital lobe infarction caused by basilar artery thrombosis.
Case report: A 72-year-old, ASA II woman underwent abdominal hysterectomy-oophorectomy, pelvic lymphadenectomy and appendectomy due to gynaecological malignancy. Procedure was performed in supine position and no facial or ocular trauma occurred during the operation. During the 90 minute procedure all monitored parameters were within acceptable limits. At the end of the procedure, patient was extubated without any complication and transferred to the ward. Six hours after the operation, she complained about partial and blurred vision in her left eye with no other neurological findings. Following day, her complaints involved both eyes. Ophthalmological and neurologic examinations revealed no pathological findings. Magnetic resonance imaging (MRI) and MRI-angiography of the brain revealed bilateral occipital infarction and basilar artery thrombus formation, respectively. Anticoagulant therapy was started immediately. A slow but progressive improvement in the patient's vision was noted and discharged home at 15th day of the operation. After three months, patient's low visual acuity with visual field defects persisted with slow improvement.

Discussion: The main causes of POVL after non-ocular surgery are ischaemic optic neuropathies, retinal vascular occlusion, pituitary apoplexy and cortical blindness (1-2). In cases with no suspected risk factors related to patient position and/or surgery, possibility of the other and less common causes should not be ignored. MRI and MRI-angiography made with this in mind, revealed bilateral occipital infarction and basilar artery thrombus formation.
References:
1. Berg KT, Harrison AR and Lee MS. Perioperative visual loss in ocular and nonocular surgery. Clin Ophthalmol 2010; 4: 531-546
2. Roth S. Perioperative visual loss: what do we know, what can we do? Br J Anaesth 2009; 103 Suppl 1: i31-40
Learning points: POVL is a multifactorial induced situation and when faced with it, less common cause such as cortical infarction should be kept in mind beside the more common causes.

17AP3-7

Central venous catheter malposition in surgical patients: a retrospective observational study

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Background and Goal of Study: Central venous catheter (CVC) malposition incidence ranges between 8 and 47%. It may cause serious complications such as venous thrombosis, cardiac arrhythmias and tricuspid valve injuries. Bedside chest X-ray (CXR) is still the gold standard method to detect CVC malposition. This retrospective study was realized to evaluate the incidence and factors associated with CVC malposition in a university hospital.
Materials and Methods: Between August and November 2012, we reviewed CXRs from surgical patients who had received a thoracocervical CVC. We reported type of surgery, vein approach and side of puncture. Distance between CVC tip and the carina was measured. CVC position was considered correct when tip-to-carina distance ranged between 0 and 55 mm, according to Wirsing's criteria. Catheter tip above the carina, with a tip-carina measured distance below zero, was defined short catheter. Tip-to-carina distance above 55 mm was defined long catheter. Qualitative variables were analyzed with the X2 test and quantitative variables with ANOVA test. Statistical significance was considered if $p < 0,05$.
Results and Discussion: During the considered period 73 CVCs were inserted, in patients mostly submitted to thoracic (47,7%) and gastrointestinal (35,6%) surgery. The vascular approach was: right jugular vein in 40 (54,8%) patients, right subclavian vein in 20 (27,4%) patients, left subclavian vein in 10 (13,7%) patients and left jugular vein in 3 (4,1%). 43 (58,9%) CVC were not correctly positioned. CVCs malposition was distributed as follows: 30 (69,7%) long catheters, 7 (16,2%) short catheters and 6 (13,9%) unusual course catheters. No significant relation was found between incidence of CVC malposition and age, gender, height, weight and type of surgery. Long catheter insertion was more frequent with right jugular vein and both subclavian veins approach, whereas left jugular catheters were associated with a higher incidence of short catheter ($p=0,02$). All left jugular CVCs were not correctly positioned.
Conclusion(s): We described a higher incidence of CVC malposition respect to other series reported in previous works. Developing CVC placement algorithms to estimate depth of catheter's position, or using guidance devices to ensure correct catheter's tip location, would be recommendable. Due to a high rate of left sided jugular catheter misplacement, further works should be promoted before recommending this approach.

17AP3-8

The swab inside the oro-tracheal tube. The purpose of a clinical case

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Background: Prospective studies suggest that an error occurs every 133 anaesthetics',despite the traditional care and standardization of anaesthetic techniques implemented in the routine work of the anaesthetist. In recent years, several surgical approaches have emerged, with its peculiarities anaesthetics approaches.A number of surgical complications derive from Laser surgery.The most frequently are: the risk of fire, haemorrhage, laryngeal edema and fistula.We report a clinical case of a patient who, during emergency anaesthetic post laser partial laryngectomy, when coughing, expelled a surgical swab through the lumen of the tracheal tube.
Case report: Male, 71 years old, ASA III diagnose of supraglottic cancer, proposed for laser partial laryngectomy. Monitored according to ASA standards and BIS. Anesthetic induction, with fentanyl and etomidate. Laryngoscopy done with GlideScope®(nº4) without visualization of the glottis. Intubated with a microlaringeal tube No. 5 when BIS 40. Then curarization with rocuronium, after confirmation of endotracheal tube placement. Anesthesic mantainance with sevoflurane to a BIS 40-60. The surgery lasted 4 hours. Immediately posop, intubation was maintained due to the increased risk resulting from the laryngeal edema. We replaced the No. 5 tube for a No. 6, under direct visualization with laryngoscopy and aid of a tube exchanger. The awakening was done after a TOF 2, decurarization with Sugammadex. The patient remained in spontaneous ventilation. After transfer to the recovery bed, in a fit of coughing after endotracheal suctioning, the patient expelled a blood clot and surgical gauze. In the immediate postoperative surveillance, the patient remained in UCPA in spontaneous ventilation, with no signs of complications. Transfer to an intermediate care unit. The patient showed no complications and was successfully extubated and discharged to the ward.
Discussion: This clinical report not only confirms the importance of safety in anaesthesia as well as the need for a complete reversal of the neuromuscular block. In the case described, an error in counting surgical swabs at the end of surgery could have had implications on the anaesthetic procedure and jeopardize the patients safety.
References:
Glavin RJ-Drug errors:Br J Anaest 2010;105(1);
Learning points: The security role in anesthesiology increasingly crucial in everyday life of anesthesiologists. Team work is undoubtedly an asset in the operating room.

17AP3-9

Malignant Hyperthermia: are we ready?

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Background and Goal of Study: Malignant Hyperthermia (MH) is an inherited disorder triggered by halogenated volatile anesthetics and depolarizing muscle relaxants. It is a rare potentially lethal syndrome[1] and there are no uniform procedures or guidelines in Portugal. High-fidelity biomedical simulation (HFBS) represents the main opportunity to train HM and improve safety and quality of patient care. The goal of this paper is to evaluate personal clinical expertise, teamwork and leadership performance in a simulation training of MH.
Materials and Methods: This was a retrospective descriptive analysis based on records of 11 controlled simulation scenarios about MH and on instructor's checklists. We assess MH crisis management and treatment, technical and nontechnical skills and time for accomplishment of key actions. Descriptive analyses with SPSS 20.0®.
Results and Discussion: Trainees total number was 31 (19% specialists; 81% anesthesiology residents) distributed amongst 11 teams. All teams diagnosed the critical event taking an average time of 173seconds (±84,1; 60-300sec); and increased ventilation after 33seconds. Nine teams (81,8%) stopped trigger agent; 72,7% changed anesthetic technique and Dantrolene was requested in an average time of 306seconds (±138; 55-550sec), after the critical event diagnostic. All teams began cooling measures, 8 teams request arterial blood gas analyses and 7 teams insured urine output. There was a team-leader in 10 teams (90,9%) and the teamwork was accomplished by only 33,3%. The diagnosis of the critical event was prompt which can be related to the simulation environment and with the delivery of bibliography. Similarly, the order for Dantrolene and its administration was rapid as was the beginning of support treatment. Nevertheless, trigger agents were not stopped by all the teams.
Conclusion(s): MH is a rare critical event, and management of an acute MH crisis is of high complexity. Its treatment requires extensive multitasking and involves effective teamwork and communication skills. The management of this critical event occurred with poor systemization revealing the need for additional training of multidisciplinary teams in HFBS in order to improve psychomotor, clinical judgment, teamwork and communication skills. The standardization of national guidelines seems essential for the correct approach of MH.
References:
1. Curr Opin in Anaesthesiol.2010;23(3):417-22

17AP4-1

A nomogram to prevent local anaesthetic toxicity

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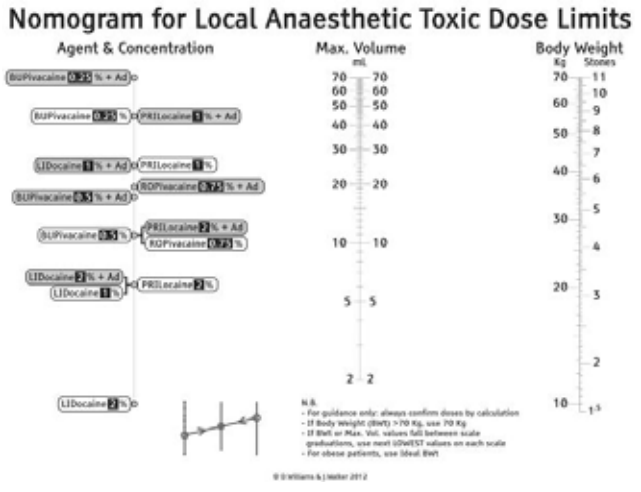
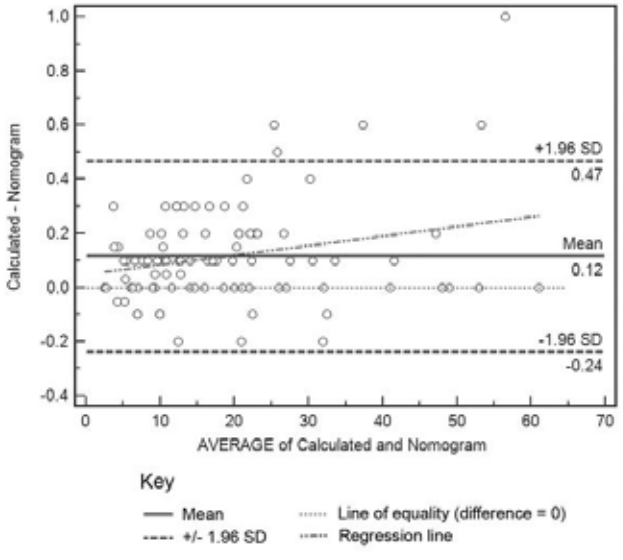
Background and Goal of Study: Despite maximum recommended dosage limits[1], local anaesthetic (LA) overdoses occur in ~1/1000 cases[2]; and are the drugs most frequently implicated in drug dosing errors by doctors of all levels of experience[3]. Causes include errors in: recall of toxic dose limits, conversion from non-standard units of concentration (%w/v) to mg/mL, and calculation of maximum volume (mL) of a given agent for a given patient body weight (BWt, kg).
We developed a nomogram to calculate maximum dose (mL) for a given LA formulation and BWt (Fig 1). The reverse includes toxic dose limits, symptoms and management of LA toxicity, and a second nomogram to calculate initial bolus (mL), infusion rate (mL/h) and maximum dose (mL) of iv lipid emulsion if overdosage occurs.
Materials and Methods: The nomogram was created using standard techniques, and drafted using Pynomo software. A spreadsheet (Excel, Microsoft, WA) was used to randomly generate 100 sets of simulated values for BWt and type of LA, from which maximum volumes of LA were calculated using both the nomogram and a calculator. Bland-Altmann (BA) analysis was performed.
Results and Discussion: The BA plot (Fig 2) showed a very close agreement between calculator and nomogram. Bias of the nomogram was -0.1mL, with limits of agreement -0.5 to 0.2mL. Accuracy is greater at lower volumes & BWt through use of logarithmic scales.



[Fig 1. The nomogram for Local Anaesthetic Toxicity]



[Fig 2. Bland-Altman plot]

Conclusion(s): Our nomogram is low-cost and accurate; avoids data entry and coding errors which occur with electronic devices"; and provides a permanent record. It allows LA calculations performed by other means to be rapidly cross-checked; and can potentially reduce the incidence of LA toxicity.
References:
1. Allman K. *Oxford Handbook of Anaesthesia*. 2nd ed. OUP, 2006
2. Barrington M. *Reg. Anesth. Pain Med.* 2009;34(6):534-541
3. Wheeler S. *Eur. J. Anaesthesiol.* 2004;21:929-931

17AP4-2

Efficacy of an early warning emergency call in operation room to avoid intraoperative adverse events

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Background: There are 16 rooms in our hospital and average around ten anesthesiology residents are in the training. In our operation rooms, "119" is a call for intraoperative cardiopulmonary arrest (CPA) to get attention of anesthesiology staff and manpower as rapid as possible. "Hurry Call" is a call for the moderate emergency situation such as fall in SpO2 or fall in blood pressure. The aim of the Hurry Call is to prevent 119. It is an early warning emergency call before patients fall into true adverse event. There are no accurate criteria for Hurry Call. Anyone is eligible to request Hurry Call if he or she feels something uncontrollable and emergency during the anesthesia. Over indicated calls, such as less serious emergency problems seem to be included in Hurry Call which we accept. Those Hurry calls during the last three years have been analyzed and relationships of the Hurry call and 119 call prevention was discussed.
Method: The progress of the case of 119 and Hurry call has been reported and the cause of the event was discussed during the anesthesiology conference. These cases have been gathered for three years (July 2008 to June 2011) prospectively. The results were filed in the database software (FileMaker Pro11®) which one anesthesiologist staff entered.
Result and discussion: 26,847 cases were under anesthesiology management among the total number of 31,234 surgeries during three years. The rate of emergency surgery was 17.8%. Four 119 calls (0.015%) and 150 Hurry calls (0.56%, 4.4 cases, average a month) were reported. Airway or respiration events (fall in SpO2; 50%, cannot ventilate; 5%) was accounted for 55% and cardiovascular events (fall in blood pressure; 26%, bradycardia; 4%) accounted for 30% of total Hurry Call. Two 119 call were for the patients with hemorrhagic shock due to multiple trauma. Another 119 call was for the patient with septic shock complicated to cardiac failure. One 119 was for pediatric difficult airway patient. The patient was resuscitated rapidly and fully recovered without neurological problems. Number of Hurry Call was 37 times bigger than 119 call. It has been considered that frequent Hurry Call helped early intervention by the anesthesiologist staff which contributed to decrease number of 119 calls. Results of the investigation should be shared to residents from patient safety perspective.
Conclusion: Early warning type of call system is required for patient safety in operation rooms.

17AP4-3

Local anaesthetic knowledge assessment of OR staff

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Background and Goal of Study: Anaesthesiologists should deeply know pharmacological characteristics of local anaesthetics, but there are also other professionals using them. The aim of the study was to assess the local anaesthetics knowledge of staff working in the OR.
Materials and Methods: Using an anonymous and voluntary structured questionnaire 40 surgeons and 41 anaesthesiologists were asked about their local anaesthetic use, periodicity, toxic doses, toxicity signs and treatment.
Results and Discussion: 81 questionnaires were collected and analysed. The most commonly used local anaesthetics were lidocaine and mepivacaine (91.4%). Most responders used local anaesthetics more than 5 times a month but less than 5 times a week (35.8%). Toxic dose for lidocaine was known by 21% (36.6% anaesthesiologists; 5% surgeons), for mepivacaine by 19.8% (36.6% anaesthesiologists; 2,5% surgeons) and for bupivacaine by 46.9% (85.4% anaesthesiologists, 7.5% surgeons). 87.7% of the participants were aware of local anaesthetic toxicity signs (100% anaesthesiologists, 75% surgeons) but only 22.2% of them reported single cases of overdose. Intralipid© use for toxicity treatment was known by 59.3% (87.8% anaesthesiologists;

30% surgeons) but recommended doses were only known by 14.8% of the participants (only anaesthesiologists).
Conclusion(s): Most anaesthesiologists are familiar with a safe use of local anaesthetics, but not surgeons. The administration of Intralipid © as a local anaesthetic toxicity treatment is not satisfactorily widespread.
References:
1. Local anesthetic system toxicity: update on mechanisms and treatment. JW Wolfe, JF Butterworth. Curr Opin Anesthesiol 2011, 24: 561-566.
2. Lipid emulsion infusion. Resuscitation for local anesthetic and other drugs overdose. Guy L. Weinberg. Anesthesiology 2012; 117: 180-7

17AP4-4

Knowledge of content of WHO checklist among anesthesia residents in France

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Background and Goal of Study: Marked reductions in postoperative complications and mortality after implementation of the WHO (World Human Organization) Surgical Safety checklist have been reported [1-2]. National implementation was imposed by Health Authority in France from 2010. The aim of this study was to assess knowledge of WHO checklist among anesthesia residents.
Materials and Methods: After consent, a high-fidelity simulation session was planned for the 2nd anesthesia residents with two different scenarios especially dedicated to the risk of error in the operative room. The importance of the WHO checklist was pointed through a 15-questions survey that tested basic knowledge about identity, allergy and antibiotic controls, inter-professional cooperation and place of checklist during emergencies or central catheter setting.
Results and Discussion: 52 residents on 60 have fulfilled the survey. 43% were directly involved in the checklist verification during their first year as resident. As it concern vigilance about identity, allergy and antibiotic the knowledge was correct before session with respectively 92% [85-99], 91% [83-96], 94% [89-100] but results were poor for anesthetist-surgeon cooperation (64% [60-68]), emergency (13% [8-18]) or central catheter setting (59% [48-69]). This simulation session significantly improved their global knowledge about cooperation (79% [2-85], $p < 0.001$), checklist for port-a-cath (70% [64-76], $p < 0.001$). 80% of residents suggested a future change in their routine practice with a new interest in this domain.
Conclusion(s): This survey emphasized the poor penetration of WHO checklist among anesthesia residents in France. High fidelity demonstration was greatly appreciated but debriefing was probably too short to obtain a real improvement in knowledge as expected by teachers.This survey emphasized the poor penetration of WHO checklist among anesthesia residents in France. High fidelity demonstration was greatly appreciated but debriefing was probably too short to obtain a real improvement in knowledge as expected by teachers.
References:
1. van Klei WA et al., Ann Surg. 2012 Jan;255(1):44-9.
2. Haynes AB et al., N Engl J Med. 2009 Jan 29;360(5):491-9

17AP4-5

Smart phone as a communication aid

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Background: Smart phones are commonly used by anaesthetists to access medical guidelines, maintain logbooks and to access email[1]. Clinical communication applications previously described include video conferencing, multimedia messaging, video calling besides voice calls and text messages[2].
Case report: We report the use of a smart phone as a translation aid to communicate with a non English speaking patient. A 30 year old Polish lady was scheduled for an elective Caesarean section. She could not communicate in English. None of the clinicians present on the day could speak the patient's language. An interpreter was not available and the hospital's language interpretation telephone helpline failed to work at that time.
We used the ***i-Translate*** (https://itunes.apple.com/en/app/itranslate-free-translator/id288113403?mt=8) application on a smart phone to communicate with this Polish speaking patient. The app was able to translate our typed questions in English into Polish and speak it out to the patient. The patient's responses were then translated back to English. We were able to obtain a history and explain the anaesthetic to the patient to her satisfaction.
Discussion: Effective communication, in a language that a patient can communicate in, is essential for good patient care and safety and to improve the overall patient experience. Smartphones may aid in translation when other services are not available. It has to be noted that an Internet connection may be required for a translation app to work in a smartphone. We could not ascertain the quality and credibility of translation while using the app. This is not different to a situations wherein a human interpreter or a telephone helpline is used for translation. The patient gave appropriate answers to our questions and appeared to understand when the anaesthetic technique was explained to her. The i-translate app in the basic version is free to download and can be used for over 60 languages. The premium version claims to have the added advantage of voice/language recognition.
References:
1. Survey of iPhone usage among anaesthetists in England. Dasari KB, Anaesthesia. 2011 Jul;66(7):630-1.
2. A Systematic Review of Healthcare Applications for Smartphones. Mohammed Mosa AS BMC Medical Informatics and Decision Making 2012, 12:67
Learning points: Translation apps in smartphones may aid as an effective translation aid when patients cannot communicate in the same language as the clinician communicates.

17AP4-6

The impact of automated alert systems on anesthesia record documentation

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Background and Goal of Study: The incomplete documentation of elements of the anesthesia record is associated with potential loss of revenue, legal liability and consequences related to non-compliance with regulations. Automated, real time alert systems have been shown to improve documentation of procedure related variables [1]. However, the impact of this has not been studied extensively. We sought to investigate the impact of the introduction of a novel, real time alert system on the rates of documentation failures in a large, tertiary care center using automated anesthesia records.
Materials and Methods: The main outcomes of this study were the failure to 1) provide attestation, 2) provide documentation of relief times and 3) to provide an electronic signature. For this purpose, data on failure rates were prospectively collected 4 weeks prior to the initiation of an automated alert system and compared to rates 4 weeks after implementation. The automated alerts consisted of up to three consecutive paging alerts to the anesthesia provider followed by an e-mail alert. Omission of documentation within 3 hours of the end of the case was defined as a failure. Rates of failure were computed for each of the 4 weeks prior and after introduction of the intervention.
Results and Discussion: In the 8 weeks of the study a total of $N=7105$ cases were performed (3323 pre and 3783 post intervention). The attestation failure rate was 6.4% ($n=214$) in the 4 weeks before the alert system was instituted and 0.7% ($n=26$) thereafter ($P < 0.01$). In the last week of study a rate of 0.1% ($n=1$) was achieved. Similarly, a drop in relief time documentation occurred. Among $n=255$ possible documentation opportunities 3.1% ($n=8$) resulted in failure before the intervention while no omissions among $n=298$ opportunities were recorded thereafter ($P < 0.01$). Failure rates to provide an electronic signature amongst attendings, residents and nurse anesthetists before the intervention were 1,9%, 6.9% and 7.5%, respectively. In the following 4 weeks, rates dropped to 0.3%, 0.7% and 0.9%, respectively ($P < 0.01$).
Conclusions: The institution of an automated alert system can significantly reduce the failure rate for anesthesia record documentation in regards to attestation, relief time entry and electronic signing. Further study is needed to identify reasons for remaining failures and discrepancies among the type of anesthesia provider.
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17AP4-7

How important are the perioperative warming measures?

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Background and Goal of Study: The absence of normothermia has been associated with increased perioperative morbidity, hospital stay and healthcare costs. Physiological monitoring and maintenance of the temperature during this period has shown better results.
Materials and Methods: An observational retrospective study was carried out, with 71 patients who were admitted to our postoperative ICU, for ten months. Patients were grouped based on those who received active warming measures (AW) during surgery, and those that were not applied (NW).
Demographic data, epidemiological data, the duration of the surgery, thermal and coagulability evolution were registered. Data were analyzed with SPSS 16.0.
Results and Discussion: In our study 67.6% (48) were male, and 32.4% (23) were women. The mean age was 61.85 years. Surgical procedures were colectomy, gastrectomy, pancreatectomy, hepatectomy, pulmonary lobectomy, pneumonectomy inter alia; with conventional and laparoscopic technique. In 87.3% (62) were included in AW group, and 12.7% (9) in NW group.The thermal evolution showed lower values for patients in AW group (35.53 vs 37.4º C, p = 0,012), but within the normal values. Hyperthermia peaks, were more common in NW patients during the first 12 postoperative hours (38,4 vs 36,6º C, p = 0,01).
Patients AW reported hypothermia symptons in a slightly higher percentage 33.9 vs 33.3% (p = 0.97), but were severe in patients NW (66,7 vs 25%, p = 0.43). The need for warming measures in the postoperative was slightly higher in NW (44.4% vs 41.9%, p = 0.887).
Both groups of patients increased clotting times, slightly higher in AW group (INR 1.13 vs 1.10, p = 0.47), and a smaller decrease in platelets count (264677 vs 253333, p = 0.78), however in both groups the levels remained within normal limits.
Conclusion(s): The perioperative thermal situation was more stable in AW, with less clinical severe symptoms of hypothermia and hyperthermic in crisis in the first 24 hours after surgery. The need for postoperative warming measures was lower in AW. Also there were a minor decrease in platelet count at 24 hours after surgery, with a slight increase in clotting times.
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17AP4-8

Is the nasogastric tube useful to reduce postoperative nausea and vomiting in orthognathic surgery?

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Background and Goal of Study: Orthognathic sugery is used to correct dentofacial deformities and if ends fixing the upper maxilla with the jaw with bands or wires. Despite using prophylaxis, postoperative nausea and vomiting (PONV) are frequents (40-56%), in part caused by the irritant action of the swallowed blood (1). There is a high risk of aspiration if the patient vomit, because the difficulty to open the mouth. The aim of this work is to study the usefulness of nasogastric tube (NGT) to reduce the incidence of PONV.
Materials and Methods: Study approved by Ethics Board. We prospectively included the orthognathic surgery patients in our hospital that signed an Informed Consent. Patients who could not receive any of the drugs stated by protocol were excluded. Patients were randomized in two groups: with or without NGT (T, and noT, respectively) during surgery and first 6 postoperative hours
All patients received general anesthesia with propofol, fentanyl and rocuronium. During the osteotomy, controlled hypotension (MAP 50-60 mm Hg) was maintained. Antiemetic prophylaxis fixed (2): dexamethasone 4-8 mg after induction and droperidol 1,25mg at the end of the surgery. Thereafter the patients received ondansetron 4mg/8h.
Results and Discussion: T 10 patients and noT 16patients. The groups were homogeneous for basal data (age, gender, and Apfel score (2)). The nausea incidence in post anesthesia recuperation unit (PARU) first 6h post-surgery in the groupT was higher than in the group noT (25% vs 50%)(p=0,19). The same occurs with vomiting (12,5%- 20%)(p=0.6), and T group needed more extra antiemetic drugs than group noT (60% vs 18, 8%) (p=0, 031). There was no difference of nausea and vomiting incidence during the stay in PARU and first day post-surgery.
60% of groupT complained about discomfort caused by the NGT.
Conclusion(s): The nausea and vomiting incidence after orthognathic surgery is too high despite the antiemetic prophylaxis recommended by Apfel (2), and seems to be increased by a NGT. Therefore, more studies must be carried on this field.
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Perioperative Care of the Elderly

18AP1-1

Anesthetics isoflurane and propofol differently affect cognitive function in humans

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Background and Goal of Study: It is largely unknown whether different anesthetics have different effects on the incidence of postoperative cognitive dysfunction (POCD). We therefore set out to determine effects of anesthetics isoflurane and propofol on cognitive function in humans.
Materials and Methods: The subjects were patients who had abdominal surgery under spinal anesthesia (S, N = 60), isoflurane anesthesia (I, N = 60), or propofol anesthesia (P, N = 60) by randomization. The subjects in I and P were further assigned to high (I-high or P-high) and low (I-low or P-low) amount of anesthesia groups. The subjects received cognitive tests immediately before and one week after the anesthesia and surgery by an investigator who was blinded to the anesthesia status.
Results and Discussion: There were 180 subjects in the study; 106 males and 74 females, with a mean age of 69.0 $\pm$ 9.2. The mean number of subjects with cognitive function decline (* P = 0.04) and POCD incidence (## P = 0.002) in the I group (11.0 $\pm$ 5.71, 28%), but not the P group (7.09 $\pm$ 4.11, 13%), were higher than that from the S group (6.36 $\pm$ 4.54, 6%). Interestingly, the subjects in I-high group had worse cognitive function than those in I-low group, but the subjects in P-high had better cognitive function than those in P-low group.
Conclusion(s): These findings illustrate the different effects of isoflurane and propofol on cognitive function and suggest that propofol, but not isoflurane, would be better for patients who are at increased risk for POCD, pending on further studies.

18AP1-2

The relation between preoperatore usement of benzodiazepines and the incidence of postoperatore delirium (POD) on elderly patients in urology

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Background and Goal of Study: Is to discover benzodiazepines role on noted postoperative delirium and furthermore to analyse the relation between the length of time of benzodiazepines use and perstistance of POD.
Materials and Methods: Participant on this study are110 patients(pt) that had undegone surgery procedure and were of ages over 65 years old. Pt with cardiac problems, Insult cerebral,Alzhemimers,phsicosa,parkinson.were

excuded.Patients are devided on two groups , the first group had received preoperatively benzodiazepines to treat anxyety and insomnia(G1)and the second group (G2) patients that did not receive benzodiazepines preoperatively for any reason. Information about benzodiazepines use is collected by directly pt interview. All pt had undergone endotracheal anesthesia where induction is reached with fentanyl 2 ug/kg, tiopental 7mg/kg and intubation is done with sexametonium 1mg/kg. And than the continued anesthesia is reached by using pavulon 0.1mg/kg and as gas anesthesic is used sevofluran and oxygen. During the anesthesia is monitored blood pressure,heart rate, SaO2 and ECG.As for physic status preoperator comorbidity,age,the length of surgery procedure did not have any difference between both groups.Also did not have any difference on hemodinamic intraoperatore between two groups. It is evaluated the incidence of delirium in first 48 postoperatore hours between two groups.To evaluate postoperatively confusion was used confusion assesment method (CAM).The point value minimental preoperatively (MMS) were the same in both groups.

Results and Discussion: POD was noted on 26% of pt that received benzodiazepines and 12% of the group that did not receive benzodiazepines($p< 0.01$). Pt that had < 23 point on MMS were 9% while received benzodiazepines and 3% on the pt that did not use benzodiazepine($p< 0.05$).POD accurance was significantly higher on the group that received benzodiazepines and especially on those pt that received this medication for a long time. On pt with MMS < 23 who used preoperatore benzodiazepines for long time, the incident of confusion was 14% and on those that recieved it for a short time the incidence was 0.

Conclusion(s): Deliriumi postoperatore accurance postoperatively is significantly higher to pt who used benzodiazepines preoperatively (26%) and especially for pt that received this medication for a long periode of time compare with 12% of pt that did not receive benzodiazepines preoperatively ($P< 0.05$).

18AP1-3

Is baseline Cerebral State Index correlated to age or neuropsychological performance?

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Background and Goal of Study: Increasing age seems to be associated with a higher Bispectral index value at loss of consciousness during anaesthesia induction. The purpose of the present study was to assess the possible correlation between age and baseline Cerebral State Index (CSI) value before anaesthesia. We furthermore assessed if there was an association between baseline CSI and the performance in neuropsychological tests.

Materials and Methods: We enrolled 70 patients above 60 years of age scheduled for elective non-cardiac surgery with general anesthesia. Baseline CSI was determined with the Cerebral State Monitor that provides a value between 0-100, based on processed EEG. Cognitive function (Z score) was assessed by the ISPOCD neuropsychological test battery prior to and one week after surgery. The correlation between baseline CSI and preoperative performance in the Visual Verbal Learning, Letter digit coding, and Stroop Colour word interference tests were also analysed.

Results and Discussion: The mean age of the 70 patients was 69.9 years. Fifty two patients had a baseline CSI assessment and there was no difference in CSI between patients aged below ($N=31$) and above (or at) 70 years ($N=21$), 90.8 vs. 92.1 respectively ($P=0.42$). No significant correlation was found between baseline CSI and neither age, nor neuropsychological test performance with correlation coefficients between 0.005 and 0.1 and corrected P values between 0.49 and 0.97.

Conclusion(s): We were unable to detect a significant association between baseline CSI and neither age nor neuropsychological test performance.

References: None.

Acknowledgements: None.

18AP1-4

Exposure to general anaesthesia could increase the risk of dementia in elderly

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Background and Goal of Study: Postoperative cognitive dysfunction (POCD) could be associated, several years after, with an increased risk of dementia (1). Several experimental studies suggest that some anesthetics could promote neuroinflammation and formation of Alzheimer's disease (AD) precursors (2). The aim of this study was to analyze the risk of dementia associated with anaesthesia within a prospective population-based cohort of elderly.

Materials and Methods: The Three-City (3C) study is a prospective population-based cohort, designed to assess the risk of dementia and cognitive decline due to vascular risk factors. Participants aged 65 years and over were interviewed at baseline and subsequently 2, 4, 7 and 10 years after. Each examination included a complete cognitive evaluation with systematic screening of dementia. From the 2-year follow-up, 7008 non-demented participants were asked at each follow-up whether they have had a history of anaesthesia (general anaesthesia (GA) or local/locoregional anesthesia (LRA)) since the last follow-up. Data were analyzed using a Cox model with delayed entry with anesthesia as time-dependent variable, adjusted for potentially confounding factors (socio-economic factors and comorbidities).

Results and Discussion: Mean age of participants was 75.4 years and 62.1% were women. At the 2-year follow-up, 32.9% of the participants ($n=2309$) reported an anaesthesia over the 2 previous years, with 19.0% ($n=1333$) reporting a GA and 13.5% ($n=948$) a LRA. A total of 632 (9.0%) participants developed a dementia over the 8 subsequent years of follow-up, among them 284 probable AD and 228 possible AD. Future incident demented reported more often an anaesthesia at the 2-year follow-up, 37.0% for future incident demented vs 32.5% for non-incident demented ($p=0.022$). This difference in anesthesia was due to difference in GA, with 22.3% of future demented reporting a GA vs 18.7% of non-future demented ($p=0.0264$). After adjustment, participants with at least one GA over the follow-up had an increased risk of developing a dementia over the follow-up compared with participants without anaesthesia (Relative Risk=1.35 [95%CI: 1.11-1.63]).

Conclusion: These results are in favor of an increased risk for dementia several years after a general anaesthesia. A long-term follow-up of these patients should be planned.

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18AP1-6

Spectral entropy indices at sevoflurane-induced loss of consciousness in elderly patients

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Background and Goal of Study: Entropy is the objective monitor of the depth of anaesthesia based on the patient's EEG. In adults, independent of age, the depth of anaesthesia for surgery is considered as adequate when state entropy (SE) and response entropy (RE) values are between 40 and 60 [1,2]. We investigated whether SE and RE differed between elderly and non-elderly patients at the point of sevoflurane-induced loss of consciousness (LOC).

Materials and Methods: SE and RE were recorded continuously in elderly ($\geq$65 yr) and non-elderly ($\leq$60 yr) surgical patients undergoing vital capacity induction of anaesthesia with sevoflurane.

All patients were premedicated with midazolam 0.05-0.1 mg/kg orally and were given 1μg/kg fentanyl intravenously before induction. No muscle relaxants were used during the study. LOC was defined as the absence of response to voice and mild shaking.

Statistical analysis was performed using Statistica 10 PL software (StatSoft, Tulsa,USA). Both parametric (Student's *t* test) and nonparametric (Mann-Whitney's *U* test) were employed. Data in nominal scale were compared with chi-squared test. $P< 0.05$ was statistically significant.

Results and Discussion: We analysed 22 elderly and 22 non-elderly patients (average age 70 yr (range, 66-76) vs. 43 yr (24-61), respectively). At LOC, SE and RE were not differed between elderly and non-elderly patients: SE (median 85 (range, 43-91) vs. 87 (19-90); $P=0.77$); and RE (93 (66-100) vs. 93 (19-98); $P=0.32$). But only a minority of elderly and non-elderly patients lost consciousness within a range 40-60 for SE and RE (1 (5%) elderly vs. 4 (18%) non-elderly for SE and 0 vs. 3 (14%) for RE, respectively; $P< 0.05$ for both comparisons). At LOC, SE and RE values were above 60 in 21 (95%) elderly vs. 15 (68%) non-elderly for SE and 22 (100%) vs. 16 (72%) for RE ($P< 0.05$ for comparisons).

Conclusion(s): We determined that almost all elderly and majority of non-elderly patients lost consciousness when SE and RE were above those which indicate an adequate depth of anaesthesia during induction with sevoflurane.

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18AP2-1

Quality of recovery after knee surgery: a comparison of age and complexity of surgery using the Postoperative Quality of Recovery Scale (PQRS)

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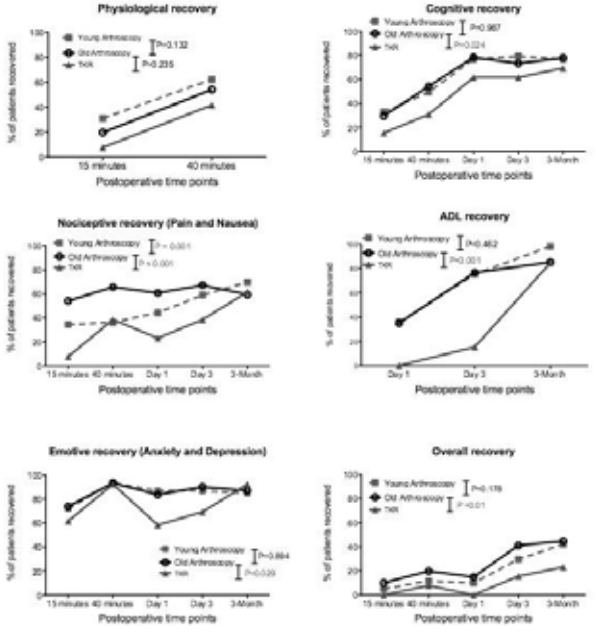
Background and Goal of Study: The Postoperative Quality of Recovery Scale (PQRS)[1] assesses quality of recovery in multiple domains over repeated times. We investigated whether recovery was affected by age, or by duration and complexity of knee surgery in patients ≥ 65 yr.
Materials and Methods: A prospective case-controlled observational study included 61 arthroscopy patients 18-40 yr, 61 arthroscopy patients ≥ 65 yr, and 13 total knee replacement (TKR) patients ≥ 65 yr. All patients received general anaesthesia with propofol induction, desflurane maintenance and multimodal analgesia. PQRS was performed prior to surgery, 15 min, 40min, 1 and 3 days, and at 3 months after anaesthesia. Recovery was measured in physiological, nociceptive (pain and nausea), emotive (anxiety and depression), cognitive, and activities of daily living (ADL) domains. Recovery was defined as "return to baseline values or better" and dichotomised to recovery or not. Cognitive recovery included a tolerance factor to account for performance variability. Data are presented as proportion of patients recovered. Analysis tested the global hypothesis of group differences in recovery over time using the Cochran Mantel Haenzel test.
Results and Discussion: Recovery in each domain over time is shown in Figure 1. The PQRS was able to demonstrate significant differences between old and young arthroscopy patients in the nociceptive domain only (P=0.001). Despite small sample size in TKR patients, the PQRS was able to discriminate poorer recovery for TKR vs. the older arthroscopy patients in nociceptive (P< 0.001), emotive (P=0.029), cognitive (P=0.024), activities of daily living (P< 0.001) and all-domains (P=0.010).



[Figure 1]

Conclusion(s): Age had minimal impact on quality of recovery after arthroscopy. Patients undergoing TKR had worse recovery in nociceptive, emotive, ADL, and cognitive domains than similarly aged patients undergoing arthroscopy.
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Acknowledgements: Baxter Healthcare funded the study.

18AP2-2

Re audit of patients undergoing surgery for fracture neck of femur (NOF): a monitoring tool of perioperative care for fracture NOF ptients

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Background and Goal of Study: Previous audits on fracture neck of femur (NOF) at Medway Maritime Hospital (MMH) showed our 30 day mortality dropped from 18.9% to 9 % over 5 years after various improvements made. We carried out a one year retrospective audit to review the management in terms of 30 day mortality, operating rate and to identify any new trends.
Materials and Methods: 333 patients admitted at MMH over year. The data that was recorded to Hip fracture database from MMH was analysed.
Results and Discussion: Mean age of patients is 81.68 yrs with males 80.63 yrs (22.82%) and females 82 yrs (77.17%). 324(97.29%) patients were managed surgically had a 30 day mortality of 11.41%. 9(2.7%) patients who were managed conservatively had a 30 day mortality of 66.66%. Males had higher mortality (23.68%) over females (9.72%). Lower mean AMTS were noticed in patients who died (5.68) than survivors (7.45).The number (%) of patients operated in relation to timing of surgery and mortality are shown as below.

Operating time from admission	Number Patients Operated (%) 2011	Number Patients Operated (%) 2010	30 day Mortality (%) 2011	30 day Mortality (%) 2010
<24 Hours	193(56.56%)	189(53%)	12.43	6.34
24-36 Hours	34(10.49%)	84(24%)	14.70	13.04
36_48 Hours	51(15.74%)	37(10%)	7.84	18.94
<48 Hours	278(85.80%)	309(87.3%)	11.87	9.7
>48 Hours	46(14.19%)	45(12.7%)	8.69	11.11
All Paitents operated	324(97.29%)	354(96.5%)	11.41	9.85

[Operating rate and 30 Day Mortality for 2010 & 2011]

Conclusion(s): Our operating rate and mortality rates are consistent and within national guidelines. The audit findings overall reveal operating early keeps the mortality at its lowest. Non-surgical management carries higher mortality (66.66%).The mortality is higher in males over females and again more in patients admitted with low AMTS over higher AMTS.
Recommendations: Improve the operating rate by aiming to operate on all patients within 24 hours. Implement the lessons from NCEPOD for the elderly 2010 which includes optimizing pre and postoperative care by using a multidisciplinary approach, so that all crucial elements of care such as fluid management, drug therapy, nutritional support and pain management are adequately addressed. Improve the care of male and patients with low AMTS. Monitoring the key indicators of patient care by regular audits will help to improve the care of patients.
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18AP2-3

Creatinine increase as a marker of infection in hip fracture patients: a historical cohort

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Background and Goal of Study: Bacterial infections are common in elderly hip fracture patients. C-Reactive Protein, GSR and leucocytes are not reliable laboratory markers in this population[1].
Materials and Methods: 249 consecutive cases of hip fracture patients admitted between June 1, 2010 and February 28th, 2012 were classified into two groups: normal GFR and decreased GFR (< 60 MDRD-4). Age, sex, peak creatinine and discharge creatinine and in the decreased GFR group, a basal creatinine value for comparison were recorded then crossmatched to existing bacterial cultures during hospital stay. We calculated sensitivity, specificity, positive predictive value and negative predictive value.
Results and Discussion: 239 patients were included mean age 84,3 years with female predominance. 106 (39,4%) had decreased GFR at admittance.

During stay, 109 patients presented an increase of basal creatinine above 0,3 mg/dl (AKIN Stage 1)[2]; and 79 had positive bacterial cultures (Table 1). Most frequent causes were: infection and drop in hematocrit. Specificity and sensitivity were 0,7 and 0,67 respectively. If cases with a low hematocrit were removed, specificity climbed to 0,83. Positive predictive value and negative predictive value were 0,51/0,82. A ROC curve was plotted for the overall results (Figure 1). Most frequent culture types were urine and surgical wound and most frequent micro-organisms were *E. Coli*, *P.Mirabilis* and *E. Faecalis*.
Conclusion: Creatinine increase over 0,3 mg/dl of basal value could serve as a marker of infection in the elderly hip fracture patient. Specificity markedly increases when patients with low hematocrit are excluded.
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18AP2-4

Frailty and postoperative outcomes in 4th aged patients undergoing elective surgery

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Background and Goal of Study: The extreme old are rapidly growing; yet few studies have addressed specific geriatric variables in this group. Frailty has been studied in patients over 65 years but not in the oldest old. Consequently, we aimed to describe the 4th age population undergoing elective surgery and analyze the relation between frailty and postoperative outcomes.
Materials and Methods: We included all patient aged 85 years and above undergoing elective surgery between 2010-2012. We recorded demographic data, ASA score, preoperative comorbidity and complexity of surgery. Frailty was measured with Fried's criteria. The main outcome variables were morbidity, 30-day mortality length of hospital stay and discharge status.
We used X^2 test for categorical variables, McNemar for paired proportions and ANOVA for multiple combinations.
Results and Discussion: 45 patients were included (24 females, 21 males); median age was 87 (range 85-96). 29% were non-frail, 51% intermediate and 20% frail. The most prevalent comorbidities were hypertension, arthritis, neoplasms and peripheral vasculopathy. 51% underwent minor surgeries, 40% intermediate, and 9% major procedures. Overall morbidity was 40%, and the 30-day mortality was 16% (81% of it during admission). The mean length of hospital stay was 18,2 days (range 1-54). When stratifying patients according to frailty, no significant differences were found for most outcome variables. Regarding discharge status; of all the patients who had lived on their own, only 7,7% remained in the same situation, whereas 17,9% required home assistance -family or professional- after discharge ($p = 0,016$). 33,3% ($p= 0,03$) of the patients were discharged to an institution or a convalescence center. 62,5% frail patients were still in such centres 30 days after surgery whereas for the intermediate and non-frail the prevalence was 18,8% ($p = 0,025$).
Conclusion: Loss of self-sufficiency, institutional discharge and prolonged time of convalescence after elective surgery are high in the fourth age (especially the latter amongst frail patients). The incidence of other poor postoperative outcomes was found higher -though not significant- in patients with some degree of frailty. This tendency might become significant in a bigger sample.
Frailty assessment is a quick, non-invasive practice that could help patients and physicians make more informed decisions. It should be considered among routine preoperative tests in this emerging population.

18AP2-5

Tooth loss is associated with an increased risk of intraoperative hypotension: a retrospective matched cohort study

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Background and Goal of Study: Hypotension is a frequently-encountered side effect caused by induction of general anesthesia as well as changing position of surgical patients. Indeed, marked decrease of blood pressure is observed in elder patents with atherosclerosis. Recent epidemiologic reports suggest that periodontitis is one of key risk factors of cardiovascular disease such as coronary heart disease, stroke and peripheral arterial disease [1]. Thus, raised level of circulating inflammatory cytokines impairs vascular function in patients with periodontitis [2]. Although large population of elder people is reportedly suffered from periodontitis, it remained to be elucidated whether periodontitis could be a predictive factor of intraoperative hypotension. The aim of the present study was to assess the association between tooth loss and decrease in intraoperative blood pressure of lumbar spine surgery patients.
Materials and Methods: A retrospective cohort study based on 171 patients underwent lumber spine surgery were performed. The patient having at least one deficit of teeth was diagnosed as cases with periodontitis. A propensity score was built following 7 confounding factors (age, body mass index, gender, smoking habit, pre-existing disease including hypertension, diabetes mellitus, and hyperlipidemia) and a 1:1 matching was performed. A total 74 patients with or without periodontitis were selected. Decrease in mean blood pressure (MAP) during anesthesia induction with propofol and changing position from supine to prone were compared between groups. For reporting statistics, variables were compared with student-t test, and chi-square analysis.
Results: Patients demographic data were similar between the two groups. Control MAP was slightly higher in the patients with periodontitis (114.4 ± 14.7 mmHg versus 105.0 ± 16.3 mmHg, $P=0.078$). The patients with periodontitis had a significantly larger decline in MAP after anesthesia induction (-26.9 ± 17.2% with periodontitis, -18.2 ± 17.5% without, $P = 0.035$), and after changing position (-26.9 ± 17.2% with periodontitis, -18.2 ± 17.5% without, $P = 0.014$).
Conclusions: The present study revealed that decrease in MAP induced by anesthesia induction and intraoperative postural changing is larger in patients with periodontitis. Tooth loss may be associated with intraoperative hypotension during anesthesia.
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18AP2-6

Enhanced Recovery After Surgery program in patients undergoing radical cystectomy. A prospective trial in Spain

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Background: ERAS or "fast-track" programs allows an earlier postoperative recovery for patients, by reducing morbidity and hospital stay and thus lower cost.
ERAS programs for pre, intra and postoperative times require a multidisciplinary work, where anesthesiologists, urologist and even patients on them self playing an important role.
Goal: To Compare two groups undergoing radical cystectomy "Bricker or Hautmann" type following classical perioperative management program versus ERAS program. Morbi-mortality and hospital stay are studied.
Materials and Methods: We performed a prospective trial from January 2010 to October 2012 where 99 patients were included into 2 groups. Classic program 51 patients vs ERAS program 48 patients.
Variables were divided into pre-cystectomy (demographics data), intraoperative postoperative complications(following classification of Lowrance) and hospital & ICU stay.
Results were described by statistical central tendency (mean) and dispersion (sd) for quantitative variables and percentages for qualitative variables.
In bivariate analysis were used chi square tests for qualitative variables and t-test or Mann-Whitney test for quantitative variables.
Statistical significanced was considered with p value < 0.05. Analyzed using SPSS.
Results:

- 99 patients were included for study where 81 were males vs 18 females.
- Classic program included 51 patients vs 48 in ERAS group.Both groups were comparables.
- 69% of ERAS patients were ASA II-III vs 55% in classic($p>0.05$). ASA III-IV in ERAS group 31% vs 45% ($p>0.05$).
- We found less intraoperative and postoperative complications in ERAS group than classic one ($p< 0.05$).
- The most common complication in both groups were ileus(29% classic group vs 8% ERAS.$p< 0.05$).
- Blood loss was 1145ml in classic group vs 722ml in ERAS ($p< 0.05$)
- ICU stay in classic group was 2.1 days vs 1.2 in ERAS, and hospital stay 32.2 days in classic group vs 19.5 in ERAS ($p< 0.05$).

Conclusion: Implementation of ERAS protocols showed less complications and hospital stay, improved patients recovery, and thus lower costs.

18AP2-8

Levosimendan for acute renal failure associated with cardiogenic shock before hip fracture repair

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Background: Inotropic drugs are part of the treatment of heart failure; however, inotropic treatment has been largely debated due to the increased incidence of adverse effects and increased mortality. Recently, levosimendan has been proved to be effective in acute heart failure, reducing the mortality and improving cardiac and renal performance.
Case report: We report the case of a 75-year-old woman with history of hypertension, chronic atrial fibrillation and congestive heart failure with baseline LVEF of 30%, an episode of pulmonary embolism in 2004, chronic renal failure (baseline creatinine 2,2 mg/mL), obstructive sleep apnea-syndrome associated with morbid obesity, and dyslipidaemia. She was admitted to the emergency department due to an accidental fall with pertrochanteric fracture of the right femur. During the preoperative stay she developed a cardiogenic shock complicated with acute renal failure; renal replacement therapy was started with continuous veno-venous hemofiltration.
In order to optimize the patient and improve kidney function, it was decided to start a treatment with levosimendan at 0,05 mcg/kg/min, avoiding the induction bolus and gradually increasing the dose up to 0,1 mcg/kg/min, according to the haemodynamic response and the tolerance of the patient. The treatment proved to be effective and the patient was successfully withdrawn from renal replacement and was lately submitted to the intervention. She was largely transfused perioperatively (up to six times) but she did not develop any new episode of cardiac failure.
Discussion: Levosimendan may constitute a valid choice to be considered in the management of preoperative decompensated heart failure associated with renal insufficiency. The main property of the drug allowed to restore renal function and to prepare the patient for the intervention. Moreover, the new equilibrium, between increased cardiac function and beneficial vasodilation, revealed helpful during and after intervention because it allowed the cardiovascular system of our patient to deal with the consequences of haemorrhage and fluid therapy.
References:
Davis et al. Br J Anaesth 2004; 93: 121±8
Learning points: The role of inotropes in optimization of high-risk surgical patients may encompass other factors apart from an increase in oxygen transport variables.
Levosimendan may have promising effects for perioperative cardiac and renal function optimisation in patients undergoing elective noncardiac surgery.

18AP2-9

Influence of type of the anesthesia on plasma level the N-terminal pro-brain natriuretic peptide at elderly patients in early postoperative period

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Background and Goal of Study: N-Terminal Pro-brain Natriuretic Peptide (NT-proBNP) is inactive precursor of Brain natriuretic peptide with natriuretic and vasodilatating action. Elevated levels of this peptide is a marker of acute heart failure at an early operating period [1, 2]. The aim of the study was to investigate the changes NT-proBNP in elderly patients with concomitant cardiovascular disease in the intra-and early postoperative period, operated under general and spinal anesthesia.
Materials and Methods: 62 male patients, aged 69.4±4.5 suffering from benign prostatic hyperplasia (BPH) were performed open prostatectomy. All patients had concomitant cardiovascular disease (chronic heart failure II class NYHA). Depending on the type of anesthesia, all patients were divided into 2 groups.
Group 1 consisted of 30 patients, operated under general anesthesia.
Group 2 consisted of 32 patients, operated under spinal anesthesia.
Total volume infused in day of operation in both groups was different. In 1st group, total volume infused 1600 ± 250 ml and in the 2nd group - 2700 ± 250 ml. NT-proBNP plasma level was determined preoperatively, intraoperatively 1 hour after incision, and during 12-24 hrs postoperatively. Statistical comparisons were based on the t test.
Results and Discussion: Initial NT-proBNP plasma levels in the both study groups were similar, approximately 662±149 pg/ml. NT-proBNP values were similar in both groups intraoperatively 1hour after incision. In the first group, peptide levels were not significantly changed after 12 hours postoperatively. In the second group, NT-proBNP levels during the same time has increased by three times and was 1310.6±180 pg/ml ($p< 0.05$). Peptide levels in the second group at 24 hours was two times higher than in the first group ($p< 0.05$).
Conclusion(s): Levels of NT-proBNP in the perioperative period shows important prognostic information for the diagnosis of heart failure. Large volume infusion, which is typical for spinal anesthesia, promotes development of heart failure in the early postoperative period.
References:
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2. Ogata K, Fukusaki M, Miyako M, et al. The effects of colloid preload on hemodynamics and plasma concentration of atrial natriuretic peptide during spinal anesthesia in elderly patients. Masui 2003; 52(1):20-5.

Airway Management

19AP1-1

Comparison of success rate of blind intubation through Air-Q and LMA Fastrach™ in sniffing position and neutral position

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Background and Goal of Study: Supraglottic airway devices are common airway management tools in general anaesthesia. Both the conventional LMA Fastrach™ (Fastrach) and the Air-Q enable ventilation and provide a conduit for blind intubation. However, the effect of head positions on the success rate of blind intubation has not been evaluated. We compared the success rate of intubation in neutral or sniffing position using two devices.
Materials and Methods: After institutional review board approval, we studied 84 adult patients scheduled for elective surgery under general anaesthesia requiring tracheal intubation. We obtained written consent from all participants. Patients were assigned to two groups according to the device and subdivided by head position; Air-Q/neutral, Air-Q/sniffing, Fastrach/neutral, Fastrach/sniffing. Blind intubation was attempted after induction of general anesthesia. In the Air-Q group, the Percentage of Glottic Opening (POGO) score was recorded at the outlet of the device using a bronchial fiberscope both at the neutral and sniffing position before the attempt. Two blind attempts were allowed. A fibreoptic-assisted intubation through the airway device was performed after second failed blind intubation. Thereafter, patients' trachea was intubated by direct laryngoscopy when fibreoptic-assisted intubation was failed.
Results and Discussion: The success rate of each intubation attempt in each group was shown in Table 1. The overall success rate of blind intubation with the Fastrach is significantly higher than that with the Air-Q (91% vs. 52%). Sniffing position significantly improved POGO through the Air-Q (median 65 % in sniffing position, vs. 20 % in neutral position), however, the success rate of blind intubation insignificantly decreased with sniffing position in the Air-Q group. There was no significant difference in the success rate between subgroups with the Fastrach throughout the study.

Group	Air-Q		Fastrach		
Subgroup	Sniffing (n=21)	Neutral (n=21)	Sniffing (n=21)	Neutral (n=21)	P value
1st attempt	38% (8/21)	52% (11/21)	67% (14/21)	76% (16/21)	0.65
2nd attempt	43% (9/21)	62% (13/21)	91% (19/21)	91% (19/21)	<0.0083
3rd attempt	86% (18/21)	95% (20/21)	91% (19/21)	91% (19/21)	0.78
4th attempt	100% (21/21)	100% (21/21)	100% (21/21)	100% (21/21)	—

[Table 1 - Success rate of intubation. Success rates are compared by Chi-square test with Bonferroni correction of p value. P<0.0083 (0.05/6) is considered to be significant (*).
1st, 2nd attempt (blind intubation.) 3rd attempt (fiber-assisted.) 4th attempt (direct laryngoscopy.)]

Conclusion(s): Although the sniffing position significantly improved POGO through the Air-Q, the head position had no significant impact on the success rate of blind intubation through either device.

19AP1-2

Effectiveness of the C-MAC video laryngoscope in the management of unexpected failed intubations

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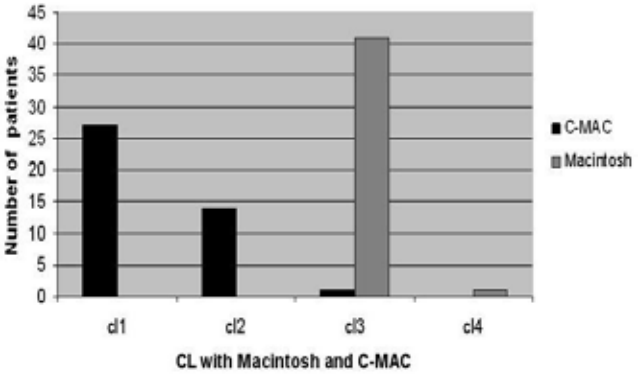
Background and Goal of Study: Studies have shown that the limited laryngeal view improved with C-MAC videolaryngospe (VL) following direct laryngoscopy (1). However, there is insufficient information on the efficacy of C-MAC and potential complications in emergencies during everyday clinical practices. The purpose of this study was to review the experiences of an anesthesiology department regarding the use of a C-MAC VL in unexpected failed intubation attempts.
Materials and Methods: Data were analyzed from patients whose intubation attempts using Macintosh direct laryngoscopes (ML) had failed, and on whom a C-MAC VL was utilized as the primary rescue device. The best laryngeal views obtained on consecutive attempts were recorded as Cormack and Lehane (CL) grade. The success rate of C-MAC in intubation was assessed, and laryngeal views from both devices were compared. The Wilcoxon signed-rank test was used for the comparison of data obtained from the same patient using two separate devices.
Results and Discussion: The Cormack and Lehane score was III in 41 patients, and IV in one patient, with the Macintosh laryngoscope, while Cormack and Lehane score was I in 27 patients, II in 14 and III in one with CMAC. Although the C-MAC did not improve the laryngeal view in 1 patient, intubation was successful on the second attempt using a C-MAC. Endotracheal tubes were placed in the trachea on the first attempt in 36 patients (86%), and on the second attempt in 6 patients (14%). No complications were observed other than minor damage (blood on blade) in 6 patients (14%).



[Figure.1 Comparison of glottic view (Cormack and Lehane grades) using the Macintosh laryngoscope and C-MAC VL.]

Conclusion(s): The C-MAC VL is efficient and safe as a primary rescue device in unexpected failed intubations. This data provides evidence for the clinical effectiveness of videolaryngoscopy in managing the unexpected failed intubations in routine anesthesia care.
References:
1. Piepho T. et al. Anaesthesia. 2011 ;66(12):1101-5.

19AP1-3

A new curved forceps (SUZY forceps) for McGrath MAC laryngoscope to remove foreign body causing airway obstruction

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Background: In the field of pre-hospital and emergency care, removing foreign body causing airway obstruction is one of the important missions to be accomplished during airway management. However, conventional Magil forceps which has straight shape does not effectively used with the latest videolaryngoscopes having anatomically designed curved blade. We recently made a curved forceps for foreign body removal which fit the curved anatomical blade of McGrath MAC videolaryngoscope and successfully used in patient at risk of asphyxia.
Case report: An 82 years old male presented a choking sign while he is eating a chicken and lost his consciousness. He was brought to our emergency department by ambulance. He presented stridor at inspiration, and pulse-oxymeter showed 79% under reservoir mask at a rate of 10L/min oxygen flow. His Glasgow coma scale was E4 V1 M4. Shortly after arrival, his heart rate dropped to bradycardia.
As he was edentulous, mask ventilation was not effective. Laryngoscopy with the McGrath MAC videolaryngscope revealed a foreign body partially lodging in front of the laryngeal inlet. We used a new curved forceps to successfully remove the object, the small block of chicken meat, followed by tracheal intubation under the Cormack Lehane grade I view shown on the built in monitor of the McGrath MAC. Some chicken meat particle was suctioned through the tracheal tube, and ventilation was effectively performed. Ventilation via the

tracheal tube was successful and pulseoxymeter showed 99%.
Patient recovered his consciousness after one hour and became arousable by calling. Tracheal tube was removed and he was recovered uneventfully within a day.
Discussion: Videolaryngoscopes are now widely used in our daily anesthesia practice and known to provide better laryngeal view and reliable intubation condition. They can also solve difficult intubation case.
However, they may not be a good tool for foreign body removal as there have been no suitable forceps which fit the curved blade configuration. As a result, videolaryngoscopes can not completely replace the role of conventional Macintosh laryngoscope.
We believe these curved forceps is a necessary tool to use videolaryngoscopes more efficiently in the airway management.
Learning points: Exclusive forceps is necessary for videolaryngoscope having curved blade configuration to completely replace the role of the conventional laryngoscopes in airway management.

19AP1-4

Postoperative throat symptoms: does the endotracheal tube cuff pressure play a role?

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Background and Goal of Study: Post-operative throat symptoms remain a common complaint after general anesthesia with endotracheal tubes (ETT). The incidence is estimated to be between 30 and 70%.[1] However, causes of these symptoms remain unclear. Previous research suggested that - amongst others - overinflated ETT cuffs above 30cm H_2O could increase incidence and severity of postoperative throat symptoms.[2] We therefore conducted a prospective double blind clinical study to investigate the correlation of the ETT cuff pressure and other possible risk factors on the overall incidence of postoperative throat symptoms as well as on hoarseness and on soreness separately.
Materials and Methods: After ethics committee approval we enrolled 141 patients. Male and female ASA I-III patients age 18 years and older with an anticipated intubation duration of ≥2 hours were included.

We excluded patients:
- with anticipated prolonged intubation
- undergoing oral or neck surgery
- with gastric tube or tracheostoma in place
- on chronic steroid medications

Demographic and perioperative data were prospectively collected. The ETT cuff pressure was measured within 15min after intubation by trained study staff. One hour after extubation throat symptoms were assessed in the Post-Anesthesia Care Unit (PACU). In addition all patients received a follow up questionnaire to assess their throat symptoms for 7 days after surgery.
Results and Discussion: 130 patients were included in the final analysis. The incidence of overall throat symptoms, hoarseness and soreness was 76.9%, 65.4%, 45.4% in PACU, respectively. There was no difference in demographic data and in mean ETT cuff pressures between patients with and without postoperative throat symptoms. Multivariate analysis suggests that intubation experience of 4-10 years reduces hoarseness (OR 0.3, CI 95% 0.11-0.85) while tube size >7.0 and omittance of an oro-gastric tube might increase soreness (OR 4.51, CI 95% 1.07-19.02; OR 6.54, CI 95% 2.14-19, respectively).
Conclusion(s): Our prospective study could not confirm a correlation between the ETT cuff pressure and throat symptoms in PACU. Multivariate analysis suggests a distinct set of risk factors for hoarseness and soreness postoperatively. Future research should investigate both outcomes separately.
References: 1) Tanaka 2009, Cochrane Database Syst Rev. 2) Curiel García 2001, Med Mex. 2001
Acknowledgements: The study was supported by a grant from the Mt. Zion Health Fund, San Francisco / USA

19AP1-5

Efficacy of the McCoy fiberoptic laryngoscope in patients with a difficult airway

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Background and Goal of Study: The McCoy laryngoscope is a well-known device to improve laryngeal view compared to the Macintosh laryngoscope in difficult airways. Recently, indirect laryngoscopy has been reported to be effective to manage routine and difficult airways because of its better laryngeal view than that by direct laryngoscopy. A new McCoy fiberoptic laryngoscope with a compound lens system (Machida Endoscope Co., Ltd., Tokyo, JAPAN) has been clinically available. In the present study, we compared the laryngeal views with the indirect McCoy laryngoscopy with the direct and indirect views with the Macintosh configuration (without levering maneuver of the McCoy laryngoscope) in patients with a difficult airway.
Materials and Methods: We retrospectively analyzed intubation profiles of 43 patients undertook elective surgery requiring general anaesthesia. They were intubated by using the fiberoptic McCoy laryngoscope. We considered the percentage of glottic opening （POGO） score less than 10% with direct view of the Macintosh configuration (without levering maneuver) as a difficult airway. The POGO scores with direct and indirect view in Macintosh configuration and indirect view in McCoy configuration (with hinged blade tip by levering maneuver) were compared. Statistical analysis was performed with Wilcoxon signed rank test, and $p < 0.05$ was considered as significant.
Results and Discussion: There were 12 patients (5 male and 7 female) with a difficult airway. Patients were aged 25-73 years old, and were designated ASA physical status 1-3. Their median (IQR [range]) POGO score was 5 (10 [0-10])%. In the indirect view of the Macintosh configuration did not change the POGO score (10(15 [0-20])%). On the other hand, the indirect view of the McCoy configuration significantly improved the POGO score to 35(40 [0-90])%.
Conclusions: The McCoy fiberoptic laryngoscope with a compound lens system improved the glottic view in patients with a difficult airway. The improvement on the POGO score from 5 to 35% is meaningful for tracheal intubation. We conclude that the indirect view with the new McCoy fiberoptic laryngoscope is useful to manage difficult airways.

19AP1-6

GlideScope videolaryngoscope vs. Macintosh direct laryngoscope for intubation of morbidly obese patients

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Background and Goal of Study: Morbidly obese patients are at increased risk of hypoxemia during tracheal intubation because of increased frequency of difficult and impossible intubation and a decreased apnea tolerance. Intubation with the GlideScope videolaryngoscope (GS) was compared with the Macintosh direct laryngoscope (DL) in morbidly obese patients.
Materials and Methods: Forty patients (body mass index ≥35 kg/m^2) scheduled for bariatric surgery were randomized to intubation with GS (group GS) or DL (group DL). The primary outcome was intubation time. Secondary outcomes were number of attempts, Cormack-Lehane grade, intubation difficulty scale score (IDS). Group assignment was not blinded.
Results and Discussion: Intubation in group GS and group DL lasted 52 (20-152) and 29s (15-180), respectively ($P = 0.0001$). Laryngoscopic views were better in group GS with Cormack-Lehane grades 1/2/3/4 distributed as 16/3/1/0 vs. 5/5/6/4 in group DL ($P = 0.003$). IDS scores were significantly lower with GS than with DL. Two cases of failed intubation occurred in group DL vs. none in group GS (non-significant). Both patients were intubated with the GlideScope without problems.
Conclusion(s): Intubation of morbidly obese patients with GS was slightly slower than with DL. The increased intubation time was of no clinical consequence as no patients became hypoxemic. GS provided better laryngoscopic views and decreased IDS scores.

19AP1-7

Comparison of GlideScope® Video Laryngoscope blades and ease of intubation in morbidly obese patients: a pilot study

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Aims: GlideScope® Video Laryngoscope (GS) blades are available in various sizes. However, no published criteria exist to guide which blades to use in bariatric patients. We conducted a prospective randomised feasibility study looking at outcomes using two GS blade sizes on bariatric patients for elective weight loss surgery.
Methods: Patients having elective bariatric surgery at King's College Hospital were included after institutional approval. Operators were two consultant anaesthetists experienced in Glidescope intubations. GlideScope blade size 3 (GS-3) and 4 (GS-4) were used in all patients. Patients were randomised to GC-3 or GC-4 first before receiving a standard induction. A size 4 i-Gel supraglottic airway was then inserted and the patient ventilated (100% Oxygen/ Sevoflurane) for 3 minutes. GS was used to aid tracheal intubation, video laryngoscopic views (VLSV) using both blades were documented and the last blade was used to facilitate tracheal intubation. Ease of intubation and complications were recorded.
Results: 48 patients were included in the study(14%male) with a median age of 40.5(25-58). The median body mass index was 44(38-60). All patients had adequate neck movement and Mallampati score 1-2. All VLSV using GS-3 were Grade 1(90%) or 2 (10%). However, the GS-4 VLSV were inferior with only 33% Grade 1, 50% Grade 2, 15% Grade 3 and 2% Grade 4.
Tracheal intubation was easy in all patients after a grade 1 / 2 view using GS-3, but only 45% intubations were easy using the GS-4 with similar views. 3 patients required GS-3 for intubation after a failed attempt with GS-4. Difficult intubations were documented in 9 patients with GS-4. The glottis was central on the GlideScope screen in 77% patients using GS-3 but only 10% using GS-4. The glottis was in the upper part of the screen in 73% using GS-4 and the operator had difficulty in manoeuvring the tracheal tube in 53% of cases.
Discussion: GS is a useful tool in airway management, but blade size influences outcome. A combination of GS-3 and grade 1 view in the centre of the screen achieves the best intubation conditions. GS-3 provided the best VLSV in the majority of patients in our study. GS-4 is bulkier than GS-3, limiting oropharyngeal space for intubation. Despite a grade 1 view with GS-4, incidence of difficult intubations is high. A select group of patients will need GS-4 blades in preference to GS-3. More research is needed into this aspect of videolaryngscopy in morbidly obese patients

19AP1-8

Flexible fiberoptic versus Parker Flex-It™ and hockey stick formed stylet as an intubation guide with the videolaryngoscope Truphatek® Truview PCD™

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Background and Goal of Study: The intubation with direct laryngoscopy using a Macintosh blade is still the gold standard in the management of the non-difficult airway. Fiberoptic intubation is still the gold standard in the management of the difficult airway. Intubation with videolaryngoscopes and the indirect laryngoscopy may be a good alternative to secure the common and the difficult airway. Visualisation of the glottis is often easy with videolaryngoscopes but entering the trachea with the endotracheal tube may be a problem because intubation must be performed in a curved way. Therefore special stylets were designed and different methods were described. Aim of the study was to compare flexible fiberoptic (FO), Parker Flex-It™ (PF) and a hockey stick formed stylet (HS) in patients with the Truphatek Truview PCD-videolaryngoscope to time and success of insertion.
Materials and Methods: After ethic vote approval 69 patients without expected difficult airway were randomly assigned for videolaryngoscopy (Truphatek® Truview PCD™) with FO (n=12), PF (n=28) and HS (n=29) as introduction aid. One in videolaryngoscopy experienced anaesthetist performed all intubations. Every step of the intubation was noted by time and success. Data are mean ± standard deviation.
Results and Discussion: Success rate was 100% in all groups. Time from introducing the blade of the Truphatek® Truview PCD™ in the mouth to the first ventilation was not significantly different between the groups (PF: 34.2s ± 16.2s vs. FO: 42s ± 14.8s vs. HS: 43.4s ± 25.6s). No complications like injuries of mouth or lips were noted in all groups. Also no postoperative complications like hoarseness or sore throat were noted 1 h after the operation or on the first postoperative day.
Conclusion(s): Combination of Truphatek® Truview PCD™ with a flexible fiberoptic as a guide for intubation is a comfortable, flexible and atraumatic alternative for a hockey stick formed stylet or the ParkerFlex-It™.

19AP1-9

Glidescope vs. flexible fiberoptic scope for potentially difficult airway

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Background and Goal of Study: Because of improved anatomical views, the Glidescope Video Laryngoscope (GL) has been introduced as a potentially promising means of managing difficult airway. We tested the hypothesis that in patients with anticipated difficult airway, intubation with GL is safer and faster technique than flexible fiberoptic intubation (FB), an already established technique.
Materials and Methods: Prospective randomized trial in 30 anesthestized patients at risk for difficult intubation. Patients included in the study presented with one or more of the following features:
1) history of difficult intubation
2) BMI > 35kg/m^2
3) Mallampati III
4) thyromental distance < 6cm
5) mouth opening < 4cm
6) limited neck mobility.
Patients were randomly assigned to oral FB intubation (n=15) or oral intubation with GL (n=15) after induction of general anesthesia.A single anesthesiologist performed all intubations.The following data were collected: success rate, intubation time, maneuvers to aid intubation and complications (airway trauma, SpO_2< 90%).
Results and Discussion: Intubation success rate with GL vs. FB was 14/93,3% vs. 13/86,6% at first attempt and 15/100% vs. 15/100% at second attempt. The time required to intubate the trachea in anesthetized patients was similar in both techniques (65±30sec vs. 68±35sec). A second anesthesiologist was needed in 2 cases of FB intubation in order to help with passage of endotracheal tube.Neither desaturation, nor other adverse events occurred.
Conclusion(s): For patients with an identified difficult airway, GL is a safe, easy to use and rapid alternative to flexible fiberoptic broncoscope.

19AP1-10

The usefulness of Glidescope in the placement of double lumen tubes

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Background and Goal of Study: Glidescope Video Laryngoscope (GL) assisted intubation is a useful technique for patients with difficult airway. Placement of double lumen tubes (DLTs) may be considerably more difficult compared to standard tracheal tubes. The aim of this study was to determine if the GL is useful in intubation with DLTs as opposed to the traditional Macintosh Laryngoscope (ML).
Materials and Methods: 50 patients scheduled for pulmonary resection requiring left-sided DLT placement were randomly assigned to oral intubation using the GL or to intubation with the ML (GL and ML groups). The following data were recorded: demographic information (e.g. BMI, Mallampati class, mouth opening, thyromental distance, neck movement), intubation success rate, the need for a second attempt or for switching from one technique to the other, glottis view using the Cormack Lehane (CL) score, and the time for intubation (time from insertion of the device into the oropharynx to the time when confirmation of DLT was assessed by capnography). Complications such as soft tissue trauma, hypoxemia (SpO2< 95%) and dental damage were also noted.
Results and Discussion: The two groups were comparable with respect to demographic characteristics. There was only one failed intubation (4%) in the GL group and 90% of intubations were successful in the first attempt. In the ML group, the failure rate was 12% (3 patients) and success rate in the first attempt was 80%.
All failed intubations were performed with another device. The intubation time was significantly less with GL than with ML (62,2 ±18 sec vs. 70 ± 32 sec). Compared to ML, the GL improved the glottis view. 92% of GL cases and 84% of ML cases exhibited a CL view ≤ 2. Complications did not differ between the two groups.

Conclusion(s): This study suggests that GL is an effective tool for intubation with DLTs, mainly by reducing intubation time and by increasing first attempt success rate.

19AP1-11

Tracheal intubation in the right lateral position. A comparative study between Airtraq laryngoscope and the Macintosh laryngoscope

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Background and Goal of Study: The Airtraq laryngoscope (AL) is a new single use indirect laryngoscope designed to facilitate tracheal intubation in anaesthetised patients either with normal or difficult airway anatomy. It is designed to provide a view of the glottis without alignment of the oral, pharyngeal and tracheal axes. Aim of the study was to compare the efficacy of the Airtraq laryngoscope versus the Macintosh laryngoscope (ML) on tracheal intubation in the right lateral position.
Materials and Methods: After IRB approval 80 patients (ASA I-II), scheduled for general anaesthesia were included. Patients were randomly allocated to be intubated in the right lateral position by a single experienced anaesthetist, either with the Airtraq laryngoscope (group AL, n=40), or with the Macintosh laryngoscope (group ML, n=40). Laryngoscopic view, attempts at tracheal intubation, manipulations, intubation time and success rate were recorded.
Results and Discussion: The laryngoscopic view with the Airtaq laryngoscope was significantly better (Cormack and Lehane 1) in all patients, compared with the Macintosh Laryngoscope (25/40, 62.5%), ($p< 0.01$). The median times to intubation with the AL compared with the ML were 10 s (interquartile range, 5-15 s) and 27 (16-38) s, respectively ($p< 0.01$). All patients in both groups were successfully intubated.
Conclusion(s): AL proved to be more effective than the ML on tracheal intubation in the right lateral position.

19AP2-1

A novel airway rescue technique, camera in tube intubation through an i-gel™

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Background and goal of study: Airway rescue techniques are of vital importance in cases of cannot intubate cannot oxygenate. Even experienced anaesthetists encounter frequent problems with these techniques, sometimes with devastating consequences (1). Therefore there is a clinical need for easier and faster methods. We have recently reported our results of the camera in tube intubation (CITI) technique, tracheal intubation with a VivaSight™ tube through a supraglottic device (2). Aim of the current study was to compare this novel technique with direct laryngoscopy.
Materials and Methods: A Laerdal SimMan™ manikin was placed in left- and subsequently in right lateral tilt to simulate a difficult intubation position. Two 4th year registrars, two experienced consultants and one experienced nurse anaesthetist were asked to intubate first conventionally with a laryngoscope Macintosh blade 3 and next with a VivaSight 7.0 via an i-gel 5.0. Times were recorded until visual confirmation of correct tube placement. For both techniques the same VivaSight tube was used. Maximal time for intubation was set at 40 seconds. The intubation times were compared with a Mann-Whitney test (IBM SPSS 20.0). A p value < 0.05 was considered statistically significant. Review Board approval was obtained.
Results and Discussion: A total of 120 intubations (60 with a laryngoscope and 60 with the CITI i-gel technique) were performed. With laryngoscopy 56 attempts (93%) were successful within 40 s. With the CITI i-gel technique we observed the same overall success rate (93%). The mean (SD) time to intubation with a laryngoscope was 10.1 (4.2) s and with the CITI i-gel combination 10.6 (4.1) s ($p=0.243$). In contrast to the consultants and nurse anaesthetist, the registrars had a higher success rate using the CITI i-gel technique (100%) than with the conventional method (83%). Their intubation times were also faster using this technique, 10.3 (3.9) s vs 12.8 (4.9) s ($p=0.041$). We believe this novel technique may proof promising for airway rescue, particularly for personnel with less airway management experience like registrars or paramedics.
Conclusion: Camera in tube intubation through an i-gel is a fast and easy technique for tracheal intubation of a manikin placed in a difficult intubation position. Clinical studies are needed.

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19AP2-2

A new method to reduce gas leak during mask ventilation in patients with a nasogastric tube

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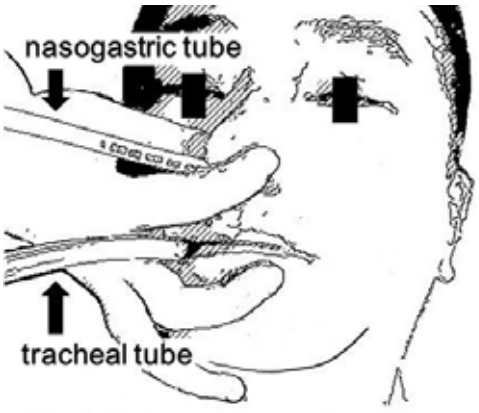
Background and Goal of Study: Face mask ventilation is an important and basic skill for anesthesia and resuscitation. It is sometmes difficult to perform face mask ventilation because of inadequate seal and air leak when a nasogastric tube is used. We introduce "tube mask ventilation" as a new ventilation method using tracheal tube inserted into the oral cavity with both the nose and mouth closed (Fig 1). The aim of this study was to ascertain the effectiveness of tube mask ventilation compared with standard methods for mask ventilation for reducing air leak.



[Figure 1. Tube mask ventilation]

Materials and Methods: With ethical approval and written informed consent, 60 ASA physical status 1 or 2 patients aged 20 - 70 yr were enrolled in this study. General anesthesia was induced with propofol and rocuronium intravenously. After the placement of a 16 Fr. nasogastric tube, three kinds of positive-pressure ventilation, tube mask ventilation, mask ventilation with a cushion face mask and mask ventilation with an anatomically shaped non-cushion face mask, were evaluated using a ventilator circle system in each patient in a crossover fashion with maintenance the head in extension.
A volume-controlled anesthesia machine ventilator was used at a preset gas flow of 8 L / min, tidal volume of 10 mL / kg, and respiratory rate of 10 breaths/ min. Air leak, defined as a difference between inspired and expired tidal volumes, was compared among the three conditions.
The results were expressed as means ± SD. The data were analyzed using the D'Agostino & Pearson test (normality test), one-way ANOVA and Tukey's post hoc test.
Results and Discussion: Air leak with tube mask ventilation (61 ± 46 mL) was significantly less than that with mask ventilation using a cushion face mask (181 ± 130 mL, $P < 0.001$) and that with mask ventilation using an anatomically shaped non-cushion face mask (149 ± 111 mL, $P < 0.001$). These results indicate the effectiveness of tube mask ventilation for patients with a nasogastric tube.
Conclusion: In patients with a nasogastric tube, tube mask ventilation markedly reduced air leak compared with that using traditional mask ventilation methods.

19AP2-3

Usefulness of Jew elevation device (JED™) during oral or nasal fiberoptic intubation in patients with neuromuscular blockade

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Background and Goal of Study: Patients after administration of intravenous anesthetics for general anesthesia induction are frequently unable to maintain airway patency, because of the retracted tongue root and the dropping epiglottis on the posterior pharyngeal wall. Fiberoptic intubation, therefore, becomes difficult in terms of obtaining good visual field of larynx in anesthetized patients. Jew elevation device (JED™, Hypnoz, USA) are often useful during moderate sedation to maintain pharyngeal airway. So, this study conducted to assess the utility of JED during fiberoptic nasal or oral intubation in anesthetized patients.
Materials and Methods: Fourteen patients (ASA-PS:1-2, Female : Male=9 : 5, BMI: 22.4(mean)) were enrolled into this study. 9 patients were intubated through oral and 5 patients through nasal using fiberoptic bronchoscopy (FOB) after standard anesthesia induction. Nasal FOB intubations were performed only when the surgeon requested for the operative procedure. Oral airway was used for oral FOB intubation. Firstly, with all patients' mandible elevated forward using JED, FOB was inserted through oral or nasal. Where the tip of FOB reached the posterior pharyngeal wall, the angle of FOB was arranged and examined the visibility of larynx (JED-ON). After that, JED elevation was released and second examination (JED-OFF) was performed once again. We classified the view of larynx into 4 grade according to Cormack-Lehane (CL) classification and defined FOB-CL classification, Grade1; most of the glottic opening can be seen - Grade4; neither the glottis nor the epiglottis can be seen.
Results and Discussion: Our results showed that JED elevation improved the visibility of larynx dramatically (Table.) during FOB intubation in anesthetized patients, especially during nasal intubation. Less effect of JED during oral FOB compared with nasal FOB is associated with the insufficient mandible elevation by mouth opening by airway.

	FOB-Oral intubation(n=9)		FOB-Nasal intubation (n=5)	
FOB-CL Grade	JED-ON	JED-OFF	JED-ON	JED-OFF
Grade 1	2	0	5	0
Grade 2	3	0	0	0
Grade 3	4	4	0	0
Grade 4	0	5	0	5

[Table. FOB-CL Grade with or without JED]

Conclusion: It has been demonstrated that JED is useful during FOB intubation as a means of ensuring clear visibility of larynx without the other supports.

19AP2-4

Unplanned extubation: a quality marker of intensive care unit. Review of 10 years

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Background and Goal of Study: The unplanned extubation, in an intensive care unit, is a common risk with potentially fatal consequences for patients. It is a marker of poor quality of care[1]. The aim of this study is to review the unplanned or accidental extubation in our hospital, assess the risk factors associated, planning strategies to reduce their impact and improving the quality of health care and patient safety.
Materials and Methods: Reviewing a prospective departmental database of unplanned extubation of patients admitted in our posoperative intensive care unit between January 2001 and December 2011. The study was considered an audit therefore not required informed consent. We focused on the following topics: incidence, risk factors and prevention. Recorded days of intubation, causes unplanned extubation and the relationship between both. The rate of accidental extubation (RAE) was calculated as the number accidental extubation per 100 days of intubation.
Results and Discussion: During the study period, 1133 patients were intubated with 3895 days of mechanical ventilation, we recorded 20 self extubation events, with a RAE of 0.51 unplanned extubation per 100 days of intubation. The main associated causes were inadequate sedation and agitation during weaning. The incidence of unplanned extubation according to current systematic reviews is between 0.1 to 3.6 episodes per 100 days of intubación[1]. Although within accepted standards, opportunities to improve patient safety may be found. After analyzing the situations in which unplanned extubation occurred, preventive measures were taken to reduce the incidence of unplanned extubation: updating sedation protocols and conducting continous education sessions of staff involved.
Conclusion(s): The review of unplanned extubation allowed us to design preventive strategies, such as an update of the sedation protocol, agitation avoidance, improve surveillance bedside and encourage continuous education for physicians and nurses. Implementation of these measures will reduce the incidence and improve patient safety.
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19AP2-5

Tracheal extubation - an audit of compliance with the 2012 Difficult Airway Society Guidelines

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Background and Goal of Study: Tracheal extubation is a high risk phase of anaesthesia which may be complicated by airway obstruction, respiratory embarrassment and hypoxic cardiac arrest[1, 2]. In 2012 the UK Difficult Airway Society published extubation guidelines[3]. We audited anaesthetist's extubation practice against this new guideline in a large district general hospital.
Materials and Methods: Check lists for awake and deep extubation were prepared in line with the Difficult Airway Society Guidelines. Extubation performed following elective or emergency surgery was observed without interference or recommendation across a four week period, with a check list completed for each extubation witnessed.
Results and Discussion: A total of 108 extubations performed by 44 anaesthetists across a range of surgical specialties were observed. Awake extubations (79% - 85/108) were witnessed more frequently than deep extubations (21% - 23/108). The majority of patients were preoxygenated (95% - 103/108) and neuromuscular blockade antagonised (82% - 89/108). Most patients received oxygen during recovery from anaesthesia (98% - 106/108). Poorly performed manoeuvres are shown in Table 1.

		Suction under direct vision	Bite block used	Eye opening / obeying commands	Positive pressure applied during extubation	Anaesthetist present until emergence
Awake extubation	% (/85)	11	31	25	18	
Deep extubation	% (/23)	13			0	26

[Table 1]

Conclusion(s): The findings of this audit suggest that compliance with the 2012 Difficult Airway Society extubation guidelines is moderate to poor. We suspect compliance is likely to be similar in other UK hospitals. In order to improve compliance we are planning to have a number of extubation tutorials and to introduce an extubation checklist to our anaesthetic chart. We hope these measures will improve practice and plan to re-audit in 6 months.
References:
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19AP2-6

Optimizing ventilation through a cuffed narrow bore catheter (CNBC) using expiratory ventilation assistance (EVA): an animal study

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Background and Goal of Study: EVA has been introduced as a ventilation principle to allow sufficient gas exchange through small lumen cannulas or catheters [1]. However, optimal ventilation settings have not yet been determined. Therefore we evaluated the effect of different ventilation frequencies on the efficiency of EVA through a 40 cm long cuffed narrow bore catheter (CNBC) with a 2.5 mm ID ventilation lumen and a separate pressure monitoring channel [2].
Materials and Methods: After approval by the local Animal Welfare Committee six pigs (38-45 kg) were anesthetized and normoventilated by intermittent positive pressure ventilation at an FiO_2 of 0.4. Monitoring lines were placed. After baseline recordings the CNBC was inserted through the endotracheal tube. Ventrain, a new ejector ventilator [3] (Dolphys Medical, Eindhoven, The Netherlands) connected to an oxygen flowmeter set to 15 L/min, was used to apply EVA. As part of a larger experiment, the pigs were ventilated for up to 30 minutes in a random order at ventilation frequencies of 15, 30, and 60 cycles per minute with an I:E-ratio of about 1:1. After a washout period of at least 30 minutes the next experimental run was started. At fixed intervals blood samples were collected. Descriptive statistical analysis of the data was performed.
Results: Data are presented as median [range]. The minute volume required for normoventilation prior to the experiments was 6.9 [4.8-8.0] L/min.

	Cycles/min	Baseline	15 min	30 min
paO_2 (mmHg)	15	157 [92-174]	443 [375-507]	439 [367-504]
	30	150 [98-175]	462 [356-538]	457 [394-521]
	60	153 [96-160]	434 [326-508]	424 [354-503]
$paCO_2$ (mmHg)	15	40 [39-41]	32 [27-36]	32 [28-38]
	30	41 [37-43]	40 [34-46]	37 [32-47]
	60	42 [39-44]	53 [39-71]	55 [42-77]

[Arterial blood gas samples during EVA]

Conclusion: When using flow-controlled EVA through a 40 cm long, 2.5 mm ID CNBC, a ventilation frequency of 15 cycles per minute achieved better CO_2-removal compared to higher frequencies. Efficient gas exchange through this CNBC offers new possibilities for clinical practice.
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Acknowledgements: This work was supported by European funding, OP-Zuid [31R104].
Conflicts of interest: D. Enk receives royalty payments from Dolphys Medical for Ventrain.

19AP2-7

Ventrain™ in a case of can't intubate can't ventilate situation

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Background: Diificult airways are fortunately rather uncommon and a can't intubate can't ventilate situation appears in probably one in 10,000 anaesthesias.
Case report: A 77 year old male Caucasian patient was scheduled for CABG due to instable angina pectoris. He had main stem and proximal LAD stenosis. Just before entering the OR he had a new episode of severe chest pain. Anaesthesia was induced with Fentanyl, Propofol, & Rocuronium. He had short neck and circumf. >50cm,BMI 36.Video laryngoscope C-Mac-D-blade was prepared. He had C&L 2 on screen and 3 with direct laryngoscopy. Several intubation attempts were made using a rather stiff guide with 8 oral tube.
The attempts were unsuccessful and it became impossible to ventilate the patient with bag and mask and with LMA. As colleague with airway interest I was called. They had prepared for cricothyroidotomy. It was difficult, due to the anatomy, to puncture the trachea with the needle and multiple attempts were made. I punctured the trachea with a 2 mm needle and started to ventilate the patient using the Ventrain™ at a ratio of 1:1 with 100% oxygen. The oxygen sat. rose from < 50% to about 75-80%.
After ventilating a couple of cycles blood clots were suctioned into the Ventrain™ tube from the trachea, but it did not compromise the ventilation. Now the cricothyroidotomy was successfully performed using the Melker Cricothyroidotomy 5 with cuff Several blood clots were then suctioned from the trachea. Surgery was postponed, and PCI was performed. Laryngoscopy showed a very edematous epiglottis and no glottis was seen.
The next day the ENT-surgeons tried to perform a tracheostomy but failed due to the anatomy. Most of the trachea was intrathoracic so they had to finish the operation by changing the Melker number 5 to a flexible tracheostomy cannula 7 mm through the cricothyroid membrane. Laboratory tests showed a small myocardial infarct. The patient was awakened and showed no signs of cerebral ischemic complication despite 15 min. with oxygen sat.< 50%.
Discussion: In a sitation of CICV performe an early cricothyroidotomy.
References:
Ventrain: an ejector ventilator for emergency use.Hamaekers AE, Borg PA, Enk D. Br J Anaesth.2012;108:1017-21.
Learning points: In patients with difficult airway the number of intubation attempts should be minimized in order to avoid traumatizing the epiglottis and larynx. Ventrain could be used to ventilate the patient while preparing for cricothyroidotomy or tracheostomy.

19AP2-8

First clinical experiences with a novel tracheal intubation technique: camera in tube intubation

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Background and Goal of Study: Airway related complications cause morbidity en mortality[1]. A camera embedded in the tip of the tube has potential benefits to reduce complications, including confirmation of correct tracheal tube placement in low-output states. Recently we have developed a novel tracheal intubation technique: camera in tube intubation: CITI[2].The goal of the study was to describe our first clinical experiences
Materials and Methods: The Review Board approved the study. Patients gave written informed consent. Eighteen ASA I patients Mallampati (MP) 1 (n=15) and MP3 (n=3) with normal airways were included. Three MP1 patients were intubated before prone positioning. After prone positioning tracheal tube position was compared to the supine position. General anaesthesia was induced intravenously. After neuromuscular blockade we inserted a 10 cm Berman™ intubating airway pre-loaded with a Vivasight™ tube size 7.5. After obtaining a view of the arytenoids or vocal cords a jaw-thrust manoeuvre was performed to improve the view. A 14F Frova™ intubating catheter was inserted through the glottis over which the Vivasight tube was advanced until the carina was seen. We recorded the time to capnographic confirmation of tracheal intubation and we studied any complication of the technique.
Results and Discussion: All 18 intubations were successful. In MP 1 patients, the mean time (range) to intubation was 90 seconds (70-120). The first three MP 1patients required two or three attempts, the following twelve patients required 1 attempt. It took 70 (55-120) seconds to intubate the MP 3 patients. The first MP 3 patient required 2 attempts. Tube displacement after prone positioning was more than 1 cm in two patients, in the third patient there was no tube migration. There were no complications. Seven patients (38%) complained of a sore throat, comparable with standard laryngoscopy and intubation
Conclusion(s): Our first clinical experiences indicates that camera in tube intubation is an easy to learn, promising intubation technique
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19AP2-9

Survey of extubation practice in adults at a tertiary centre

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Background and Goal of Study: Tracheal extubation is an important aspect of airway management. We surveyed the current practice of extubation in our hospital amongst all anaesthetists. This survey aimed to find out the familiarity of DAS extubation guidelines[1] to improve existing practice.
Materials and Methods: We designed a questionnaire which identified the grade of the anaesthetist and the number of intubations done every week by them in adult patients. We collected data specifically on tracheal extubation strategies and use of specific techniques.
Results and Discussion: The questionnaires were completed by 69 anaesthetists. 57% anaesthetists intubated atleast ten to thirty patients in a week. 81% (56) anaesthetists were familiar with the DAS extubation guidelines. Although oropharyngeal suctioning was performed by all of them, 72% (50) mentioned that they rarely used a laryngoscope to do suctioning. 88% (61) anaesthetists preferred to extubate their pateints in sitting position. 52% (36) anaesthetists rarely used a peripheral nerve stimulator. The most common tracheal extubation strategy used was remifentanil infusion by 32% (22) anaesthetists. 46% (32) anaesthetists mentioned that they would rarely replace the tube with a laryngeal mask airway under deep anaesthesia. The choice of extubation strategy for a patient with difficult airway by 65% (45) anaesthetists was to do it awake.
Conclusion(s): It is important to have a plan for safe management of airway at extubation. It is vital to use an appropriate advanced technique such as an airway exchange catheter or remifentanil infusion during extubation of an 'at risk' patient to avoid complications[2, 3].
In our survey we identified that majority of the anaesthetists were aware of DAS extubation guidelines. However usage of peripheral nerve stimulator and suctioning of the oropharyngeal cavity with laryngoscope should be encouraged. To improve our existing practice we are now running regular training sessions in our departmental airway lab.
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19AP2-10

Submandibular tracheal intubation in a facial trauma patient

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Background: Maxillofacial surgery is often a challenge to the anesthesiologist in order to provide a safe airway. Orotracheal intubation can't always be performed due to interruption of the surgical field and interference with teeth occlusion, sometimes needed to adjust and fix maxillary fractures. In the other hand, nasal intubation can be difficult in cases of deformity or nasal bone fracture and is contraindicated in cribiform plate fractures because of the potential complications and risk of cranial intubation. In these cases, short-term tracheostomy, is usually the solution.
However, it brings a lot of potential complications like hemorrhage, pneumothorax, tracheal stenosis and recurrent laryngeal nerve damage. In patients in whom mouth opening is normal, tracheal intubation can be performed by submandibular approach.
Case report: 48 year-old male, ASA IIE, victim of an accident at work, with multiple fractures of the middle third of the face, which needed urgent surgical treatment. At physical examination he had some findings that raised suspicion of skull base fracture. Maxillofacial CT couldn't exclude fracture of cribiform plate. Rapid sequence induction was performed with Propofol and Succinylcholine and maintenance was obtained with Remifentanyl, Rocuronium and Sevoflurane, under standard ASA monitoring.
After orotracheal intubation with a 7,5 armoured, tracheal tube, surgeon made a 2cm transverse skin incision, 2cm above the angle of mandible. Using an artery forceps, blunt dissection was carried out through the skin incision towards the mouth cavity as close as possible to the inner side of the mandible. After disconnecting tube and removing the universal adapter, the tube was held in the oropharynx by the anesthesiologist, with the aid of a laryngoscope. The tube was then pushed out of the submandibular incision by the surgeon. In the end of the procedure, the same was done in a reverse way. No complications occurred. The patient was discharged to ward 4 hours after the end of surgery.
Discussion: After discussing with the surgeon and given the inconvenience of the oral route and the contraindications to nasal intubation, it was decided to perform a submandibular intubation. It is a safe and fast procedure, if done by an experimented surgeon. It was indispensable a good cooperation between anesthesiologist and surgeon during all this process.
Learning points: Understanding that alternative airway approaches exist for special circumstances

19AP2-11

Submental intubation: an alternative to tracheostomy when orotracheal and nasotracheal intubation are contraindicated and long-term intubation is not required

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Background: Surgical repair of complex maxillofacial trauma presents a challenge to the surgeon and anesthesiologist. The requirement for intraoperative maxillomandibular fixation (IMMF) to re-establish dental occlusion precludes orotracheal intubation (OTI). Nasotracheal intubation (NTI) is contraindicated when the facial fractures involve the nasal pyramid or irradiate towards the base of the skull. Where intubations via oral and nasal route cannot be performed, the standard solution is tracheostomy, which is associated with many complications.
Case report: We present 4cases where we avoided tracheostomy in patients with multiple maxillofacial fractures. All patients had fractures disturbing the dental occlusion and associated fracture of the skull base or a displaced nasal fracture.After induction, OTI was done with reinforced endotracheal tube (ETT). A 1'5-2'0cm skin incision was made in the submental region and ETT was taken out through this incision in all the cases. At surgery, there was no chance extubation or ETT damage, the parameters of ventilation and gas exchange remained to be within the normal range.
Results and Discussion: Submental intubation (SMI) was successfully carried out in all our patients, and permitted reduction and fixation of all the fractures without the interference of the tube during surgical procedure. There were no intra or postoperative complications. All the patients were extubated between 4 and 24hours. Submental scars were minimal.Our average time to complete a SMI was 11minutes.
-Altemir proposed SMI as an alternative to the classic method: it obviates the need for tracheostomy and its related complications[1].
-Jundt reviewed the literature to analyse the evidence supporting SMI and to aid in the development of a new airway algorithm in craniofacial surgery patient: of 842 patients from 41 articles represented in the review, the success rate was 100%, and very low rates of minor complications were reported[2].
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Conclusions: We conclude that SMI in selected cases of craniomaxillofacial injuries is an excellent alternative to tracheostomy, when long-term intubation is not required.
SMI is a simple, safe,and effective technique, with low rates of morbidity, for securing an airway in maxillofacial trauma patients.

19AP3-1

Tongue width-based laryngeal mask airway size selection in male adults

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Background and Goal of Study: Optimal size selection is crucial to the effective use of laryngeal mask airway (LMA). The current choice of LMA size is based on the body weight, and the gender-based selection has also been suggested. However, the relationship between body weight, gender and the dimension of hypopharynx where LMA positioned is inconsistent. Here we introduce a new tongue width-based method to determine the optimal size of LMA in male adults.

Materials and Methods: First, we made four rulers with different width which corresponding to the four different classical LMAs. (No. 2.5, 3, 4, 5) The patient was asked to open mouth and protrude tongue, and the optimal size of LMA was determined by the corresponding ruler which had the same width of tongue of the patient. In this cross-over study, the enrolled patients have two different LMA size selection which determined by weight-based formula and tongue width-based formula. Five parameters: frequency of insertion attempts, the presence of cuff in the mouth, end-tidal CO_2 shown on monitor, oropharyngeal leak pressure, and fiberoptic score (1-4) were measured following LMA insertion.
Results and Discussion: Frequency of insertion attempts, the presence of cuff in the mouth, end-tidal CO_2 shown on monitor, oropharyngeal leak pressure, and fiberoptic score (weight-based vs tongue width-based): 71% vs 90%, 24% vs 5%, 81% vs 95%, 17.9±3.85 cmH_2O vs 15.14±3.15 cmH_2O, and 2.23±0.83 vs 3.38±0.74, respectively.
We found that the tongue width-based formula is better than weight-based formula in selecting optimal size of LMA. Although the oropharyngeal leak pressure was lower when using tongue width-based selected LMA, the presence of some air leak is not so crucial for the patients with spontaneous breathing when using LMA.
Conclusion(s): The tongue width-based formula is a good method for selecting optimal size of LMA in male adult.
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19AP3-2

The supraglottic airway i-gel in comparison with laryngeal mask airway in anesthetized patients

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Background and Goal of Study: The i-gel is a novel device that differs from other supraglottic airway devices in that it has a softer and a non-inflatable cuff. This study was designed to investigate the usefulness of the I-gel compared with the laryngeal mask airway (LMA) in anaesthetized, paralyzed patients in Baqiat-tolah hospital.
Materials and Methods: The American Society of Anesthesiologists physical status I-III patients scheduled for surgery were included in this prospective study. General anesthesia was achieved with intravenous infusion of propofol, remifentanil and atracurium. The patients were randomly assigned to I-gel and LMA groups (50 patients, each group). Properly sized I-gel (No. 3-4) or LMA (No. 4-5) was inserted. We assessed airway leak pressure, success rates and postoperative complications.
Results and Discussion: There were no differences in the demographic data among the two groups. The success rates for first attempt of insertion were similar among the two groups. There were no differences in the incidence of adverse events except for the larger incidence of dysphagia in the LMA group.
Conclusion(s): I-gel may have a higher airway sealing than that of LMA, and is not associated with adverse events. The I-gel might be an effective alternative as a supraglottic airway device.
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19AP3-3

Comparison of clinical efficiency of i-Gel™ with LMA Pro-Seal™ in breast surgery

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Background and Goal of Study: We compared I-gel (new single-use supraglottic airway device without an inflatable cuff) with Pro-Seal laryngeal mask airway in anaesthetized, non-paralysed patients in breast surgery.
Materials and Methods: Sixty-two (62) females aged 19-60 years, ASA I-II for breast surgery were studied. General anesthesia was achieved with intravenous infusion of propofol and fentanyl. The patients were randomly assigned to I-gel and Pro-seal groups (32 and 30 patients, respectively). We assessed hemodynamic reaction, leak fraction, ease of insertion, success rate of insertion, airway trauma by post-operative blood staining of the device and sore throat.
Results and Discussion: There were no differences in the hemodynamic data immediately after insertion of devices, no significant difference between the leak fractions among the two groups. The success rate at first attempt of insertion were 32/32 (100%) for I-gel and 27/30 (90%) for Pro-Seal which was statistically not significant. Blood staining of the device was more with Pro-Seal 4/30 (13,3%) than with I-gel 1/32 (3.1%) but the results were not statistically significant too.
Conclusion(s): I-gel and Pro-Seal have a similar airway sealing and hemodynamic reaction after insertion. I-gel is relatively easier to insert, requires less attempts of insertion and is less traumatic as compared to Pro-Seal for anaesthetized, non-paralysed patients in breast surgery.

19AP3-4

A comparison of the i-gel with the LMA-Supreme in non-paralysed anesthetized adult patients

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Background: The purpose of the present prospective, randomised, controlled trial was to assess these two disposable devices I-gel™ (1) and LMA-Supreme™ in routine clinical practice.
Materials and Methods: 80 patients (ASA 1-3) were randomly allocated to controlled ventilation with I-gel™ (n=40) or ILMA-S™ (n=40). A size 4 and 5 was used . Time of insertion of each device was measured and additionally the ALP for the ILMA-S™ (ALP; at a cuff level of 60 cmH_2O). Occurrence of gastric inflation was assessed with a stethoscope. After successful device placement and measurement of ALP, a diluted solution of 20 ml toluidine blue was inserted via the gastric tube directly in the upper oesophagus. After insertion, the position of both devices and the presence of fluid leakage into the larynx, which was defined as blue staining within the mask bowl, was controlled using the fiberoptic score (FOS). Postoperatively the position of both devices and toluidin staining was controlled again and subsequently ALP measurement repeated. Patients were asked about sore-throat, dysphonia and dysphagia 24 hours after surgery.
Results: Insertion of the I-gel™ was possible in 34 patients with the first attempt (85%) and in 5 patients with the second attempt (12%). In the ILMA-S™ group, insertion was successful with the first attempt in 35 patients (87%) and with the second attempt in 4 patients (10%). Ventilation was established in 10 sec (range 8-20 sec) in the I-gel™ group and in 18 sec (range 10-26) in ILMA-S™ group ($p < 0{,}0001$).
There was 1 failure in the I-gel™ group and 1 failure in the ILMA-S™ group. Mean P_{aw} and ALP was comparable between both devices. No gastric inflation occurred with the I-gel™ mask, whereas gastric inflation was observed in the ILMA-S™ group in 1 patient. FOS of the position of the devices was significantly better in the I-gel™ group ($p < 0.005$) as presented in figure 1. Toluidine blue was detected in 4 patients in the I-gel™ group (ALP of 22, 24, 25 and 27 cmH_2O) after insertion and in 1 patient (ALP 27 cmH_2O) during the second control. In the ILMA-S™ group in 2 patients (ALP of 21 and 23 cmH_2O) directly after insertion.
No patient reported relevant dysphagia and dyshonia.
Conclusions: Both devices appeared to be simple and save alternatives to secure the airway. Silent aspiration may occurr with both devices despite an acceptable ALP.
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19AP3-5

The LMA Supreme: an initial assessment of performance in paediatric patients

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Background and Goal of Study: The paediatric laryngeal mask airway Supreme was designed with the same components as the adult laryngeal mask airway Supreme, and adjusted specifically to the anatomical characteristics of the child. We aimed to determine whether these features make it suitable for positive pressure ventilation in anaesthetized children.
Materials and Methods: The laryngeal mask airway Supreme was inserted in a group of 60 paediatric patients undergoing elective surgical procedures, with general anaesthesia and positive pressure ventilation.
Results and Discussion: Insertion was considered very easy in 56 cases (93,3%). The device was successfully inserted at the first attempt in 57 cases (95%). Mean time to achive an effective airway was 9,07 seconds (5-30). Mean oropharyngeal leak pressuer was 23,48 cm H2O (10-40). Initial fibre-optic inspection of larygeal position showed the vocal cords in 51 patients (85%). Audible leaks were more common in size 1 group. There were no cases of gastric insufflation or blood staining.
Conclusion(s): Our result suggest that the laryngeal mask airway Supreme (sizes 1, 2 and 3) is suitable for positive-pressure ventilation in anaesthetized children.
References:
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19AP3-6

Rapid sequence induction versus routine induction in obese patients scheduled for bariatric surgery

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Background and Goal of Study: Patients with obesity are more likely to suffer serious airway problems during anaesthesia than non-obese patients. In particular, problems can be encountered regarding ventilation and intubation during induction of anaesthesia (1).
Moreover, obese patients are at higher risk of gastric fluid regurgitation and aspiration at this stage. Thereby, the application of rapid sequence induction (RSI) is regularly practiced in the morbidly obese (2).
To our knowledge, the superiority of RSI to routine induction has not been established yet. In this prospective study we compared RSI to standard procedure and we investigated the incidence of desaturation and gastroesophageal regurgitation in obese patients scheduled for bariatric surgery.
Materials and Methods: After obtaining informed consent, 44 consecutive patients were randomly allocated to the RSI (n = 23, gr. 1) or the classical induction group (n = 21, gr. 2). After cricoid pressure 1 mg/kg total body weight of succinylcholine were injected in group 1.
In group 2, 0.15 mg/kg of cisatracurium were injected after ensuring adequate mask ventilation. The following parameters were recorded: demographics, BMI, criteria for difficult ventilation and intubation, apnea duration, intubation attempts, SpO_2 before induction, 5 min after pre-oxygenation, immediately after intubation and minimal saturation.
Finally, oropharyngeal and gastric pH were assessed using a litmus paper. Data were compared using Pearson's Chi-squared test, ANOVA and *t*-test (mean values, $p < 0.05$ being significant).
Results and Discussion: Demographics, BMI, difficult ventilation/intubation criteria and apnea did not differ between the two groups ($p > 0.05$). Patients in group 1 showed significantly lower minimum saturation values compared to group 2 (84.17% versus 93.86 %, $p = 0.027$). Measurements of oropharyngeal pH were similar in both groups (7.6, $p = 0.729$). Oropharyngeal values compared to gastric pH excluded gastric liquid regurgitation in each group ($p = 0.09$).
Conclusion: Our data suggest that routine induction provides safety regarding desaturation and gastric content aspiration in obese patients compared to rapid sequence induction.
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19AP3-7

A new technique at insertion of laryngeal mask airway

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Background and Goal of Study: Laryngeal mask airway (LMA) have been frequently used for airway management. The satisfaction of the insertion and trauma at insertion are problems. We present a new in insertion technique for LMA with partially inflated cuff.
Materials and Methods: Consecutive 157 patients undergoing general anesthesia with LMA were randomized to two groups by coin toss. Induction and maintenance of anesthesia were standart in two groups. There were 85 patients in study group (group S) and 72 patients in control group (group C). LMA insertions were made by same physician. LMA was inserted with standart technique -which was described by Brain- at group C. Laryngeal mask airway was inserted with new techinque at group S. In new technique the head was positioned with extension by nondominant hand, mouth was opened with dominant hand, LMA was held with dominant hand from the tube part and inserted until the tip touches to the oropharynx. The index finger of nondominant hand was inserted to mouth to pass by the LMA and reach the tip of it and the tip of LMA was directed to caudal by index finger. Then LMA was inserted by the guidance of the index finger towards it reaches to the trianguler base of the orophariynx.
Results and Discussion: There were no difference between the groups for the demographic details, ASA scores, insertion success and duration of anesthesia. The mean age was 47 ,4 for group S and 51,7 for group C. Count of attempt was better in study group. Mean count number was 1,11 at group S and 1,28 at group C ($p=0.02$). Also blood on LMA were seen more common at group C ($p=0.04$). There were no statistical difference at sore throat but it was less seen at group S. Also airway satisfaction was not statistical different between groups but while all airways were succesfull in group S we can not inserted LMA by standart method at 1 patient and inserted it at first attempt by new technique.
Conclusion: New technique is less traumatic and easy to use at daily practice.
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19AP3-8

Inconsistent size nomenclature in extraglottic airway devices

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Background and Goal of Study: Predicting the appropriate size of an extraglottic airway device (EAD) is not an easy task due to the complexity of the inconsistent relationship between demographic data and oropharyngeal geometry.[1] Ramachandran et al.[2] revealed that 47.7 % of failed laryngeal masks involved the use of a laryngeal mask outside the recommended size. Also, the manufacturer's recommendations evolved over time due to evolution in device design with the advent of the introduction of new EADs.
Materials and Methods: We evaluated the manufacturers' guidelines regarding size recommendations of all EADs. Additional sizing information was obtained via literature search on Pubmed, Google Scolar, and textbooks on airway management.
Results and Discussion: Most often, the size indication of an EAD is based on the patient's weight, as originally advocated by Archie Brain for the Classic-LMA: size 1 (< 5 kg); size 1.5 (5-10 kg); size 2 (10-20 kg); size 2.5 (20-30 kg); size 3 (30-50 kg); size 4 (50-70 kg); size 5 (70-100 kg).
However, for similar nomenclature, 12 manufacturers, producing a total of 25 different types use an alternative method based on height (e.g. Combitube®, EzT®), gender (e.g. AMD®), age or a modified weight classification system

(e.g. airQ®). Sometimes there is a weight overlap between sizes (e.g. iGel®) or an arbitrary weight classification (e.g. Cobra®), which may add to the confusion.

Conclusion(s): Successful use of an EAD depends in part on appropriate size selection, clinical judgment, and patient anatomy and physiology. Size ranges are based most often on weight, although manufacturers differ in their sizing recommendation. We hereby plea for a standardization in the use of the sizes of EADs to reduce possible errors. We encourage the manufacturers of EADs to develop a new consensus about a consistent size systematic of EADs to promote safer clinical practice in airway management.

References:

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19AP3-9

Comparison of LMA-Supreme and i-gel in children: difficult airway scenario

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Background and Goal of Study: The supraglottic devices has been widely used to secure the airway in paediatric patients. LMA-Supreme (LMA-S) and i-gel, have also a double lumen which allow to insert a gastric tube and allow free gastric drainage. These supraglottic airway devices may be an alternative in difficult airway management. This study was designed to compare the size 2 LMA-Supreme with i-gel in simulated difficult airway scenario by using an cervical collar to limit mouth opening and neck movement. Up to date, there were no randomized controlled study evaluating the clinical performance of size 2 LMA-S and i-gel in such simulated difficult airway scenario for paediatric patients.

Materials and Methods: After the approval of the ethics committee, sixty ASA grade I-II paediatric patients who were undergoing, lower abdominal, inguinal, orthopedic surgery and 10-25 kg in weight were included in this prospective, randomized, single blinded study. Written informed consent was taken from the parents.

The patients were randomly assigned to the i-gel and LMA-S groups (30 patients in each group). Success rate, ease of insertion; insertion time (time to successful ventilation), number of attempts, airway leak pressure, fiberoptic glottic view, and adverse events were determined in each group. A gastric tube was placed through the device's esophageal drainage tube. Insertion time, number of attempts and insertion difficulty of gastric tube, also recorded.

Results and Discussion: Demographic and surgical features were similar between the groups. Success rate for the LMA-S was 100% and 97% for the i-gel. Mean time of successful insertion of the device was significantly shorter with the LMA-S than with the i-gel (LMA-S:11.23±1.83 sec , i-gel:13.4±2.24 sec) (P=0.001). Mean airway leak pressure for the LMA-S was significantly higher than with the i-gel (LMA-S:20.90±3.22, i-gel:18.89±3.15cmH_2O) (P=0.01). Gastric tube placement was possible in all patients and the insertion time of gastric tube's was shorter with the LMA-S than with the i-gel (LMA-S:10.3±3.57 sec, i-gel: 12.6±3.21 sec) (P=0.01). There were no significant differences between groups in grade of glottic view with fiberscope and complications.

Conclusion(s): LMA-S, in size 2, is easy to insert and provides higher airway leak pressure and needs shorter insertion time compared with same size i-gel and can be a better alternative choice than i-gel for difficult airway management in paediatric patients.

19AP3-10

Awake vidoelaryngoscope-assisted intubation in a patient with stridor

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Background: There is a lack of consensus on how best to secure the airway in patients presenting with stridor. Awake fibreoptic intubation has been criticised for the "cork-in-a-bottle" effect of the fibrescope (FS) obstructing an already narrowed airway [1]. Inhalational induction was reported to be associated with complete airway obstruction [2].

This case demonstrates potential benefits of awake videolaryngoscope-assisted intubation in a patient with stridor.

Case report: A 64-year-old man presented for urgent panendoscopy for presumed upper airway malignancy. He had a soft biphasic stridor at rest. Nasendoscopy revealed a tumour of the left ariepiglottic fold. The patient was heavy smoker and morbidly obese, with severe gastric reflux, OSA, AF and previous MI. Our airway management strategy consisted of awake intubation using a VS, FS or awake tracheostomy.

After establishing IV access and standard monitoring, sedation using remifentanil TCI was started with a patient in a semi-sitting position. Topical anaesthesia of the upper airway was established using 10 % Xylocaine spray and 4% lignocaine administered via mucosal atomisation device. After gentle insertion of the Pentax AWS a full view of the glottis was obtained. Attempts to pass size 6 tube failed. With each attempt at passing the tube, patient's breathing became easier as stridor was replaced with air flow through the tube. Placement of the size 5 tube was achieved after a bougie (3mm OD) was used to guide the tube through the narrowed airway. Macintosh laryngoscopy post induction revealed a grade 3 view.

Discussion: Awake VS-assisted intubation provided wide-angle view of the larynx throughout attempted intubation. Had we tried to railroad size 6 tube "blindly" over a FS, we might have caused trauma and complete loss of the airway.

The "cork-in-a-bottle" effect associated with FS technique was replaced with relief to the airway obstruction when passing the tube using VS. Awake VS-assisted intubation may be a useful intubation technique in patients with stridor.

References:

1. Mason RA. The obstructed airway in head and neck surgery. *Anaesthesia* 1999; **54**: 625-628
2. Cook TM, Woodall N, Frerk C. Fourth National Audit Project. Major complications of airway management in the UK: *Br J Anaesth* 2011; **106**:617-31.

Learning points: Awake VS-assisted intubation provides wide-angle view of the larynx throughout attempted intubation. The "cork-in-a-bottle" effect associated with FS technique is avoided.

19AP3-11

Study of the morbidity associated with two supraglottic devices: the LMA™ classic and i-gel™

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Background and Goal of Study: Since the introduction of the Laryngeal Mask Airway Classic (LMA), various devices have been developed. The I-gel mask (I-gel) doesn't have an inflatable cuff, being different from similar devices. This should be less traumatic to adjoining structures[1]. However, there aren't studies comparing the incidence of morbidity associated with the use of I-gel and LMA.

Thus, the aim of this work was to compare the incidence of sore throat, dysphagia, hoarseness, sensitivity changes on the tongue (SCT), heartburn and post-operative nausea and vomiting (PONV) between I-gel and LMA devices and also evaluate the influence of the professional experience as the number of attempts for the placement of the device upon the occurrence of the same morbidity.

Materials and Methods: A prospective study was performed in an outpatient surgery unit. Patients submitted to surgery under general anaesthesia with the use of a supraglottic device were randomly assigned for a LMA or an I-gel device. The presence of odynophagia, dysphagia, hoarseness, SCT, heartburn and PONV were examined until 24 hours after surgery. All data were compared with the chi-squared test and continuous data were analysed with Student t-tests or Mann-Whitney tests for the detection of differences between the I-gel and LMC groups.

Results and Discussion: A total of 145 individuals were included, 75 of which assigned to I-gel group and 70 to the LMA. There were no significant differences between the type of supraglottic device and the occurrence of the symptoms in study ($p>0.05$ for all symptoms).

So, we showed that the incidence of morbidity is similar with booth devices and all symptoms incidence, except for dysphagia, was similar to that found in other works. A significant increase in the incidence of odynophagia ($p< 0.001$, OR=10.86) and dysphagia ($p< 0.001$, OR=12.34) was observed when more than one was needed attempt for placing the device, regardless of device used, comparing to those patients were only one attempt was needed to place the device.

We also found a significant increase in odynophagia's incidence ($p=0.013$) when the device has introduced by an anaesthesiology resident, comparing with its placement by an anaesthesiologist.

Conclusions: It is mostly the experience of the user rather than device itself, which influences more the occurrence of the morbidities in he placement of supraglottic devices.

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19AP4-1

Sedation for endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA)

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Background and Goal of Study: EBUS-TBNA provides a real-time ultrasound-guided sampling of lymph nodes adjacent to the trachea that are commonly involved in lung cancer. Several issues must be considered when performing EBUS-TBNA such as sharing the airway with the bronchoscopist, the big size of the ultrasonic bronchoscope, and the need of a good level of hypnosis to avoid coughing but also hypoventilation. Different anaesthesia techniques have been used for this procedure without evidence of superiority among them. The aim of this study was to assess whether EBUS-TBNA performed under sedation with propofol and remifentanyl while maintaining spontaneous breathing is safe and comfortable for both patient and bronchoscopist.

Materials and Methods: Single-center, open-label, prospective, descriptive study of patients undergoing sedation for EBUS procedure. Haemodynamic and respiratory parameters and Ramsay sedation scale were recorded. Patient, bronchoscopist and anaesthesiologist satisfaction was assessed by a 5 points scale at the end of the procedure.

Results and Discussion: EBUS-TBNA was performed in 142 patients from January 2010 until November 2012, in 14 patients during hospital admission and in 128 patients as outpatients. In all cases the procedure was successfully.performed. The duration of the procedure was 90 min (SD±37). Ramsay score was between 3 and 5.

Cough was observed in 33 patients (23,2%), most of them during the insertion of the echo-bronchoscope. 28 patients (19,7%) presented minor complications including hypertension (5 patients), hypotension (14 patients), tachycardia (4 patients), desaturation (SatO2< 90%) (11 patients), 6 patients required manual ventilation, bronchospasm (3 patients), nausea (2 patients) and transient bacteriemia (3 patients).

Two patients (1,5%) were admitted due to bacteriemia. The satisfaction level of patients, anesthesiologists and bronchoscopists was reported as good. Outpatients were discharged 164 min (SD±60) after the end of the technique without any later complication.

Conclusions: EBUS-TBNA can be safely performed under moderate sedation plus topical anaesthesia, allowing spontaneous breathing, rapid recovery and early discharge. No severe adverse reactions were gathered.

19AP4-2

The inhibitive effect of remifentanil on complications associated with removal of the laryngeal mask airway

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Background and Goal of Study: Removal of the laryngeal mask airway (LMA) when patients are fully awake has been recommended, but airway complications can be occurred. It may be safer to remove the LMA whilst the patients are deeply anaesthetised, but there is high probability of aspiration, delayed emergence. According to other research, remifentanil infusion reduced coughing associated with tracheal extubation[1]. We evaluated the inhibitive effect of remifentanil on airway complications associated with removal of the LMA during emergence.

Materials and Methods: We studied 88 patients (ASA 1-2, 18-65year) undergoing lower extremities surgery. The patients that could not maintain ventilation with LMA were excluded. The patients were randomly divided into R0(remifentanil infusion is stopped) or R1.0(effect-site concentration(Ce) of remifentanil at 1ng/ml) or R1.5(Ce of remifentanil at 1.5ng/ml). Anesthesia was induced with propofol 1.5mg/kg, sevoflurane 2vol%, Ce of remifentanil at 3ng/ml via TCI system. It was kept Ce of remifentanil at 0, 1.0, 1.5ng/ml respectively, 10 min before the end of the surgery. LMA was removed when spontaneous breathing was adequate. Agitation at emergence, eye opening time, the removal timeof LMA, the total infusion dose of remifentanil , and Observer's assessment of alertness/sedation scale(OAA/S) and visual analogue scale(VAS) were recorded at 10 min after LMA remove. Airway complications were also recorded from the end of the surgery to 5 min after the LMA removal.

Results and Discussion: No differences were found between the groups with respect to the patient characteristics including operation time, anesthesia time, remifentanil dose, OAA/S and VAS. Eye opening time and LMA removal time of the group R1.5 were longer than other groups significantly(Table 1). Incidence of airway complications was the highest in group R0(Table 1).

Conclusion(s): The continuous infusion of remifentanil to effect-site concentration at 1.0ng/ml during emergence can reduce the incidence of airway complications associated with removal of the LMA without any delay in LMA removal time.

References:

1. Br J Anaesth 2009 Dec;103(6):817-21.

	R0	R1	R1.5	p-value (R0-R1)	p-value (R0-R1.5)	p-value (R1-R1.5)
Eye opening time (sec)	318.34 ±110.74	314.07 ±95.67	472.61 ±165.29	0.991	0.000	0.000
LMA removal time (sec)	267.93 ±93.78	304.43 ±85.47	493.26 ±188.72	0.558	0.000	0.000
Sedation-agitated scale	1.38 ±0.94	0.57 ±0.63	0.65 ±0.80	0.001	0.002	0.934
Airway complications	15 (51.7%)	3 (10.7%)	7 (22.6%)		0.002	

[Table 1. Results]

19AP4-3

Proposal for a prospective, cohort study implementing an algorithm making extubation safer

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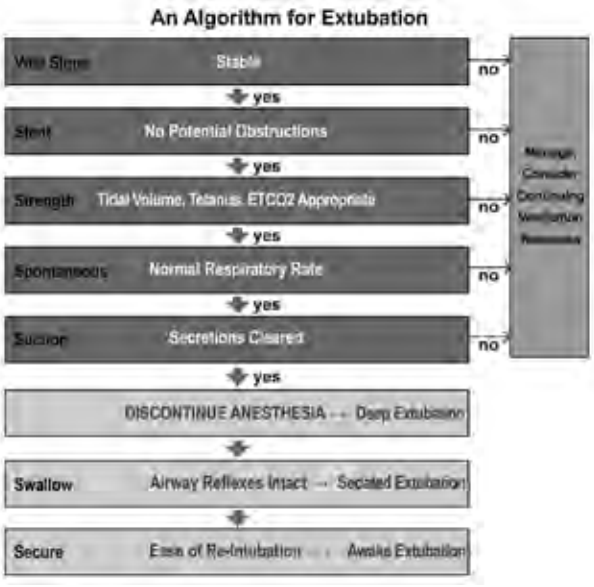
Background: Considerable research and development has focused on laringoscopy and intubation, but little consideration has been given to extubation despite the fact that many preventable complications occur with extubation. Closed claims studies show that complications related to extubation exceed those related to intubation. We propose the study of an algorithm for extubation to improve the process, decrease failures and teach extubation.



[Figure 1: Extubation Criteria VSS + 4S = 2S]

Methods: A multicenter prospective cohort study to validate the algorithm VSS+4S+2S. We will analyze and compare the application of algorithm against all techniques in non-difficult airway patients.

VSS, refers to all *vital signs being stable* before extubation is considered.

4S, incorporates *Stent, Strength, Spontaneous and Suction.* Stent (the endotracheal tube) is no longer needed when another airway device is substituted to maintain patency or the risk of obstruction has passed. Strength is observed through tidal volume, tetanus and $ETCO_2$ levels. Spontaneous drive is

determined when normal respiratory rate is present. The need for suction is ascertained by inspection. 2S consists of *Swallow and Secure*. Swallowing implies, intact airway reflexes. Secure, indicates the patient has been evaluated for reintubation which may indicate that an awake extubation is preferable to sedated extubation.

Discussion: Commonly, anesthesiologists extubate only after the patient is fully awake. This often results in choking, bucking, discomfort and possible injury. Using a protocol has been approved by the Ethics and Research Committee, we will collect data about time of surgery end and anesthesia extubation, number of reintubations and observed secondary events such as choking, bucking, and injury. This study requires a large sample number and we welcome other institutions to join our study.

Conclusion: This simple extubation algorithm reminds anesthesiologists of the extubation process and helps evaluate each step. It may allow for a reliable and safer extubation. The algorithm provides an understandable teaching method, allowing anesthesiologist to discuss extubation in a universal manner and encourage further plans to resolve extubation issues.

19AP4-4

Diffusion of nitrous oxide through endotracheal tube cuffs

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Background and Goal of Study: During anesthesia with nitrous oxide, this gas enters the cuff of the endotracheal tube, which increases the cuff pressure and may cause damage to the tracheal tissue. A new line of endotracheal tube, Portex Blue Line Profile Soft Cuff (SPN) from Smiths Medical, has been reported to overcome this problem. In this study, we compare the permeability of nitrous oxide through endotracheal tube cuffs between SPN with a normal tube, Mallinckrodt™ Nasal RAE Tracheal Tube Cuffed Murphy Eye (MRN) from Mallinckrodt.

Materials and Methods: Five kinds of gases were prepared and inflated into the cuffs of MRN and SPN, respectively at the pressure of 30 cmH_2O; Air (A group), 100% oxygen (O group), 70% nitrous oxide/30% oxygen (70N group), 50% nitrous oxide/50% oxygen (50N group), or 30% nitrous oxide/70% oxygen (30N group). These cuffs were kept in room air(23°C, 1atm). Cuff pressures were recorded at every 5 min for 60 min. Data were compared using statistical analysis software with significance set at $p < 0.05$.

Results and Discussion: In the A group, the cuff pressures at 60 min in the MRN and SPN were 26.8±1.9 $cmH_2O$and 30.0±0.0 cmH_2O, respectively. In the nitrous oxide-containing groups (70N, 50N, and 30N), however, the cuff pressures decreased faster according to the concentration of nitrous oxide. In the 70N group, the cuff pressures in the MRN and SPN at 60 min were 3.2±0.4 cmH_2O and 5.5±1 cmH_2O, respectively. In the 70N group, the cuff pressures in the MRN and SPN decreased significantly faster in group 70N at 10 and 20 min than those in other groups. The mean duration decreasing to 15 cmH_2O in the MRN and SPN were 12 minutes and 27 minutes, respectively. The cuff pressures of SPN were kept higher than those of MRN in all groups. When high concentration nitrous oxide inflated into the cuff of SPN, however, the cuff pressure may changes largely in short time.

Conclusion: Some tube cuffs like SPN were developed to prevent cuff pressure change due to low permeability of nitrous oxide. However, this function may be still insufficient in spite of some improvement of permeability. We have to pay attention to cuff pressure during anesthesia using nitrous oxide.

19AP4-5

Predicted end-tidal sevoflurane concentration for insertion of a laringeal mask Supreme: a prospective observational study

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Background and Goal of Study: The single-use Laryngeal Mask Airway (LMA) Supreme is a new supraglottic airway device recently that combines features of the LMA Proseal and the LMA Fastrach. It has been reported to be reliable and easy-to-use in clinical practice; however, the anaesthetic techniques for its insertion are not standardised. The purpose of this study was to determine the ED_{50} of end tidal sevoflurane concentration for successful LMA Supreme insertion without the use of neuromuscular blockade.

Materials and Methods: We designed a prospective observational study. Thirty-one consecutive elective patients scheduled for minor elective surgery under general anaesthesia. Patients with a potentially difficult airway (Mallampati III or IV, a limited mouth opening or cervical spine disease), reactive airway disease, sign of upper respiratory infection and patients who had a risk of gastric aspiration were excluded from the study. Patients were preoxygenated with 100% oxygen and anaesthetized using normal tidal volume inhalation of sevoflurane. The target sevoflurane concentration was determined using a modified Dixon's 'up-and-down' method (starting at 2.5% with 0.5% as the step size). After the predetermined end-tidal concentration has been established and maintained for 10 min, LMA Supreme insertion was attempted. The main outcome measure was the patient's response to LMA Supreme insertion, classified as either "movement" or "no movement". The mean of the concentrations of seven cross-overs from "movement" to "no movement" was used to estimate the ED_{50}.

Results and Discussion: Thirty-one patients were enrolled in this study: 19 women and 12 men. The mean (SD) age of the patients was 50±13 years, body weight 74±16 Kg and height 168±8 cm. The estimated sevoflurane concentration for successful LMA Supreme insertion in 50% of adults was 3.03±0.75% (95% confidence interval 2.3 to 3.7%). The values of the ET_{50} and ET_{95} obtained by logistic regression were 2.83 and 5.30%, respectively.

Conclusion(s): Sevoflurane alone can provide acceptable conditions for insertion of LMA Supreme in adults, at an estimated minimum alveolar anaesthetic concentration of 3% and minimal adverse effects.

19AP4-6

Combination of low-dose atracurium and remifentanil is optimal for tracheal intubation in extremely short time surgery regarding intubating condition, hemodynamics and recovery profile

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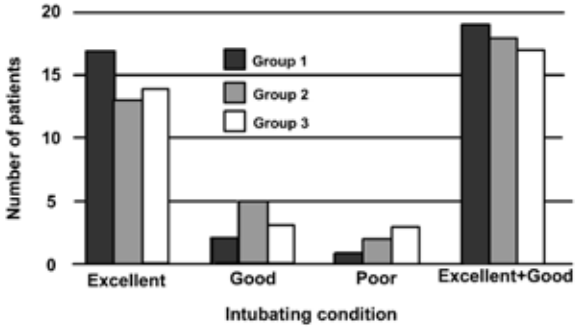
Background and Goal of Study: The goal of this study was to examine if tracheal intubation with combination of low dose atracurium and remifentanil can provides excellent intubating condition without adverse hemodynamic response, and rapid recovery after extremely short time surgery.

Materials and Methods: In a double-blind, randomized design, 60 patients, aged 20-60 yr, who underwent laryngeal microsurgery for vocal cord polypectomy, were randomly allocated to one of 3 groups; Group I (n = 20): atracurium 0.5 mg/kg and remifentanil 1 μg/kg, Group II (n = 20): atracurium 0.25 mg/kg and remifentanil 2 μg/kg, Group III (n = 20): atracurium 0 mg/kg (only normal saline) and remifentanil 3 μg/kg. All of the atracurium and remifentanil were diluted with normal saline to same volume of 5 ml and 10 ml respectively. Exclusion criteria was cardiovascular, cerebrovascular disease, predicted difficult intubation. After inducing anesthesia with 2 mg/kg of propofol, atracurium was injected, and then remifentanil was administrated over 90 seconds. After tracheal intubation, intubating condition were evaluated. Mean arterial pressure, heart rate, BIS values were recored before induction, before intubation and after intubation. At the end of surgery, time interval to restore self respiration was assessed.

Results and Discussion: There were no significant differences among groups with respect to age, sex, height, body weight.



[Intubating condition]

	Group I (n = 20)	Group II (n = 20)	Group III (n = 20)
Operation time (min)	19.2 ± 6.8	18.4 ± 7.4	20.7 ± 7.6
Restore self respiration (min)	6.6 ± 3.7	3.0 ± 1.8 *	4.4 ± 3.1
Hypotension	2 (10%)	3 (15%)	8 (40%)
Bradycardia	1 (5%)	2 (10%)	10 (50%)*†
Additional remifentanil	15 (75%)	12 (60%)	4 (20%)*†
Additional atracurium	0 (0%)	1 (5%)	6 (30%)*

[Recovery time and adverse effects]

Values are mean ± SD or number of patients (%). *: P < 0.05 compared with Group I, †: P < 0.05 compared with Group II.
Conclusion(s): Combination of 0.25 mg/kg of atracurium and 2 μg/kg of remifentanil could be optimal regimen for tracheal intubation in extremely short time surgery like laryngeal microsurgery. It provides optimal intubating condition and rapid recovery after surgery without adverse hemodynamic response.

19AP4-7

Haemodynamic response and safety of deep sedation with sevoflurane vs. propofol for nasotracheal fiberoptic intubation

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Background and Goal of Study: Haemodynamic response and safety of sevoflurane inhalational deep sedation for FOB intubation has not been well studied yet. Our aim was to evaluate FOB nasotracheal intubation safety using two sedation techniques: propofol or sevoflurane deep sedation.
Materials and Methods: After local ethics committee approval and written informed consent obtained, 40 consecutive ASA I-III patients scheduled for surgery under general anesthesia were randomly assigned to two groups for FOB intubation: propofol(Group P) or sevoflurane(Group S) sedation. Exclusion criteria were: study medicaments allergy, history of malignant hipertermia and risk of bronchoaspiration. After monitoring, basal systolic(bSAP), diastolic(bDAP), mean arterial pressure(bMAP) and peripheral oxygen saturation($bSpO_2$) were registered. After standard premedication, patients in Group P were administered a propofol Target Controlled Infusion(TCI) with an initial target of 2.5-3 $\mu g \cdot ml^{-1}$, with oxygen and maintaining spontaneous ventilation. TCI target concentration was changed by intervals of 0.5 $\mu g \cdot ml^{-1}$ as appropriate. Patients in Group S were asked to breath 8% sevoflurane in oxygen through a FOB intubation face mask. Then, standard FOB nasotracheal intubation was done. After tracheal intubation, SAP(pSAP), DAP(pDAP) and MAP(pMAP) were recorded. Minimal SpO_2 and time for FOB procedure, were also recorded. Chi or Fisher's exact test, Student's T and Mann Withney's U test were used as appropriate for statistical analysis. A p< 0,05 was considered significant.
Results and Discussion: One patient in Group S was excluded because of missing data. Both groups were similar. There were no differences in FOB time: 12,2(4,8) minutes for Group S and 11,1(3,7) for Group P. Haemodynamic measurements are shown in Table 1.

GROUP	SAP		MAP		DAP	
	Basal	Post	Basal	Post	Basal	Post
Group P(*)	144,5 (22,8)	123 (21,8)	97,1 (16,9)	82,4 (14,1)	69,7 (15,2)	81,6 (10,4)
Group S	139,4 (27,2)	125,7 (22,1)	94,9 (14,5)	91 (18,5)	77,4 (12,9)	70,2 (11,6)

[Data show mean(±SD) or median(range). p>0,05.]

There were a significant decrease in pressure measurements between basal and postintubation moments in Group P (p< 0.05), were not in Group S. Median(range) minim SpO_2 was: Group P, 91(86-94) vs. Group S, 98(86-100), p< 0.05.
Conclusion(s): In our study, propofol sedation produces more haemodynamic repercussion and SpO_2 decrease than inhalational sevoflurane sedation. In similar circumstances, we recommends sevoflurane inhalational sedation for FOB nasotracheal intubation.

19AP4-8

A meta-analysis and trial sequential analysis of the use versus avoidance of neuromuscular blocking agents for improving conditions during tracheal intubation with direct laryngoscopy in adults

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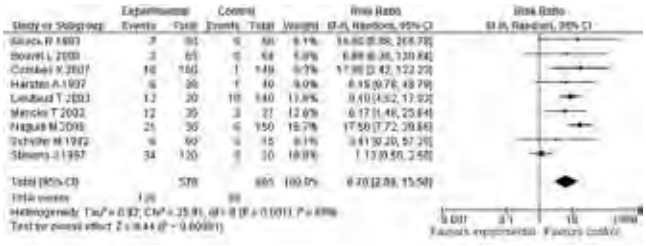
Background and Goal of Study: A large cohort study[1] has indicated that no use of neuromuscular blocking agents (NMBA) is a risk factor for difficult tracheal intubation (DTI). However, confounding by indication is a problem when observational studies are used to evaluate interventions. Our aim was to meta-analyse randomised clinical trials (RCT) evaluating the effect of using NMBA versus no use of NMBA on DTI for adults.
Materials and Methods: Medline was searched for RCT evaluating the use of NMBA versus no use of NMBA for improving conditions of tracheal intubation. Criteria for inclusion: patients aged >= 14 years planned for tracheal intubation by direct laryngoscopy. As there is no consensus for an intubation score, we used the definitions of DTI presented in the individual articles. A meta-analysis and trial sequential analysis[2] (TSA) was performed.
Results and Discussion: We included 9 RCTs with 1235 participants. No use of NMBA significantly increased the risk of a DTI (relative risk 6.70, 95 % confidence interval 2.89 - 15.5; P< 0.0001).



[Fig 1]

We performed TSA using a diversity-adjusted required information size of 2613 patients to detect or reject a 189% relative risk increase with a power of 95% and an overall type 1 error of 5%. The cumulative z-curve crossed the trial sequential monitoring boundary for harm. This demonstrate firm evidence for even the lowest possible harmful effect in the traditional meta-analysis of avoiding NMBA compared to using NMBA on the proportion of DTI even when the significance level is adjusted for repetitive testing and sparse data in a cumulative meta-analysis. Our results are preliminary, as we have not yet performed a full-scale literature search in all electronic databases and the risk of bias in the included trials has yet to be assessed. Further, the definitions of DTI varied substantially among trials contributing to both clinical and statistical heterogeneity in the analysis.
Conclusion(s): Despite the strong association between avoidance of NMBA and DTI found in this meta-analysis, an exhaustive literature search and a bias evaluation is needed.
References:
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19AP4-9

The optimal effect-site concentration of sufentanil for laryngeal mask insertion during induction with target-controlled propofol infusion at 4.0 μg/mL

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Background and Goal of Study: Target-controlled infusion (TCI) is a significant step forward in the administration of drugs and has been successfully implemented in clinical practice. The aim of our study is to determine the optimal effect-site concentration (C_e) of sufentanil for satisfactory insertion of laryngeal mask airway (LMA) when administered with a target-controlled infusion (TCI) of propofol at 4.0 μg/mL
Materials and Methods: After approval of the local ethics and research committee, 23 adult patients scheduled for minor elective surgery, were prospectively enrolled in this study. All patients received induction with a combination of propofol and Sufentanil TCI. The TCI of Sufentanil was started at a target C_e of 0.1 ng/ml. After equilibrium, the TCI of propofol was initiated, targeting a preset C_e of 4.0 μg/mL. After loss of consciousness LMA was inserted and assessed by an experienced anesthesiologist. The C_e of Sufentanil for next patient was guided by a modified Dixon's up-and-down method using 0.05 ng/mL as a step size. The C_e of Sufentanil required for successful LMA insertion in 50% of adults (EC50) was determined by calculating the midpoint concentration of all independent pairs of patients after at least 6 crossover Points.
Results and Discussion: The optimal effect-site concentration (EC50) of sufentanil for LMA insertion during propofol induction using target C_e of 4 μg/mL was 0.16 ng/mL (95% CI= 0.12 to 0.20). There was a significant reduction in propofol induced pain score in patients with successful LMA insertion compared with failed insertion P = 0.0275. There were no significant differences in both HR and MAP values among baseline values, at LMA insertion, or one minute after insertion. The possible explanation is that Sufentanil TCI provides stable analgesia and better hemodynamic control.

Conclusion(s): Effect-site concentration of sufentanil required for successful LMA insertion in 50% of patients (EC50) using propofol target C_e of 4 μg/mL was 0.16 *n*g/mL (95% CI= 0.12 to 0.20) and associated with significant reduction in the propofol induced pain and hemodynamic stability.

References:

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19AP4-10

Severe hypoxia, unconsciousness and very low BIS due to muscle rigidity during attempted tracheal intubation using only Remi

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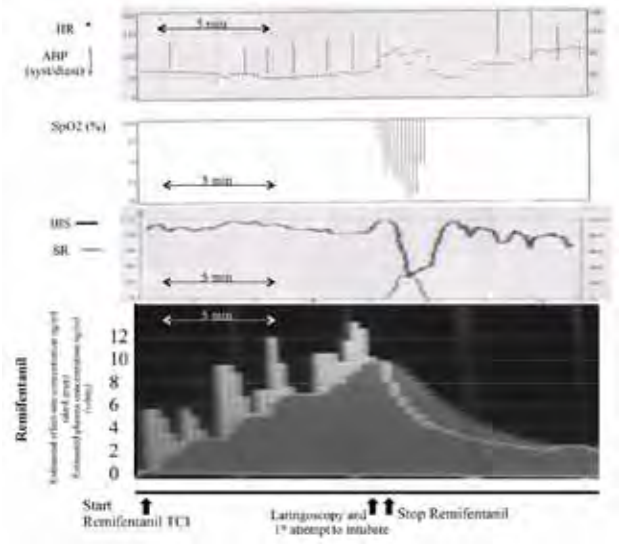
Background: Remifentanil (Remi) can be used for intubation in conscious patients[1,2]. High doses are required, implying side effects like rigidity, highest with Remi[3]. We report a case where Remi used to allow laringoscopy, resulted in rigidity, hypoxia and unconsciousness and discuss the safety of this technique.

Case Report: A 39 yo male suffered facial trauma, arm fracture and brain concussion from a fall. On day 3 he was scheduled for facial and arm surgery.GCS 15 and fully cooperative. A difficult airway was anticipated (facial trauma).We planned Remi by TCI (effect site target) to videolaringoscopy assessment. After 100%O2,Remi was started and the Ce (effect site conc) was increased while the videolaringoscope was inserted.Six Ce increments over 11 min, brought Remi Ce 3 to 10 ng/ml (t 323ug: 0,4ug/kg/min).At 7,5ng/ml the vocal cords were visualized (grade I).Patient was cooperative but Remi Ce was increased to 10 before attempting tube insertion.The vocal cords closed,breathing stopped,SpO2 dropped and he became unconscious.SpO2 was < 85 during 2 min (minimum 44).BIS fell from 85-25 during 2,5 min with burst suppression 30%.Remi was stopped.Manual ventilation became efficient only after 2 min.It took 3 min for Remi Ce to drop < 6ng/ml at which point SpO2 rose.He regained consciousnes and BIS>90. Remi Ce was set at 2,5, propofol and rocuronium were given and tracheal intubation performed. Surgery and the post-op were uneventful with no neurological impairment.



[Fig 1]

Discussion: Remi is very useful for airway assessment or intubation. TCI may allow objective assessment of safety levels. 7,5ng/ml may be the upper limit for safe Ce.Stop Remi may be as effective as naloxone in case of rigidity.

References:

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Learning points: TCI may allow better usage of Remi when high doses are anticipated; estimated Ce 10ng/ml is likely to result in muscle rigidity. BIS is capable of detecting cerebral hypoxia.

19AP4-11

TCI-propofol induced sleep endoscopy for evaluation of upper airway in patients with obstructive sleep-apnea-hypopnea syndrome: is oxygen necessary?

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Background and Goal of Study: Drug-induced sleep endoscopy (DISE) allows inspection of upper airway for accurately localize the anatomical region that collapses in obstructive sleep-apnea-hypopnea syndrome (OSAHS). The sedation technique adopted in most centres throughout Europe is the target controlled infusion (TCI) of propofol without oxygen supply. We have started to perform DISE in our centre. The goal of this paper is compare the advantages of use supplemental oxygen during this procedure.

Materials and Methods: We enrolled 34 OSAHS patients for DISE examination with a protocol. The endoscopies were carried out by the same otorhinolaryngologist and only 3 different anaesthetists. The patients were in a supine position. The clinical assessment included heart rate, non-invasive blood pressure (NIBP), oxygen saturation (SpO2) and electrocardiography monitoring. The subjects were randomly allocated to two groups: the TCI group (T0) and the TCI-supplemental oxygen group (T1). We provide oxygen via nasal cannula with two litres per minute which we connected after monitoring. The following variables were observed: plasma and effective concentration of propofol, total propofol consumption, minimal SpO2 achieved, hemodynamic perturbations, electrocardiogram changes and ventilatory assistance.

Results and Discussion: 30 patients (88%) were male and 4 (12%) female. The mean age was 49.26 ± 12.27 (range 17-69) years old and body mass index 28.18 ± 6 (range 18.8-35.1) kg/m^2. In both groups the mean plasma concentration of the drug when they started to snore was similar (T0=3.85 mcg·mL^{-1} vs. T1=3.83 mcg·mL^{-1}) and the effective concentration was the same, 2.8mcg/mL. The total propofol consumption was less in T1 (247.7 vs. 212.8 mg). The mean minimal SpO2 was 76% (lowest 57%) in T0 and 87% in T1 (lowest 72%). Nor side effects were registered and 8 patients (1 in T1) required mandibular advancement.

Conclusion(s): Our results suggest that sedation technique for DISE may enhance with a nasal cannula with 2L·min^{-1} of oxygen. The use of oxygen is advantageous because it allows the observation of apnoea events with lower oxygen desaturation. Thereby it is a safe technique for all patients, regardless of their physical condition. In both groups, the TCI system based on pharmacokinetic principles allows achieved precise concentration for the required clinical effect in each patient with similar total propofol consumption.

19AP5-1

An alternative management of the airway and prone positioning for the morbidly obese patient

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Background: We describe the Awake Fibreoptic Tracheal Intubation of a morbidly obese patient to facilitate assisted self prone positioning for emergency lumbar discectomy for Cauda Equina syndrome.

Case report: A 28 year old woman BMI 62, weighing 180kg, presented as an emergency following a 36 hour history of urinary retention with overflow incontinence, and saddle anaesthesia. After consent peripheral intravenous access was obtained. A remifentanil infusion was started to provide anxiolysis and facilitate intubation. A radial arterial line was inserted and the airway anaesthetised with 5% lidocaine and 0.5% phenylephrine spray and further with 4% lidocaine gargle. A split oral airway was introduced and 2% lidocaine was further applied to the trachea. Oral intubation with size 8.0 armoured cuffed endotracheal tube was acheived. Capnography was confirmed but the cuff was not inflated at this time. Remifentanil was stopped to aid positioning. The patient then self transferred on to the Jackson table with an elevated bolster for the upper thorax, and lateral bolsters to support the pelvis and thighs. Optimum position was acheived by through joint effort between patient and theatre team. It was checked that there had been no deterioration in neurology. Patient comfort and the absence of excessive pressure was confirmed prior to induction of anaesthesia, which was carried out with an intravenous bolus of Propofol.

Discussion: With the prevalence of morbid obesity increasing these patients are encountered more frequently than ever before. Case series have been published in which patients with unstable spines have undergone awake intubation for optimal positioning, but none of these were morbidly obese.

Prone positioning has implications for the theatre team as well as the patient. Inadequate positioning and padding of vulnerable areas may result in nerve injuries and pressure necrosis. Suboptimal positioning can lead to compression of the inferior vena cava and subsequent haemodynamic compromise, increased bleeding and venous stasis. The capacity of the table is also an important consideration.

References:

Brodsky JB et al: *J Clin Anaes* 13:138-40; Telefeian A et al: *J Neurosurg(Spine 1)* 97:20-4 ; Malcharek MJ et al: *J Neurosurg Anesthesiol* 24:217-221.

Learning points: Awake intubation allowed for safe transfer and optimal positioning of a morbidly obese patient. It should be considered when encountering these patients to protect both patients and theatre staff.

19AP5-2

From an easy airway to an unanticipated difficult airway to an anticipated difficult airway: a changing airway and its changing management

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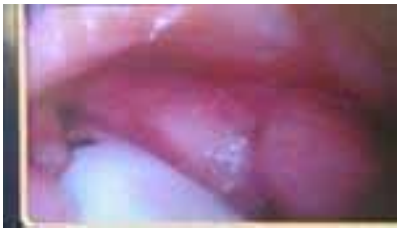
Background: The incidences of difficult laryngoscopy, difficult intubation, and difficult mask ventilation (DMV) are not well defined but are estimated to occur in 1.5%-13%, 1.2%-3.8, and 0.01%-0.5% of patients, respectively(1). Once a difficult airway as been identified it is paramount that a strategy is implemented to deal with and avoid previous problems(2). We describe the changing airway management of a patient over a ten year period.

Case report: A 77 year old man presented for surgery and his third general anesthetic (GA) in 2012. The first GA in 2002 was uneventful with a grade 2 laryngoscopy. The second GA in 2005 posed significant problems with DMV and difficult ventilation via laryngeal mask airways sizes 4 and 5. The airway was subsequently secured with a endotracheal tube using a fibreoptic scope and Aintree catheter. It was noted that the patient had large hyperplastic mucosal folds which were the presumed cause of difficulty in airway management. It was decided that the best strategy was to perform an awake fibre optic intubation. A combination of remifentanil sedation and topical anesthesia was used to establish optimal intubation conditions. A size 6.5mm nasal cuffed endotracheal tube was used to secure the airway. It was noted that the patient did indeed have marked hyperplastic mucosal folds in the supraglottic area resulting in partial airway obstruction (fig1) and a grade 3 laryngoscopy.



[figure showing large mucosal folds]

Discussion: The change in the patients airway management indicates that the patients airway anatomy had changed. It is interesting to note that the patients weight increased from 74kg to 82kg over ten years this with the natural loss of soft tissue elasticity associated with ageing may account for the difficulties in subsequent airway management. This case demonstrates the need for vigilance and planning and dispels the assumption made by some that previously uneventful management predicts uneventful airway management in the future.

References:

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2. Henderson JJ, Popat MT, Latto IP et al. Anaesthesia. 2004 Nov;59(11):1152.

Learning points: The anatomy of an individuals airway can change.

19AP5-3

Unexpected trismus and airway management

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Background: The difficulty in airway management is the major challenge for anaesthesiologists. Nowadays, there are well-studied and helpful algorithms for this kind of urgent/emergent situations[1,2]. The previous and careful airway evaluation is the best way to prevent potential problems. However, if the patient doesn't collaborate in the evaluation, the anaesthesiologist will manage a potential unpredictable airway condition.

Case report: Male, 60 years, ASA II, proposed for urgent explorative laparotomy for intestinal occlusion. Personal history of oligophrenia, institutionalized for years. The patient didn't collaborate in the clinical interview nor in the airway evaluation. It was possible to observe the deteriorated dentition, maintained cervical mobility, TMD>6,5cm. It wasn't possible to evaluate mouth opening or Mallampati classification. The standard ASA monitoring was used complimented by BIS, TOF and diuresis.

Anaesthetic induction: 2μg/Kg fentanyl iv, propofol 2mg/kg, succinylcholine 1.5 mg/kg iv (rapid sequence induction planned). The orotracheal intubation was attempted, but not achieved because of the trismus. Facial mask ventilation was possible. Then, blind nasal intubation was attempted but, also, not achieved by esophageal intubation. The decision was to keep this tube placed in the right nostril, and nasotracheal intubation was attempted and successfully completed through the left nostril.

Maintenance: cisatracurium 0.1 mg/kg, remifentanil infusion (0.025 to 0.15 mg/kg/min), sevoflurane1.8%, FiO_2 42%.

There were no surgical complications during the procedure and the patient was extubated successfully; he remained in the the post anesthesia care unit for 4 hours and later discharged to ward.

Discussion: There are few reports published in the literature of intubation of patients who experienced trismus before or after anesthetic induction. A valid option for such situations will be intubation guided by broncoscopy[3, 4]. However, in a situation of adequate ventilation but unsuccessful intubation the experienced anesthesiologist can choose other solutions with equal success, as described.

References:

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3. Masui. 2012 Jan; 61(1):96-9.
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Learning points: the unexpected trismus after anesthetic induction is an unpredictable situation; we made a double blind nasal intubation to solve the problem, with success.

19AP5-4

Fiberoptic-guided exchange of a Laryngeal tube with an endotracheal tube: a comparison of two techniques in a simulation model

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Background and Goal of Study: Laryngeal tubes (LT) are often used as airway rescue devices. Among pre-hospital medical personnel, the success rates are high and significantly faster compared to an endotracheal tube (ETT). Therefore, LTs are increasingly used in the pre-hospital setting. The exchange of an LT may often be desirable. Two fiberoptic bronchoscope (FOB) facilitated techniques have been described to exchange a LT for an ETT: an endoluminal technique using an Aintree intubating catheter and an extraluminal technique using a nasal route alongside the LT.In this randomized crossover mannequin study we compared both techniques. The primary outcome was time to achieve an effective airway through an ETT. We hypothesized that the endoluminal technique would be significantly faster.

Materials and Methods: The institutional IRB waived the need for formal consent. Thirty residents were recruited to the study. Each participant attempted both techniques in an intubation simulation model. The tube exchange time was recorded from picking up the FOB until confirmation of ventilation with the ETT.

Results and Discussion: Thirty residents participated with both techniques in a randomized crossover model. Four participants in each group had a failed attempt at intubation. Time to establishing an effective airway was significantly shorter with the intraluminal technique (68.3 ± 32.82 sec.) versus the extraluminal technique (110 ± 61.47 sec.) ($p=0.004$, paired-test). The exchange time of the LT for the endoluminal technique was significantly shorter. Genzwuerker

et al. reported the feasibility of this technique in 10 elective surgery patients with a 90% success rate. For the endoluminal technique it is however prudent to use a fiberoptic technique. Lutes et al. describe a blind approach using a gum elastic bougie and consider this technique a failure. The extraluminal technique has only been described in case reports. An advantage of the extraluminal technique may be easier continuous ventilation and oxygenation during the procedure.

Conclusion(s): Endo- and extraluminal exchange techniques can both be performed safely with similar success rates. However, the endoluminal technique is significantly faster.

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19AP5-5

Anatomic location of the vocal cords in relation to cervical vertebrae - a new predictor of difficult laryngoscopy?

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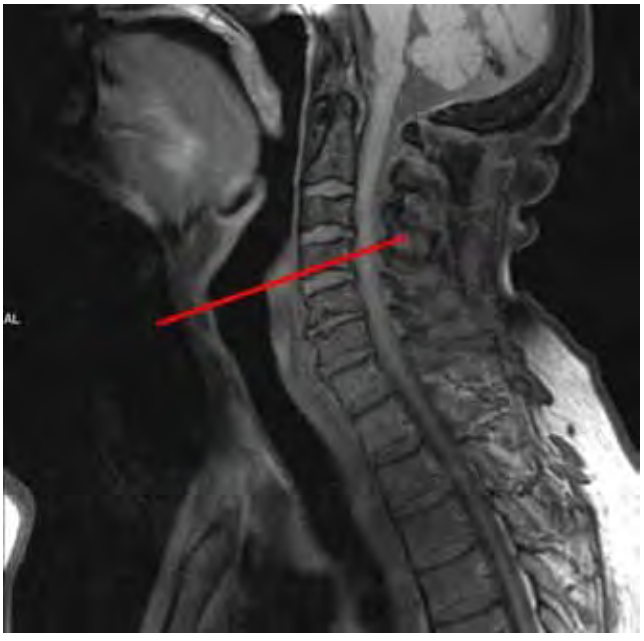
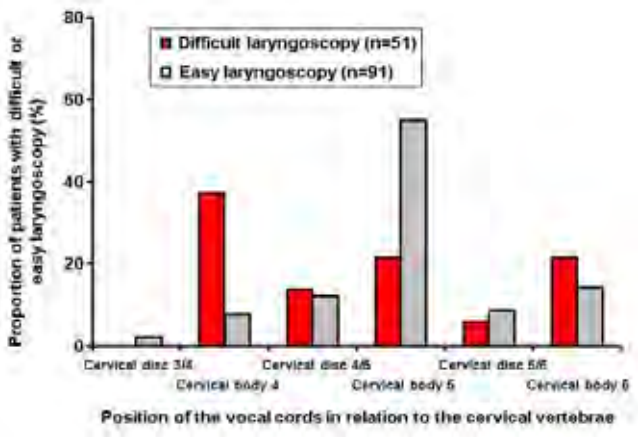
Background and Goal of Study: Several anatomical factors like micro- or rethrognathia, macroglossia, tempormandibular joint affections, and others are known to limit the view at laryngeal structures during direct laryngoscopy. In this study we investigated the hypothesis that the anatomic position of the vocal cords related to the cervical vertebrae may give a hint for possible difficult laryngoscopy.

Materials and Methods: After approval of the local Ethics Committee and written informed consent we included 142 patients undergoing neurosurgical procedures into the study. In all patients a magnetic resonance tomography of head and neck (Figure 1) had been performed as part of diagnostic evaluation of the underlying disease. Difficulty of laryngoscopy (without BURP[1]) has been rated according to the classification of Cormack-Lehane[2], whereby Cormack 1 and 2 were rated as easy and Cormack 3 and 4 as difficult laryngoscopies. Statistical analysis was done using Chi-square test, $p < 0.05$ was considered significant.

Results and Discussion: 142 patients between 19 and 82 years were enrolled in the study. Difficult laryngoscopy was more frequent in patients with cranial or caudal position of the vocal cord level (figure 2, $p < 0.01$)



[Figure 1]



[figure 2]

Conclusion(s): There is a correlation between difficult laryngoscopy and the anatomic position of the vocal cords related to the cervical vertebrae. Anesthesiologists should take advantage of exisiting imaging of the cervical spine when assessing the patient's airway.

References:

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19AP5-6

Acquired abnormalities of tracheal geometry creating difficulties in positioning of double lumen tube

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Background and Goal of Study: Employment of double lumen tube (DLT) is crucial for ensuring comfortable and secure conditions for most general thoracic operations.

Preoperative evaluation of the trachea and main bronchi diameters is recommended to determine suitable DLT size for easy and proper positioning. At the same time, impact of acquired abnormalities of tracheal geometry (widening of bifurcation, saber sheath and S-like tracheal deformations) on DLT positioning have not yet been discussed in the professional literature. Goal of our study is to determine the influence of acquired tracheal geometric abnormalities on DLT positioning.

Materials and Methods: Medical documents of 480 adult patients, who underwent general thoracic operations with employment of lung separation by DLT under fiberoptic bronchoscopy (FOB) control during the period 01. 2006 - 11. 2012, were retrospectively studied. Chest computed tomography scans of these patients were analyzed and compared with results of DLT positioning.

Results and Discussion: Out of 480 patients 336 were male and 144 female with mean age 58 ±14 years. Normal geometric parameters of trachea and its bifurcation were found in 449 (93.6%) patients. Abnormal acquired geometric parameters were revealed in 31 (6.4%): saber sheath deformation - in 7 patients (1.4%), S-like deformation - in 19 (3.9%) and widening of tracheal bifurcation in 5 (1%) patients. Good and easy positioning of DLT was performed in all patients with normal tracheal geometry. Difficult positioning of DLT happened in all 31 patients with abnormal tracheal geometry. Out of 31 patients proper positioning of DLT was reached only in 17 (54.8%) with assistance of FOB and using DLT of a smaller size. In the other 14 patients DLT was changed by endotracheal tube in combination with bronchial blocker (8 patients), or with high frequency jet ventilation (6 patients). There were no complications connected with DLT.

Conclusion(s): Acquired geometrical abnormalities of trachea must be considered as strong predictors of difficult positioning of DLT.

Part of such difficulties may be overcome with FOB assistance and using DLT of smaller size. When DLT positioning is not successful other existing methods of lung separation is possible to use with positive results.

19AP5-7

Use of the Difficult Airway Society (UK) guidelines in the management of tracheal extubation in an anticipated difficult airway following bilateral temporomandibular joint replacement

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Background: Management of a difficult airway at the induction of anaesthesia has guidelines for patient safety and are widely followed. However, despite the well documented risks, extubation guidelines are not frequently used. We report a case managed successfully based on the recently published UK Difficult Airway Society (DAS) guidelines for tracheal extubation[1].
Discussion: A 30 year old male with a 13 year history of severe Rheumatoid Arthritis presented with bilateral temporomandibular joint (TMJ) ankylosis, scheduled for bilateral TMJ replacement. Preoperative anaesthetic assessment confirmed evidence of a difficult airway: no mouth opening, a 30 degree fixed neck flexion and right neck torticollis. After sedation with a Remifentanil infusion titrated to effect and topical airway anaesthesia a nasal fibreoptic intubation was performed and the endotracheal tube position confirmed. Anaesthesia was induced with an intravenous bolus of Propofol and maintained with Desflurane in oxygen enriched air and a Remifentanil infusion.
Following bilateral temporomandibular joint replacement his mouth opening remained insufficient to insert a supraglottic airway device. In view of the potential difficulty in re-intubation, the prolonged procedure and potential for bleeding in the airway, tracheal extubation was planned in accordance with the DAS guidelines for high risk patients. A nasendoscopy was performed to preclude any evidence of airway oedema or bleeding. The difficult airway equipment was made available, the maxillofacial surgeons were present and the Desflurane eliminated to < 0.1 MAC. The patient was then extubated in theatre using a remifentanil infusion, an advanced extubation technique described in the guidance, once obeying commands.
The patient made an uncomplicated recovery after a brief stay in the high dependency unit.
References:
1. Difficult Airway Society Extubation Guidelines group, et al. Difficult Airway Society Guidelines for the management of tracheal extubation. Anaesthesia 2012 Mar; 67(3):318-40
Learning points: Importance of planning an appropriate extubation strategy in adults is highlighted by the recent publication of guidelines by the UK DAS. Their adoption into routine anaesthetic practice remains in its infancy. The adoption of these guidelines routinely for the management of tracheal extubation will allow practitioners to gain confidence in using the algorithms provided.

19AP5-8

Airway obstruction: a rare complication of shoulder arthroscopy

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Background: Arthroscopy is a technique with known advantages in the treatment of shoulder pathology, with reduced rehabilitation time and post-op analgesic requirements. It is associated with complications such as bleeding, infection, irrigation fluid leakage and injuries to nerves, blood vessels and cartilage from 1 to 5.3% of the cases, depending on the type of surgery.
However, this type of procedure is rarely associated with respiratory complications[1].
Case Report: We report the case of a 63 year-old woman, with a 32kg/cm^2 of BMI, ASA II, with a history of hypertension and obesity, electively proposed for the repair of the rotator cuff tear by arthroscopy.
The patient was pre-treated with 2mg of midazolam and monitored according to ASA standards. We performed a balanced anesthesia with fentanyl (3μ/kg), propofol (2mg/kg) and vecuronium (0.1mg/kg) as induction. The sevoflurane-anesthesia was maintained with a mixture of oxygen and air. The patient remained clinically stable and the surgery lasted for 3 hours. By the end of the surgery, an exuberant edema was noted by irrigation fluid infiltration, reaching the shoulder, chest and neck on the operated side. The suspicion of having additional airway commitment was confirmed by checking the absence of leakage when the oro-tracheal tube cuff was deflated.
It was decided to keep the patient anesthetized, having been transported, with head elevation, to the Post Anesthetic Care Unit, under mechanical ventilation. The patient was extubated 4 hours and 30 minutes after the end of surgery and discharged by the 6th postoperative hour, with no complaints or signs of respiratory distress, with partial regression of the neck and chest edema. There were no other complications during hospitalization.
Discussion: The extra-articular extravasation of arthroscopy irrigation fluid is a known complication of such procedures, although usually without clinical significance and spontaneous regression within 12 hours[2]. Among the risk factors which contribute to this event there is obesity, longer duration of surgery and sub-acromial space arthroscopy [3].
References:
1. Anesthesiology2003; 99:1456-8;
2. Orthopedics2009 Oct;32;
3. Anesthesiology2003; 99:1455-6
Learning points: With the description of this case, the authors aim to alert to the possibility of impaired airway edema by extravasation of arthroscopic irrigation fluid into the chest and neck, a rare complication of shoulder arthroscopy.

19AP5-9

Recommendations for rapid sequence induction in Europe - how standardized is the standard of care?

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Background: When inducing general anaesthesia in non-fasting patients, protective reflexes of the airways are lost and render the patient in a risk of aspiration. This has to be prevented, as gastric acid can severely damage lung tissue, lead to oxygenation disturbances and even cause an acute respiratory distress syndrome, known after the first describer as Mendelsohn's syndrome. To prevent gastric aspiration in non-fasting patients or patients at very high risk, a special technique for induction of general anaesthesia and direct endotracheal intubation, the so-called Rapid Sequence Induction (RSI), is used. However, this procedure is not standardized and may be performed in different ways and with different kinds of drugs. Our aim was to evaluate the actual recommendations for RSI in Europe.
Methods: In summer 2011, a standardized questionnaire was sent to the european national anaesthesia societies by postal mail. If no reply was received, the questionnaire was sent another time and the societies were contacted by e-mail up to three times. It was evaluated whether the societies publish national guidelines on RSI, whether they recommend guidelines published by another society, whether they recommend other guidelines (e.g. a scientific publication), and in which year the last update was published. Descriptive statistics were used for interpretation of the data.
Results: Of 35 contacted societies, a completed questionnaire was received from 25 countries (resulting in a reply rate of 71.4%). From 10 societies, no reply was received after two postal and three e-mail contacts.
Three of 25 societies (12%) had published their own guidelines on RSI at the time of the survey; one society (4%) had published a national guideline on RSI in children. Six societies (24%) stated that they recommend guidelines of other societies. However, five of them only recommended the guideline from the "difficult airway society", which is strictly not about RSI. The four societies (16%) that recommended other guidelines also recommended the "difficult airway society" in three cases and a scientific paper about muscle relaxants in one case. The most recent published guidelines date from 2004. Experts or subcommittees for airway management only exist in 3 of the 25 (12%) societies replying to out questions.
Conclusion: National guidelines on RSI exist only in few European countries. Thus, this "standardized" procedure may be performed totally different in European countries.

19AP5-10

Sheared plastic coating of the stylet: a rare but potentially serious complication of endotracheal intubation

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Background: Intubating stylets are frequently plastic coated to prevent injury from sharp ends and to facilitate their removal after intubation. However, the plastic coating may produce problems of its own (1). We report an experience in which the plastic sheath of the stylet sheared during its removal from a 4 mm endotracheal tube.
Case report: A 13 kg and 3 year child underwent adenoidectomy under general anesthesia. Following induction of the anaesthesia and adequate neuromuscular relaxation, laryngoscopy and intubation were attempted by a senior anaesthetist. The trachea was intubated with an endotracheal tube size 4.0 mm with the aid of a plastic coated stylet. Immediately after intubation, attend-

ing anaesthetist noticed that a broken piece of stylet had been left inside the lumen of the endotracheal tube. A 15 cm sheared plastic sheath was visible within it. The styletted endotracheal tube was therefore taken out and the patient reintubated using a new endotracheal tube.
Discussion: Shearing off the plastic coating of the stylet has been reported in the past with various sizes of endotracheal tubes. Literature reviews found several case reports with 2.5 mm and 3 mm endotracheal tubes and one case report with 6 mm double lumen tube. These plastic pieces may obstruct the endotracheal tube or forced into the airways during positive-pressure ventilation and act as foreign bodies in the airways (2).
References:
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Learning points: Shearing off the plastic coating of the stylet is a rare but serious complication of endotracheal intubation. Therefore, a loose fit should be assured and the risk of shearing must be kept in mind when styles with plastic coatings are used. The attending anaesthetist should immediately examine the stylet to note if any portion of it has been damaged, broken or shorn off into the endotracheal tube or tracheobronchial tree before ventilation, particularly when removal has been difficult.

19AP5-11

Always expect the unexpectable: isolated acute glottic edema

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Background: Acute glottic edema is a rare condition, when not associated with an infectious disease or other clinical symptoms of anaphylaxis. It also stands as a complication of prolonged orotracheal intubation. We present a case of acute glottic edema after extubation, in a patient submitted to elective surgery.
Case report: A 67 year old woman with a history of hypertension treated with angiotensin receptor antagonist, asthma and contact dermatitis sensitive to metals, povidone-iodine and adhesives, underwent surgical debridement of a chronic osteomyelitis. General anesthesia was induced with midazolam, droperidol, fentanyl, propofol and atracurium and mantained with desflurane, fentanyl, and an atracurium infusion. The intubation was performed in the first attempt (Cormack-Lehane I). Ciprofloxacin, paracetamol, morphine were given intraoperatively and decurarization was performed with atropine and neostigmine.
After extubation, she became severely hypoxemic ($SatO_2$:12%) and assisted ventilation was attempted, unsuccessfully. There were no other symptoms. The patient was re-intubated and laryngoscopy showed glottic edema. The anaphylaxis protocol was started and the patient remained intubated for 2 hours, after which uneventful extubation was possible. She was referred to immunoallergology consultation. Tests for basophils activation were positive for rocuronium and atracurium and skin tests were positive for atracurium and vecuronium. All tests were negative for suxamethonium.
Discussion: Muscle relaxants account for 69,2% of anaphylactic reactions during an anesthetic, with female predominance. There are no particular risk factors, such as atopy and allergies. Common presentation includes cardiovascular collapse, cutaneous signs and bronchospasm.[(1)] This case had an unusual presentation since there were no hemodynamic or cutaneous signs and did not even fit the definition of an anaphylactic reaction. Immunoallergologic investigation is essential to identify causative agents, and in the case of muscle relaxants (in which cross-reactivity is frequent) cross-sensitivity investigation will identify the safety of drugs that can be used in future anaesthesia.
References:
1. Hepner DL, Castells MC; Anaphylaxis during the perioperative period. Anesth. Analg. 2003;97:1381-95
Learning point: Unusual presentation of allergic reactions are real and we should be prepare to face them.

19AP6-1

Learning from NAP 4: multidisciplinary simulation training in airway emergencies

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Background and Goal of Study: The 4th National Audit Project of the Royal College of Anaesthetists (NAP4)[1] highlighted poor judgement, lack of skills, confidence and equipment as contributory to adverse airway events. Areas of particular concern include difficult airway planning, emergency cricothyroidotomy performance and tracheostomy complications on the intensive care unit (ICU). We present the findings of multidisciplinary training where the objectives, in accordance with NAP4 recommendations, were to improve knowledge, confidence and skills in staff that may be involved with airway emergencies.
Materials and Methods: The session content included presentation of NAP 4 data, Difficult Airway Society (DAS) guidelines and displaced or blocked tracheostomy algorithms. This was followed by workshops on fibreoptic intubation, videolaryngoscopes, the intubating LMA and emergency cricothyroidotomy. Participants then took part in simulated scenarios based around failed intubation, failed ventilation and tracheostomy complications. Facilitated feedback followed each scenario. Pre and post session questionnaires were completed by all participants.
Results and Discussion: Attendees comprised of 8 anaesthetists, 15 operating department practitioners (ODPs) and 6 ICU nurses. All anaesthetists were aware of NAP4 findings in contrast to only 10% of ODPs and ICU nurses. 88% of anaesthetists, and all ODPs and ICU nurses lacked confidence in managing tracheostomy complications before the session.
Post session ratings are presented as mean scores (SD) out of five. The course was globally rated as relevant 4.5 (0.63) and realistic 4.3 (0.66) and all participants enjoyed the training. The workshops were viewed as extremely useful 4.5 (0.68). 88% of anaesthetists, 60% of ODPs and 67% of ICU nurses felt more confident in managing a 'can't intubate, can't ventilate' scenario as a result of the training. All ICU nurses, 88% of anaesthetists and 60% of ODPs felt more confident at managing tracheostomy complications. All participants felt more confident in using difficult airway equipment. All agreed that such sessions should be carried out at least twice a year.
Conclusion(s): Multidisciplinary airway training is beneficial for all, allowing participants to develop more confidence, and build on technical and non-technical skills required to manage airway emergencies.
References:
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19AP6-2

Complications of percutaneous dilational tracheostomy depending on executor's experience. Who should perform it?

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Background and Goal of Study: Percutaneous dilational tracheostomy (PDT) is part of the daily management of critical patient's airway in the Intensive Care Units. This technique has widely demonstrated to be as safe as surgical tracheostomy.
The aim of this study was to show which are the complications in our center and their relationship with the physicians experience.
Materials and Methods: 100 PDTs by one-step dilation technique were performed in critically ill patients by doctors divided into 4 groups according to their experience: 1) supervised residents with < 6 PDT; 2) 6-30 PDT; 3) 31-150 PDT and 4) > 150 PDT.
The cervical anatomical difficulty was classified into 5 groups from 1 to 5, from low to high difficulty. We also recorded the major and minor complications and the time taken to carry it out. Descriptive statistical analysis and Mantel-Haenszel Chi-Square test were performed.
Results and Discussion: PDTs were performed in 12.69min (range 3-30).
The average cervical anatomical difficulty was of 2.55 (range 1-5). The easiest neck (1.75) were executed by 6-30 PDT experienced group (EG) and the most difficult ones (3.26) by EG >150 PDT.
Minor complications went up to 83%. No statistically significant differences were found with the executor experience, nor the duration, nor the neck anatomical difficulty.
Major complications was related to the most difficult necks (p 0.005) and they increased the duration of the technique (p 0.003).

	TIME PT (min)	DIFFICULTY (1-5)	>COMPLICATIONS (%)	<COMPLICATIONS (%)
< 6PT EG	12.54	2.52	21	16
6 - 30PT EG	15.75	1.75	17	66
31 - 150PT EG	21.67	2.3	0	0
> 150PT EG	10.38	3.26	27	46
TOTAL	12.69	2.55	21	83

[PT:percutaneous tracheostomy. EG:experienced group]

Conclusion(s): In our unit, less experienced physicians are more likely to suffer complications despite choosing the easier necks. The expert staff is the fastest in performing PDT and they carry out the more difficult ones.
Minor complications are innate to the technique. Major complications are related to cervical anatomical difficulty.
Therefore, it is recommended the need for skilled personnel in these units to carry out this technique.

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19AP6-3

Airway management in anesthetized small children using the pediatric i-gel and classic laryngeal mask airway

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Background and Goal of Study: The I-gel consisting a soft, gel-like transparent thermoplastic elastomer is recently used for pediatric patients, however, the I-gel has been reported to be prone to sliding out. We investigated whether I-gel are safely used in small children undergoing general anesthesia, compared with classic laryngeal mask airway(cLMA).
Materials and Methods: Sixty three children (aged 4-72months) undergoing excison of polydactyly uder general anesthesia were included. The size of device was chosen according to the manufacturer's recommendations (size 1-2.5). We evaluated oropharyngeal leak pressure, first-attempt sucess rate, peak inspiratory airway pressure, and adverse events including sliding out.
Results and Discussion: Demographic data did not differ between groups (I-gel, n=31 vs. cLMa, n=32) The leak pressure of the I-gel was not significantly different from that of the cLMA (24±6 vs. 26±5 cmH_2O, p=0.089). Peak inspiratory pressures and lung compliance were not different between groups(p=0.750 and p=0.760, respectively). First-attempt sucess rate was 77% for the i-gel and 84% for the cLMA(p=0.536). The case of sliding out was 8 of the total inserted I-gels (27%), and 5 of the 8 sliding out I-gels were changed to the alternative device. However, only one failed insertion occurred and changed to endotracheal intubation in the cLMA group. There were no differences of other side effects(cough and blood-tinged) between the I-gel and the cLMA (p=0.747 and p=0.485, respectively).
Conclusion(s): The I-gel may be suitable for pediatric patients under general anesthesia, as a surrogate of cLMA. However, the I-gel may be prone to slide out because of the more straight and rigid design against the oropharynx of small children. Therefore, it should be secured by tape to avoid loss of airway.

References:

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19AP6-4

Removal of LMA in deeply anaesthetised versus awake children

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Background: There are differing recommendations concerning the removal of LMA (laryngeal mask airway) in children. The aim of this study was to establish the prevailing practice at Birmingham Children's Hospital and correlate with the incidence and severity of laryngospasm.
Methods: Data was prospectively collected from 153, ASA 1-3 patients, 2 months-15 yrs, undergoing elective, non-airway surgery over 4 week period.
Results: LMA was removed 'awake' in 84 (55%) and 'deep' in 69(45%) patients. 6(3.9%) children had mild laryngospasm, 2 of which resolved with CPAP by recovery staff and 4 required anaesthetists' involvement. No patient needed any drugs (except oxygen) or intubation for treatment. The incidence of laryngospasm was 4.76 %(4) in 'awake' group, out of which 3.5 %(3) were under the age of 6 years. 2 (2.89%) children had laryngospasm in 'deep' group and were under 6 years. None of the patient who developed laryngospasm had history of recent upper respiratory infection.
Conclusion: Our study presents current practice in removal of LMA at a premiere Children's Hospital in the West-Midlands. Younger children (1-6 yr) were highest to develop laryngospasm regardless of the method of removal of LMA. The incidence of laryngospasm was less in children who had LMA removed 'deep' when airway reflexes were still depressed.

19AP6-5

Measuring neck circumference in the obese population: quantifying a cut-off value for difficult mask ventilation in high-risk patients

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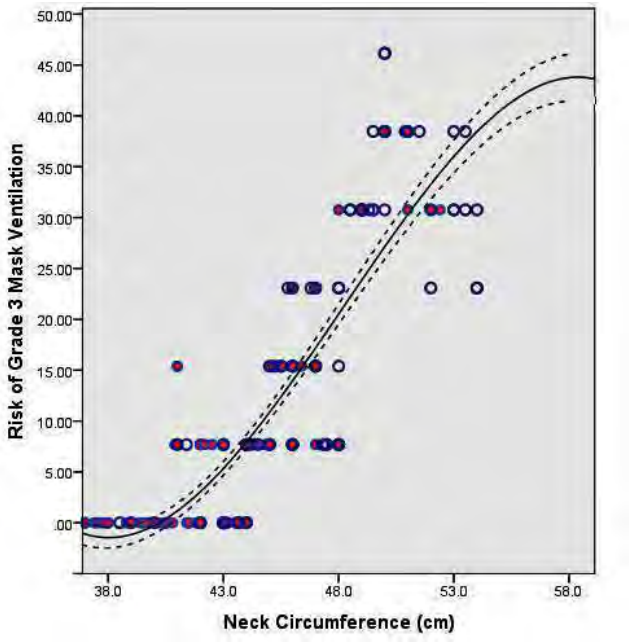
Background/Goal of Study: Ability to ventilate is paramount in airway management and limited work has specifically investigated predictors of difficult mask ventilation (DMV) [1, 2]. We aimed to quantify the neck circumference (NC) above which DMV is more likely.
Materials/Methods: This was a prospective, non-blinded study among the obese population undergoing bariatric surgery between May 2011 and August 2012 at NYU Langone Medical Center, excluding revisions of previous bariatric surgery. Principle variables were NC, BMI and grade of mask ventilation (MV) (Han et al. 2004, [3]); others: age, muscle relaxant, facial hair, TMD, SMD, provider level. Data analysis: SPSS v20.
Results/Discussion: The study group was n=294 (93 men; 201 women) reflecting a gender skew of bariatric patients at our institution, average age 40.4 yrs. We found 28 cases (5 female, 23 male) of grade 3 MV (*ventilation (inadequate, unstable, or requiring two providers)* +/- *relaxant*) [2], no cases of grade 4 MV. Among women, NC and BMI were significant predictors of grade 3 MV (p= 0.008 and p= 0.036 respectively).
Among men, BMI was a significant predictor of grade 3 MV (p= 0.022). In a binary analysis comparing risk of grade 3 MV to NC (figure 1), increasing % risk of grade 3 MV to NC is plotted along with a fitted curve (R^2 =0.766; mean from cubic fit=solid line; 95% CI of mean=dashed lines, men=blue open circle, women= red-filled circle). Above a NC of 44cm there is ~10% risk of grade 3 MV, while above a NC of 50cm risk increases to ~30%.



[Figure 1. Percentage risk of grade 3 DMV]

Conclusion: We show an increasing risk of DMV above a neck circumference of ~44cm and suggest measuring NC as part of airway assessment. In obese women NC was a significant independent risk for DMV. Study deficits: insufficient numbers of men and a small study population.
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2. Kheterpal, S., et al., *Prediction and outcomes of impossible mask ventilation: a review of 50,000 anesthetics.* Anesthesiology, 2009. **110**(4): 891-897.
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19AP6-6

The effect of systematic use of an objective airway score vs. standard clinical airway assessment on the incidence of unanticipated difficult airway management. Design and rationale-The prediction of DIFFICult AIRway management trial: The DIFFICAIR Trial - a cluster-randomized trial on 70000 patients

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Background and Aim: Pre-operative airway assessment (AA) registered in the Danish Anaesthesia Database (DAD) is based on a non-specific clinical assessment. Systematic, evidence-based and consistent AA may reduce the incidence of unanticipated difficult airway management (AM). Examination of multiple predictors for difficult airway increases the predictive value of the AA. The Simplified Airway Risk Index (SARI) is a multivariate risk score for prediction of difficult tracheal intubation (DTI). The aim of the study is to compare AA using the SARI with a non-specific clinical AA on prediction of DTI and to identify predictors of difficult mask ventilation (DMV) in order to design a risk score for DMV.
Material and methods: We cluster-randomised[1] 28 Danish departments of anaesthesia to AA either by the SARI (intervention) or by usual non-specific AA (controls). Data from patients' pre-operative AA is recorded in the DAD. Objective scores for intubation and mask ventilation grade the severity of AM. The accuracy of the prediction of DTI and DMV is measured for each group.
Primary outcome measures: The fraction of unanticipated DTI and -easy intubation.
Sample Size: The fraction of unanticipated DTI in Denmark is 1.87%. With a stratified randomization, type 1 error risk of 5% and a power of 80%, 30 departments are required to detect or reject a 30% relative risk reduction equaling a NNT of 200.
Sample size estimation is adjusted for the study design and based on standards for randomization on cluster-level[2]. With an average cluster size of 2500 intubated patients, 70000 patients will be enrolled over a 1-year trial period.
DAD is programmed so that registration of the SARI and predictors of DMV is mandatory for the intervention group but invisible to controls.
Investigators are appointed on all departments. A tutorial film, printed material for physicians in the intervention group and repeated teaching of AA and DAD registration strives for high and uniform registration standards.
Discussion: It is innovative to use a national clinical database as the basis for a randomized clinical trial. The method can serve as a precedent for implementation of evidence-based recommendations and database registration.
Conclusion: The study will contribute to the understanding on how to predict and reduce unanticipated DTI and DMV and how to produce evidence-based recommendations for airway assessment and clinical database development.
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19AP6-7

A cohort evaluation of the Truview PCD in children endotracheal intubation

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Background and Goal of Study: The Truview PCD is an evolution of Truview EVO2 that presents some advantages. It is lighter and incorporates a monitor that improves glottic view.
The goal of this prospective audit was to evaluate the utility of Truview PCD for endotracheal intubation in clinical practice and generate data for future trials.
Materials and Methods: After obtaining approval of the Ethical Committee of Hospital Universitari Joan XXIII (Tarragona, Spain) and informed consent of the parents we studied eighty-three children, ASA I-III, newborn to 16 years of age, undergoing ENT or pediatric surgical procedures under general anesthesia with endotracheal intubation. Children with two or more difficult airway criteria were excluded. We assessed demographic data, attempts of intubation, time to obtain the best possible glottic view, Cormack and Lehane score, time to intubation, easiness of getting glottic vision and intubation with Likert scale and complications. We carried out descriptive statistics.
Results and Discussion: Eighty-three pediatric patients were successfully intubated with Truview and OptiShape stylet. Demographic data: age 4,96 ± 2,84 years-old, weight 19,58±7,75 kg, height 108,80±18,83 cm, gender 60 males and 33 females. Seventy-nine children required one attempt to intubation and four two attempts. Time to glottic view and endotracheal intubation was 10,84 ± 5,66 and 33,40 ± 12,01 seconds, respectively. Eighty-two patients were classified as easy or very easy to intubate, only one case was considered difficult. Ten cases needed maneuvers to facilitate tracheal intubation. In 8 cases we had the impression of requiring an intermediate laryngoscope blade between sizes 1 and 2. One case showed blood on blade after laryngoscopy, another one showed a small lip wound, no other complications were found. Our intubation time was similar to other videolaryngoscopes time.
Conclusion(s): Truview PCD is a good device for managing normal airway in children. Intubation time is similar to other videolaryngoscopes. Good glottic vision is easily obtained but short-term training is required for adequate tracheal intubation as happens with other non-channelled videolaryngoscopes. It could be useful to get another laryngoscope blade between sizes1 and 2.
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19AP6-8

Neck circumference to thyromental distance ratio: evaluation of a new predictive tool of difficult intubation in obeses patients submitted to bariatric surgery

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Background and Goal of Study: Difficult tracheal intubation (DI) is a cause of significant morbidity and mortality associated with anaesthesia and is often related to obesity (1). A pre-anaesthetic evaluation and diagnostic of a possible difficult airway contributes to successful airway management during surgery. Recently, a new index was proposed for evaluation of DI in obese patients - the neck circumference (NC) to thyromental distance (TM) ratio (NC/TM) (2). It was proposed that a NC/TM > 5 was a better method than other established indices. Our goal was to assess whether intubation was more difficult in obese patients and to evaluate this new index in predicting DI.
Materials and Methods: A prospective observational study was conducted and a total of 482 obese patients proposed to bariatric surgery under general anaesthesia and orotracheal intubation were enrolled. They were evaluated for criteria of difficult airway in a pre-anaesthetic consultation and an intubation difficulty scale (IDS) > 5 was considered as a difficult airway during anaesthesia. The NC/TM was calculated and then statistically studied for DI ($p < 0.05$ was considered for statistically significant).
Results and Discussion: The demographic data can be seen in the table.

Sex (M/F)	**12.0/88.0**
Age (yr)	**40.91 ± 10.53**
Weight (kg)	**109.91 ± 15.93**
BMI	**42.06 ± 4.73**
NC	**41.65 ± 4.12**
TM 5.5 cm (≥/<)	**91.49/8.51**
NC/TM 5 (≥/<)	**74.90/25.10**
Mallampati (I/II/III/IV)	**24.07/35.4/36.93/3.52**
IDS 5 (≥/<)	**20.75/79.25**

[Demographic Data]

Data expressed as percentages or as mean ± SD. BMI - body mass index
We found a DI incidence of 20.75% in this obese population. In our sample, BMI (p 0.02), NC (p 0.002), NC/TM ($p < 0.001$) and Mallampati scores III-IV (p 0.002) independently predicted DI and in the IDS ≥ 5 group, NC/TM had a high sensibility and negative predictive value.

Conclusion(s): We found a high incidence of DI in obese patients submitted to bariatric surgery. The NC/TM > 5 ratio was associated with a problematic airway in this particular population. Therefore, we validated this new measure for DI prediction in obesity and we now calculate and register the NC/TM in our airway evaluation in the pre-anaesthetic consultation.

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19AP6-9

Incidence of difficult airway in a pediatric tertiary hospital

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Background and Goal of Study: Most of difficult airway predictive tests in adults have not been validated for the pediatric population. It should be noted that the child's anatomy varies with age and in children under 3 years such tests involve more difficult due to the lack of cooperation.The goal of this study was to evaluate the incidence of difficult airway in a pediatric tertiary hospital and evaluate the sensitivity and specificity of difficult airway predictive tests used in adults for the preoperative assessment in pediatric patients.
Materials and Methods: Retrospective descriptive and observational study.
We included pediatric patients (aged up to 18 years) from january to december 2011, undergoing general anesthesia with preoperative diagnosis of difficult airway. The predictive scales used were: Mallampati modified[1], distance thyromental, atlanto joint mobility, range of interdental space and previous history of difficult airway.
The data are expressed as mean and standart desviation.
Results and Discussion: 1754 pediatric patients undergoing general anesthesia, of which 79 patients (41 male and 38 female) were considered difficult airway in the preoperative diagnosis (4.5%). The mean age was 8 years ± 6.21.
67 patients were congenital malformations (84%) and 12 acquired pathology (15%).
Among all patients diagnosed of difficult airway, 40 were subjected to direct laryngoscopy, of which, 24 patients were Cormack I / II (60%) and 16 patients were Cormack III / IV (40%).1675 patients were evaluated preoperatively as normal airway, 4 were Cormack III/IV (0.23%), all of them were newborn.
The specificity of difficult airway predictive tests was 0.98 (98%) and the sensitivity of difficult airway predictive tests was 0.8 (80%).
Conclusion(s): According to other studies, the incidence of difficult airway in our hospital was 4.5%[2]. It was higher in children with congenital malformations or syndromes affecting the airway.
The predictive tests of difficult airway used in adults seems valid for the pediatric patients, without forgetting the accomplishment of a good clinical history and physical examination

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19AP6-10

Automatic prediction of difficult intubation from video

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Background and Goal of Study: Difficult laryngoscopy and tracheal intubation represent a significant source of morbidity and mortality in anaesthesia. No simple test can effectively predict difficult cases and combinations are needed to increase sensitivity and specificity. We propose a method using computer vision and machine learning to predict difficult Intubation.
Materials and Methods: Patients necessitating general anesthesia with intubation were enrolled at the anaesthetic consultation. Video recordings and depth maps of the head and neck were collected with two webcams and a Kinect®. Computer vision models (Active Appearance Models) were used to compute morphological features (MF) known as relevant to difficult intubation, based on a set of 206 landmarks automatically extracted around facial and neck components.
The MF were used to infer the patient's Mallampati score (MP) through our recently proposed machine learning algorithms. Our final set of features is then represented by patient's demographics, automated MP and MF. A classifier was then trained to assign the patient a laryngoscopic difficulty score based on the aforementioned features relying on the per-operative laryngoscopic grade as reported by the anaesthetist.
Results and Discussion: In the first 3 months of the study, 198 patients were included. Peroperative laryngoscopy showed Cormack-Lehane grades I (75.3%), IIa (16.5 %), IIb (5.1%) and III (3.5%) and 0 grade IV. Training a classifier with unbalanced classes is challenging with the risk of over fitting. For that purpose, the analysis was restricted to twenty patients (grade I: 6, grade IIa: 5, grade IIb: 5, grade III: 4, grade IV: 0).
The machine learning algorithm provides an overall accuracy of 93% in identifying difficulty in intubation. The analysis of the internal hierarchical structure of the classifier underlines the relevance of thyromental-distance, the surface of the mouth opening, the distance from the angle of the mandible to the tip of the chin and the lip-nose distance. Actual analysis of the 1000 next patients is underway and will add precision to identification of morphological specific features as well as further increase the specification of the classifier.
Conclusion(s): This study presents encouraging results for a fully automatic computer vision based system while identifying new MF to assess the difficulty of intubation. It needs further confrontation to a larger patient's dataset.

19AP6-11

A comparison of the EZ blocker with a Cohen Flex-Tip blocker for one-lung ventilation

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Background and Goal of Study: EZ Blocker is a new designed device for one-lung ventilation (1). The aim of this study was to compare the effectiveness of Cohen Flex-Tip Blocker and EZ Blocker during one-lung ventilation in thoracic surgery.
Materials and Methods: In a prospective manner**,** 40 patients undergoing thoracic surgical procedures for which one-lung ventilation required were included in this study. Patients were randomly assigned to two study groups: with a Cohen Flex-tip B; Group Cohen or an EZ Blocker; Group EZ. In both groups, FOB guidance was used during placement of bronchial blockers. Comparisons between groups included the time of correct placement, incidence of malposition and satisfaction of surgeon (Good, Fair, Poor).
Results and Discussion: One-lung ventilation was succesfully provided in all patients. Time (mean ± standard deviation) to correct placement was significantly shorter in Group EZ (146 ± 56 sec) compared to Group Cohen (241 ± 51 sec), (P = 0.01). The incidence of malposition was significantly lower in Group EZ compared to Group Cohen (P = 0.018). Surgeon satisfaction was similar, in both groups.
Conclusion(s): In our study both bronchial blockers provided similar surgical exposure during thoracic procedures. EZ Blocker had shorter time to position and less frequent intraoperative malposition.

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SUBJECT INDEX

Acid-base equilibrium, bicarbonate
13AP2-2, 17AP1-8
Acid-base equilibrium, metabolic acidosis
2AP2-3
Acupuncture
1AP6-7
Age factors
18AP1-3, 18AP2-4
Airway
3AP6-8, 7AP5-11, 10AP2-3, 12AP6-11, 15AP2-1, 15AP3-4, 19AP1-1, 19AP1-2, 19AP1-5, 19AP1-7, 19AP1-8, 19AP1-9, 19AP1-10, 19AP2-1, 19AP2-2, 19AP2-6, 19AP2-8, 19AP2-9, 19AP2-10, 19AP3-1, 19AP3-2, 19AP3-3, 19AP3-5, 19AP3-6, 19AP3-7, 19AP3-8, 19AP3-9, 19AP4-5, 19AP4-10, 19AP4-11, 19AP5-4, 19AP5-7, 19AP5-8, 19AP6-7, 19AP6-8
Airway, anatomy
19AP5-5, 19AP5-6, 19AP6-2, 19AP6-5, 19AP6-9
Airway, complications
1AP8-4, 2AP2-9, 2AP2-11, 3AP6-10, 5AP2-4, 12AP4-1, 19AP2-11, 19AP3-11, 19AP4-2, 19AP5-2, 19AP5-3, 19AP5-9, 19AP6-1, 19AP6-2, 19AP6-6
Airway, elastance
12AP1-2
Airway, obstruction
11AP3-9, 17AP3-8, 19AP1-3, 19AP2-7, 19AP3-10, 19AP5-11
Airway, pressure
19AP3-4, 19AP6-3
Airway, reflexes
1AP7-8, 19AP6-4
Airway, resistance
5AP3-6, 12AP1-2
Allergy
9AP1-3, 17AP3-2, 19AP5-11
Anaesthesia, audit
1AP3-6, 1AP3-8, 1AP4-7, 1AP4-8, 1AP5-1, 1AP6-2, 1AP6-3, 1AP6-4, 1AP6-9, 1AP7-5, 1AP7-6, 3AP6-9, 5AP2-11, 6AP2-2, 8AP5-4, 11AP2-2, 11AP4-8, 14AP5-8, 14AP7-9, 15AP1-3, 18AP2-2, 19AP3-4
Anaesthesia, day-case
1AP1-4, 1AP1-6, 1AP4-10, 1AP8-8, 1AP8-10, 2AP1-2, 2AP1-6, 2AP1-9, 2AP2-1, 2AP2-2, 2AP2-6, 2AP2-10, 2AP2-11, 3AP2-5, 10AP1-7, 17AP3-3, 19AP3-11
Anaesthesia, dental
2AP1-10
Anaesthesia, depth
3AP1-7, 17AP2-4, 17AP3-5, 18AP1-3
Anaesthesia, emergency service
3AP5-6, 12AP5-2, 13AP1-6, 13AP2-3, 13AP2-4, 13AP2-5
Anaesthesia, general
1AP2-4, 1AP4-3, 1AP4-5, 1AP4-6, 1AP6-2, 1AP7-4, 1AP7-6, 1AP7-8, 1AP7-10, 1AP8-4, 3AP2-2, 3AP2-6, 3AP2-9, 4AP1-9, 4AP2-6, 4AP3-4, 4AP4-2, 4AP5-4, 5AP1-5, 7AP3-3, 7AP3-9, 7AP3-10, 7AP5-8, 7AP5-9, 7AP5-10, 8AP5-3, 8AP5-6, 9AP2-10, 9AP2-11, 9AP3-5, 9AP3-10, 9AP3-11, 9AP5-8, 10AP2-1, 14AP7-10, 14AP8-8, 15AP1-4, 17AP1-10, 17AP2-4, 17AP3-5, 18AP1-4, 18AP2-9, 19AP6-11
Anaesthesia, geriatric
1AP2-1, 4AP5-9, 8AP5-6, 8AP5-9, 8AP6-3, 8AP6-9, 18AP1-6, 18AP2-2, 18AP2-4, 18AP2-8, 18AP2-9
Anaesthesia, journals
15AP1-5
Anaesthesia, neurosurgical
5AP2-4, 6AP3-5, 7AP1-6, 7AP5-2, 7AP5-4, 7AP5-5, 14AP1-11
Anaesthesia, obstetric
ESAAP2-1, 8AP5-2, 11AP1-2, 11AP1-3, 11AP1-4, 11AP1-5, 11AP1-6, 11AP1-7, 11AP1-8, 11AP1-9, 11AP1-10, 11AP2-1, 11AP2-6, 11AP2-8, 11AP3-2, 11AP3-3, 11AP3-4, 11AP3-5, 11AP3-7, 11AP3-8, 11AP3-9, 11AP3-10, 11AP3-11, 11AP4-2, 11AP4-5, 11AP4-6, 11AP4-7, 11AP4-8, 11AP5-1, 11AP5-2, 11AP5-4, 11AP5-5, 11AP5-6, 11AP5-7, 11AP5-8, 11AP5-9, 15AP3-2, 17AP4-5
Anaesthesia, otolaryngological
1AP3-9, 1AP4-1, 1AP7-2, 1AP7-10, 10AP1-3
Anaesthesia, paediatric
ESAPC1-4, ESAAP1-2, 1AP5-8, 1AP7-2, 2AP1-10, 3AP1-4, 3AP4-1, 4AP3-1, 4AP3-9, 6AP1-1, 8AP4-3, 8AP8-2, 9AP3-2, 9AP4-1, 9AP4-2, 10AP1-3, 10AP1-4, 10AP1-5, 10AP1-6, 10AP1-7, 10AP2-1, 10AP2-3, 10AP2-4, 10AP2-5, 10AP2-7, 10AP2-8, 10AP2-9, 10AP2-10, 10AP3-1, 10AP3-3, 10AP3-5, 10AP3-6, 10AP3-7, 10AP3-9, 17AP1-2, 19AP3-5, 19AP3-9, 19AP6-3, 19AP6-7, 19AP6-9
Anaesthetic techniques, bronchoscopy
19AP2-3, 19AP4-1
Anaesthetic techniques, conduction
1AP8-1, 3AP2-9, 8AP7-5
Anaesthetic techniques, endobronchial
19AP6-11
Anaesthetic techniques, extradural
1AP5-1, 8AP3-4, 8AP4-4, 11AP2-9
Anaesthetic techniques, fibreoptic
19AP4-7, 19AP5-1
Anaesthetic techniques, hypotensive
1AP7-10, 8AP6-3
Anaesthetic techniques, i.v.
1AP1-4, 2AP2-3, 3AP6-1, 4AP5-4, 9AP6-10
Anaesthetic techniques, i.v. regional
8AP4-9, 8AP8-5
Anaesthetic techniques, induction
1AP5-8, 3AP2-9, 11AP5-8, 19AP3-6, 19AP5-9
Anaesthetic techniques, inhalation
3AP6-6, 7AP2-7
Anaesthetic techniques, laryngoscopy
13AP2-3, 19AP1-3, 19AP1-6, 19AP1-7, 19AP1-11, 19AP4-8
Anaesthetic techniques, regional
ESAAP2-4, 1AP3-11, 1AP5-3, 5AP4-6, 8AP1-1, 8AP1-2, 8AP1-4, 8AP1-6, 8AP1-7, 8AP1-9, 8AP1-10, 8AP2-2, 8AP2-4, 8AP2-6, 8AP2-9, 8AP3-6, 8AP3-9, 8AP4-5, 8AP4-7, 8AP4-10, 8AP4-11, 8AP5-3, 8AP5-5, 8AP5-8, 8AP5-9, 8AP6-1, 8AP6-2, 8AP6-4, 8AP6-7, 8AP6-8, 8AP7-4, 8AP7-6, 8AP7-9, 8AP8-1, 8AP8-2, 8AP8-3, 8AP8-4, 8AP8-5, 8AP8-6, 8AP8-7, 8AP8-10, 10AP2-3, 10AP3-2, 11AP2-5, 11AP2-11, 11AP4-6, 14AP7-2, 15AP1-1
Anaesthetic techniques, subarachnoid
1AP5-1, 2AP2-10, 4AP5-5, 8AP3-1, 8AP4-4, 8AP5-1, 8AP5-2, 8AP5-7, 8AP6-5, 8AP6-6, 8AP6-9, 8AP8-7, 11AP1-4, 11AP2-9, 11AP3-7
Anaesthetics gases
3AP6-2, 4AP1-3, 5AP3-6, 7AP2-7, 9AP4-2, 9AP4-7, 9AP5-7, 12AP1-7, 14AP7-8, 18AP1-1
Anaesthetics gases, nitrous oxide
9AP2-8, 19AP4-4
Anaesthetics i.v., etomidate
9AP3-7
Anaesthetics i.v., ketamine
1AP7-1, 2AP1-2, 9AP2-2
Anaesthetics i.v., propofol
2AP1-11, 2AP2-8, 3AP2-3, 3AP2-8, 4AP1-10, 4AP3-6, 4AP7-3, 4AP7-8, 7AP2-10, 9AP2-1, 9AP2-2, 9AP2-5, 9AP2-10, 9AP2-11, 9AP3-2, 9AP4-5, 9AP4-9, 9AP5-2, 9AP5-7, 9AP5-9, 10AP1-10, 18AP1-1
Anaesthetics i.v., thiopentone
7AP1-6
Anaesthetics local
4AP7-2, 4AP7-7, 5AP4-5, 7AP4-6, 8AP1-4, 8AP2-2, 8AP3-3, 8AP3-11, 8AP5-5, 8AP6-8, 8AP7-1, 11AP2-9, 13AP2-6, 14AP5-9, 17AP4-3
Anaesthetics local, stereoisomers
9AP6-7
Anaesthetics volatile
2AP1-9, 4AP1-1, 4AP1-4, 7AP4-5, 7AP5-2, 9AP2-9, 9AP4-7, 10AP2-8, 19AP4-7
Anaesthetist, activity
1AP4-8, 15AP1-2, 15AP1-7, 15AP2-3, 15AP3-5, 15AP3-7
Anaesthetist, risks
1AP6-11, 1AP8-5, 4AP6-8, 8AP6-4, 15AP2-3
Analgesia, obstetric
11AP1-2, 11AP2-3, 11AP2-4, 11AP2-5, 11AP2-6, 11AP2-7, 11AP2-8, 11AP2-10, 11AP2-11, 11AP4-1, 11AP4-3, 11AP4-4, 11AP4-7, 11AP5-3, 11AP5-10
Analgesia, paediatric
8AP8-8, 10AP3-8
Analgesia, patient-controlled
14AP1-1, 14AP7-6
Analgesia, postoperative
4AP2-6, 8AP1-1, 8AP1-2, 8AP2-8, 8AP3-3, 8AP4-8, 8AP8-9, 8AP8-10, 11AP4-1, 14AP1-1, 14AP1-6, 14AP1-7, 14AP6-4, 14AP6-5, 14AP6-6, 14AP6-10, 14AP7-6, 14AP7-7, 14AP8-4, 14AP8-5
Analgesia, pre-emptive
14AP7-5
Analgesic techniques, extradural
ESAPC1-6, 11AP2-2, 14AP6-2, 14AP6-10
Analgesic techniques,i.m.
14AP2-6
Analgesic techniques, i.v.
14AP1-7, 14AP6-2, 14AP6-3, 14AP6-8

Analgesic techniques, infiltration
8AP1-7, 8AP8-9, 14AP4-9
Analgesic techniques, infusion
14AP5-9, 14AP6-10, 14AP7-4, 19AP4-9
Analgesic techniques, nasal
2AP1-5
Analgesic techniques, regional, i.a.
1AP3-3, 6AP2-9, 8AP1-8, 8AP2-8, 8AP3-8, 14AP1-8
Analgesic techniques, subarachnoid
8AP5-1, 11AP2-6
Analgesics opioid
2AP1-5, 8AP3-4, 8AP5-5, 8AP8-9, 9AP6-5, 14AP1-2, 14AP2-3, 14AP3-5, 14AP4-7, 14AP5-2, 14AP5-6, 14AP7-8, 14AP8-6, 14AP8-7
Analgesics opioid, morphine
1AP1-3, 14AP6-6
Analgesics, non-opioid
10AP3-8, 14AP2-11, 14AP4-4
Analgesics, postoperative
1AP3-4, 8AP5-9, 11AP4-7, 14AP1-2, 14AP1-4, 14AP1-8, 14AP6-3, 14AP7-4
Anatomy, larynx
19AP3-1
Animals Procedures Act
7AP2-4
Antagonists, benzodiazepine
9AP4-8
Antagonists, neuromuscular block
1AP3-8, 1AP7-5, 9AP1-1, 9AP1-6
Anticonvulsants
7AP4-8, 9AP4-1
Arterial pressure
5AP3-1
Arterial pressure, drug effects
7AP5-4
Arterial pressure, hypertension
4AP7-5, 7AP5-11
Arterial pressure, hypotension
4AP7-3, 11AP1-4
Arterial pressure, measurement
4AP3-8
Arteries, aorta
4AP4-1
Assessment, preanaesthetic
1AP3-5, 1AP4-8, 5AP2-1
Asthma
5AP4-8
Blood, anticoagulants
6AP1-7, 6AP3-2, 6AP3-6
Blood, chemotaxis
4AP6-7, 9AP5-10
Blood, coagulation
ESAPC1-5, 6AP1-4, 6AP3-5, 11AP4-2, 11AP4-3, 12AP6-2
Blood, flow
3AP3-2, 4AP1-9
Blood, flow,skin
3AP6-1
Blood, glucose
4AP2-4, 4AP2-5
Blood, haemodilution
4AP7-1, 6AP1-2
Blood, haemofiltration
12AP5-3
Blood, haemoglobin
3AP5-2, 3AP5-6, 4AP7-1, 6AP1-10
Blood, leucocytes
9AP2-3, 9AP5-1, 12AP4-5
Blood, loss
ESAPC1-5, 4AP4-3, 6AP1-2, 6AP3-9, 10AP2-7, 11AP4-5
Blood, lymphocytes
12AP4-2
Blood, neutrophils
12AP4-2
Blood, platelets
4AP4-9, 6AP1-5, 6AP3-10, 12AP4-8
Blood, salvage
6AP2-6, 6AP3-3, 6AP3-11
Blood, transfusion
3AP5-5, 6AP1-6, 6AP1-10, 6AP2-4, 6AP2-5, 6AP2-8, 6AP2-9, 6AP2-10, 11AP4-2
Blood, volume
4AP7-1, 12AP6-6
Brain, blood -brain barrier
7AP2-1
Brain, blood flow
7AP1-9, 7AP4-10, 7AP5-2, 7AP5-11
Brain, cerebral cortex
14AP8-7
Brain, electroencephalography
3AP1-2, 3AP1-5, 3AP1-7, 3AP1-8, 7AP3-5, 12AP3-11, 18AP1-3
Brain, GABA
ESAAP1-4, 7AP3-1
Brain, hippocampus
7AP2-9, 7AP3-8, 12AP2-7
Brain, hypothalamus
7AP5-6
Brain, injury
ESAPC1-1, 4AP1-1, 7AP1-1, 7AP2-4, 7AP5-6
Brain, intracranial haemorrhage
7AP1-3, 7AP1-7, 7AP1-8, 11AP3-7, 12AP6-4
Brain, intracranial neoplasm
3AP1-5, 3AP1-8
Brain, intracranial pressure
11AP3-4
Brain, ischaemia
3AP5-9, 4AP5-10, 7AP1-5, 7AP2-1, 7AP2-2, 7AP2-3, 7AP2-8, 7AP2-9, 7AP2-10, 7AP3-2
Brain, magnetic resonance imaging
7AP1-2
Brain, oxygen consumption
7AP2-6
Burns
12AP6-1
Cancer
9AP2-3, 11AP5-2, 14AP8-5, 14AP8-6
Carbon dioxide, elimination
1AP3-7
Carbon dioxide, measurement
12AP4-1
Carbon dioxide, partial pressure
4AP5-2
Cardiorespiratory system
4AP1-8, 4AP3-7, 9AP6-4
Cerebrospinal fluid
7AP2-3
Chemotherapy, cancer
10AP3-6, 14AP3-10
Clinical trials
ESAAP2-6, 1AP6-7, 7AP1-2, 15AP1-6
Complications
1AP3-3, 1AP3-5, 1AP8-4, 3AP6-9, 8AP3-9, 8AP4-2, 8AP4-5, 8AP7-7, 11AP1-1, 11AP2-10, 12AP2-6, 12AP4-2, 12AP4-5, 17AP2-8, 17AP2-9, 17AP3-5, 19AP5-8
Complications, accidents
8AP3-10, 17AP2-5
Complications, airway obstruction
2AP2-9, 12AP1-6
Complications, anaemia
6AP2-5, 6AP3-3
Complications, anaphylaxis
9AP3-9, 17AP3-2
Complications, aneurysm
7AP1-7
Complications, aortic rupture
11AP1-6
Complications, aortic valve disease
4AP5-10
Complications, apnoea
5AP2-5
Complications, arrhythmia
1AP8-3, 4AP6-1, 4AP6-4
Complications, atelectasis
5AP3-4
Complications, bronchospasm
5AP4-8
Complications, burns
3AP5-7
Complications, cardiac arrest
8AP6-6, 13AP2-6, 17AP3-1, 17AP4-2
Complications, catheter misplacement
1AP8-11, 8AP4-1, 17AP2-3
Complications, cerebral ischaemia
17AP3-6
Complications, coagulopathy
6AP1-3, 6AP3-2, 6AP3-10
Complications, death
4AP6-9, 12AP3-6, 17AP2-1, 17AP2-3
Complications, diabetes
1AP7-9
Complications, drug resistance
4AP4-9
Complications, dural puncture
8AP3-7, 8AP4-7, 11AP2-2
Complications, embolism
2AP2-4
Complications, extubation tracheal
19AP2-5, 19AP4-3
Complications, haematoma
8AP8-4
Complications, haemorrhage
6AP1-5, 6AP3-4
Complications, head injury
7AP2-8
Complications, headache
11AP3-4
Complications, hypotension
8AP6-2, 12AP1-2, 18AP2-5
Complications, hypovolaemia
4AP8-3, 4AP8-6
Complications, hypoxia
2AP2-8, 5AP2-5
Complications, infections
7AP3-9, 9AP2-8, 11AP3-11
Complications, intubation endobronchial
19AP2-7
Complications, intubation nasotracheal
17AP1-10
Complications, liver disease
12AP6-3
Complications, meningitis
10AP1-3
Complications, morbidity
4AP8-8, 7AP3-6, 12AP2-6, 17AP1-9
Complications, myocardial infarction
4AP6-8
Complications, neurological
1AP2-1, 7AP2-5, 8AP5-7, 12AP6-4
Complications, neuromuscular disease
8AP8-7, 9AP4-4
Complications, neuropathy
8AP2-3
Complications, obesity
1AP3-7, 4AP8-10, 5AP2-5, 19AP6-8
Complications, phaeochromocytoma
1AP8-1
Complications, pneumothorax
17AP3-3

Complications, pruritus
1AP1-3
Complications, pulmonary
5AP2-3, 5AP2-8, 5AP3-4, 5AP4-5, 11AP3-11, 12AP6-10
Complications, pulmonary hypertension
4AP4-2, 8AP6-4
Complications, pulmonary oedema
11AP3-6
Complications, renal
18AP2-8
Complications, respiratory
1AP2-5, 5AP2-1, 5AP2-6, 5AP2-9, 9AP1-9, 9AP3-10, 12AP1-11, 12AP6-7
Complications, septicaemia
12AP2-5, 13AP2-1
Complications, shivering
1AP7-1, 8AP3-1, 10AP1-2
Complications, skin injury
3AP5-7
Complications, smokers
4AP5-7, 5AP2-1, 17AP1-9
Complications, sore throat
3AP6-10, 19AP1-4
Complications, spinal injury
ESAPC1-6, 7AP4-7, 8AP5-8
Complications, thrombosis
2AP2-4
Complications, trauma
6AP1-5, 12AP4-4
Complications, ultrasound
12AP5-8
Diabetes
ESAAP2-2, 4AP1-4, 8AP5-4
Donors, organ transplantation
7AP1-4
Drug delivery
9AP4-5
Drug delivery, infusion
9AP3-1
Drug delivery, volume
9AP5-2
Education
1AP3-10, 12AP3-9, 13AP1-1, 15AP1-5, 15AP1-7, 15AP2-1, 15AP2-2, 15AP3-1, 15AP3-2, 15AP3-5, 15AP3-6, 15AP3-7, 17AP1-1, 17AP4-2, 19AP4-3, 19AP6-1
Education, continuing
ESAAP2-5, 15AP2-6, 15AP3-3, 15AP3-4
Education, medical students
15AP1-3
Education, untrained personnel
ESAAP2-4, 1AP3-9, 3AP4-2, 10AP3-3, 15AP1-1, 15AP2-4, 15AP3-2
Enzymes, cyclo-oxygenase
ESAAP2-3
Enzymes, cytochrome P450
9AP3-7
Enzymes, phosphodiesterase, inhibition
4AP2-9
Epilepsy
7AP4-8, 9AP4-1, 9AP4-2
Equipment, airway
1AP3-9, 1AP8-8, 10AP3-9, 19AP1-3, 19AP1-5, 19AP1-11, 19AP2-2, 19AP3-7, 19AP3-9, 19AP3-11
Equipment, alarms
3AP6-3
Equipment, anaesthesia machines
ESAAP1-5, 3AP6-2, 3AP6-6, 17AP1-5
Equipment, breathing systems
5AP1-6
Equipment, cannulae intravascular
1AP8-11
Equipment, cannulae nasal
2AP2-8
Equipment, catheters extradural
8AP4-1, 8AP4-2
Equipment, circulatory support devices
4AP1-9
Equipment, computers
17AP3-4, 17AP4-5
Equipment, extracorporeal circulation
4AP1-6, 4AP1-7, 4AP5-1, 4AP6-3, 4AP7-4, 4AP8-5, 12AP4-7
Equipment, Finapres
3AP3-6
Equipment, infusion systems
9AP3-1
Equipment, laryngoscopes
19AP1-2, 19AP1-6
Equipment, lasers
4AP4-7
Equipment, mass spectrometers
3AP2-3
Equipment, monitors
3AP3-1, 3AP5-5
Equipment, needles
8AP6-8, 8AP7-3
Equipment, pulse oximeters
3AP3-2, 3AP5-1, 3AP5-2, 14AP6-4
Equipment, stimulators
8AP7-6
Equipment, tubes double-lumen
19AP5-6
Equipment, tubes endobronchial
19AP6-11
Equipment, tubes tracheal
19AP2-8
Equipment, ultrasound machines
8AP2-2, 8AP2-7, 10AP3-2
Equipment, valves
3AP4-2
Equipment, ventilators
17AP3-1, 19AP2-6
Equipment, warming devices
1AP5-2
Ethics
15AP3-5, 15AP3-6, 15AP3-7
Eye, cataract
8AP1-3
Eye, intraocular pressure
1AP5-5, 1AP8-9, 8AP1-5, 10AP3-9
Fluid balance
1AP6-6, 3AP2-1, 3AP3-8, 4AP2-2, 4AP8-1
Fluids, i.v.
3AP3-5, 4AP8-3, 4AP8-4, 4AP8-7, 4AP8-8, 6AP2-4, 12AP5-9
Fluids, oral
1AP7-3
Formulations, bupivacaine
2AP1-3
Gastrointestinal tract
5AP1-2
Gastrointestinal tract, endoscopy
2AP1-11, 2AP2-3, 17AP3-3
Gastrointestinal tract, mucosal perfusion
4AP7-4, 4AP8-5
Genetic factors
ESAPC1-5, 1AP1-8, 1AP8-1, 9AP2-10
Geriatrics
14AP7-9
Head, injury
7AP2-5, 12AP6-9
Heart, arrhythmia
4AP2-9, 7AP1-7, 10AP3-7
Heart, blood flow,myocardial
4AP1-6, 4AP1-7
Heart, cardiac massage
13AP1-4
Heart, cardiac output
1AP6-6, 3AP4-4, 3AP4-5, 4AP3-4, 4AP8-7, 11AP3-8
Heart, cardiopulmonary bypass
4AP2-2, 4AP2-4, 4AP2-7, 4AP2-8, 4AP4-7, 4AP6-1, 4AP6-10, 6AP1-8, 6AP2-1
Heart, catheterization
10AP2-9
Heart, conduction
4AP2-7, 4AP2-8, 8AP3-10
Heart, congenital defects
4AP3-2, 4AP3-3
Heart, coronary artery bypass
3AP4-3, 4AP2-1, 4AP6-6, 10AP1-10, 12AP2-6
Heart, coronary occlusion
4AP1-5
Heart, heart rate
1AP7-4, 4AP7-10, 10AP3-6
Heart, ischaemia
4AP1-4, 4AP1-5, 4AP1-10, 4AP2-1, 4AP6-5, 4AP6-8
Heart, metabolism
4AP6-6
Heart, myocardial function
4AP3-10, 4AP4-5, 4AP5-5, 13AP2-6
Heart, resuscitation
12AP3-11, 12AP5-10, 13AP1-1
Hormones, atrial natriuretic peptide
12AP6-9
Hormones, insulin
4AP2-5
Hormones, progesterone
9AP1-6
Humidification
ESAAP1-5
Hyperthermia, postoperative
17AP4-7
Hypothermia
1AP5-3, 1AP5-6, 1AP6-1, 4AP4-6, 4AP8-11, 12AP3-10, 12AP3-11, 12AP5-10, 17AP4-7
Hypoxaemia
5AP1-2, 5AP2-2
Hypoxia
5AP2-10, 7AP2-11, 9AP2-1, 9AP2-5, 12AP1-3
Immune response
ESAAP2-6, 4AP1-5, 8AP4-11, 8AP5-4, 9AP5-10, 12AP2-5
Induction,anaesthesia
4AP1-1, 7AP2-4, 7AP4-7, 9AP3-7
Infants
9AP6-8
Infection, bacterial
4AP7-2, 7AP4-9, 12AP2-1, 12AP2-8, 12AP2-9, 12AP2-10, 12AP2-11, 17AP2-7, 18AP2-3
Infection, breathing systems
12AP1-8
Infection, central nervous system
7AP4-9
Infection, control
12AP2-3, 12AP2-9, 12AP2-10, 12AP2-11, 17AP1-4
Infection, nosocomial
12AP2-9, 12AP2-10
Infection, pulmonary
12AP4-11
Infusions
18AP2-9

Infusions, i.v.
9AP3-1, 12AP2-3
Intensive care
1AP4-4, 3AP1-9, 4AP1-8, 7AP1-4, 12AP1-6, 12AP2-5, 12AP2-7, 12AP3-1, 12AP3-2, 12AP3-6, 12AP4-1, 12AP4-3, 12AP4-8, 12AP5-2, 12AP5-4, 12AP6-2, 12AP6-11
Intensive care, audit
12AP1-5, 12AP3-4, 12AP4-9, 17AP1-6
Intensive care, infections
12AP2-1, 12AP2-2, 12AP2-4, 12AP3-5, 12AP4-11, 12AP5-2, 12AP5-6, 12AP5-8
Intensive care, sedation
9AP6-4, 12AP3-3
Interactions (drug)
ESAPC1-3, 12AP5-5
Intubation endobronchial
19AP4-4
Intubation nasotracheal, technique
15AP2-2, 19AP5-3
Intubation tracheal
3AP6-8, 4AP4-8, 19AP1-1, 19AP1-8
Intubation tracheal, complications
4AP7-9, 12AP1-6, 19AP1-4, 19AP5-10
Intubation tracheal, difficult
19AP1-6, 19AP5-3, 19AP5-4, 19AP5-5, 19AP6-6, 19AP6-8, 19AP6-10
Intubation tracheal, extubation
19AP2-4, 19AP5-7
Intubation tracheal, technique
1AP5-7, 19AP2-1, 19AP2-8, 19AP5-4, 19AP5-9, 19AP6-7, 19AP6-10
Ions, calcium
ESAAP2-3
Ions, ion channels
7AP4-5
Ions, ion channels,ligand-gated
ESAAP1-4
Ions, magnesium
1AP7-1, 1AP7-4, 9AP1-1
Ions, sodium
12AP6-9
Kidney, diuretics
4AP4-4
Kidney, failure
1AP3-2, 4AP4-1, 9AP5-4, 12AP4-6, 12AP4-7
Kidney, filtration, glomerular
18AP2-3
Kidney, function
1AP5-4, 4AP4-4
Kidney, transplantation
3AP3-7
Larynx, anatomy
19AP3-8
Larynx, laryngoscopy
15AP2-1, 19AP1-2, 19AP5-5
Liver, blood flow
4AP7-8, 9AP5-1
Liver, cirrhosis
6AP3-6, 12AP6-3, 17AP1-8
Liver, damage
2AP2-6, 4AP7-8, 9AP5-1, 9AP5-7, 12AP5-1
Liver, disease
6AP3-4, 12AP5-1, 12AP6-5
Liver, function
9AP5-9, 12AP5-1
Liver, transplantation
3AP1-6, 3AP4-6, 3AP4-7, 4AP6-9, 5AP1-7, 6AP3-6, 12AP1-8, 12AP5-11, 15AP3-1
Lung, adult respiratory distress syndrome
5AP2-7, 5AP2-8, 5AP4-7, 12AP1-1, 12AP1-10, 12AP2-8
Lung, atelectasis
5AP2-8
Lung, blood flow
3AP5-3
Lung, compliance
5AP3-7
Lung, damage
5AP3-3, 9AP2-7, 12AP1-7
Lung, deadspace
5AP1-9
Lung, gas exchange
5AP4-1, 12AP1-1, 19AP2-6
Lung, hypoxia
5AP1-1
Lung, lavage
5AP1-9
Lung, mechanics
5AP3-8, 5AP3-9
Lung, oedema
12AP5-9
Lung, pathophysiology
4AP4-10
Lung, physiotherapy
4AP4-10, 5AP3-1
Lung, shunting
5AP1-9
Lung, tidal volume
5AP4-4
Lung, volume
5AP1-8
Malignant hyperthermia
9AP5-6, 17AP3-9
Measurement techniques, accelography
9AP1-2
Measurement techniques, arterial pressure
3AP3-6
Measurement techniques, carbon dioxide
4AP8-5
Measurement techniques, cardiac output
3AP3-4, 3AP3-8, 3AP4-3, 3AP4-5, 3AP4-6, 3AP4-7, 3AP4-8, 4AP8-4, 4AP8-6
Measurement techniques, coagulation
6AP1-1, 6AP1-4, 6AP1-8, 6AP3-1, 6AP3-7
Measurement techniques, Doppler echocardiography
4AP5-5
Measurement techniques, drug concentration
8AP3-10
Measurement techniques, electromyography
3AP1-4
Measurement techniques, electrophysiology
7AP4-4, 9AP6-2, 14AP3-5
Measurement techniques, endoscopy
3AP5-3
Measurement techniques, Fick principle
3AP4-4, 3AP4-5
Measurement techniques, gas exchange
4AP3-3, 5AP1-10
Measurement techniques, neuromuscular block
3AP1-4, 3AP1-10
Measurement techniques, oximeters
3AP3-2, 3AP5-2, 3AP5-7, 4AP5-1, 4AP5-3
Measurement techniques, plethysmography
3AP3-7, 3AP5-6, 4AP8-1, 5AP1-8
Measurement techniques, pneumotachography
5AP1-8
Measurement techniques, spectral analysis
3AP1-10
Measurement techniques, thermodilution
3AP4-3, 3AP4-7
Measurement techniques, thrombelastography
6AP1-2
Measurement techniques, transthoracic electrical impedance
5AP4-1
Measurement techniques, ultrasound
3AP5-4, 4AP5-11, 8AP1-3, 8AP2-6
Measurement techniques, ventilation volumes
5AP1-4, 12AP1-9
Memory
7AP3-2, 7AP5-7
Metabolism, DNA
9AP2-8
Metabolism, free radicals
7AP2-3
Metabolism, glucose
1AP4-2
Metabolism, hyperglycaemia
5AP3-6
Metabolism, lipid
5AP2-7
Metabolism, oxygen consumption
7AP4-9
Metabolism, protein
5AP2-7, 12AP1-3
Microcirculation
3AP5-8, 4AP4-7, 4AP5-3, 4AP5-7, 4AP6-3, 4AP8-11, 11AP1-2
Model, animal
ESAAP1-1, 7AP1-1, 7AP1-5, 7AP1-9, 7AP2-1, 7AP2-10, 7AP4-5, 8AP1-5, 9AP4-8, 14AP4-3
Model, cardiomyopathy
4AP7-5
Model, computer simulation
1AP6-6, 3AP2-1, 13AP1-4, 15AP2-5, 15AP2-6
Model, heart
4AP7-10
Model, membrane
5AP1-10
Model, neuropathy
14AP3-10, 14AP4-5
Model, pharmacodynamic
9AP5-8
Model, pharmacokinetic
3AP2-1, 9AP3-4
Model, pharmaco-physiological
ESAPC1-1
Monitoring, anaesthetist activity
3AP2-6
Monitoring, arterial pressure
3AP3-1, 3AP3-8, 4AP8-10
Monitoring, carbon dioxide
3AP2-5, 5AP3-7
Monitoring, cardiopulmonary
1AP6-8, 4AP4-2, 4AP6-2, 4AP8-1, 4AP8-4, 4AP8-6, 4AP8-9, 17AP2-6
Monitoring, computerized
3AP6-7, 3AP6-9
Monitoring, cuff pressure
3AP6-10, 19AP4-4
Monitoring, depth of anaesthesia
ESAPC1-3, 1AP4-3, 3AP1-2, 3AP1-5, 3AP1-7, 3AP1-8, 3AP2-2, 3AP2-3, 7AP4-7, 14AP7-8, 18AP1-6
Monitoring, echocardiography
3AP4-2, 4AP5-6, 4AP8-2
Monitoring, electroencephalography
3AP1-9, 3AP2-2, 7AP3-5
Monitoring, evoked potentials
7AP2-7

Monitoring, intensive care
3AP3-1, 4AP4-3, 4AP6-9, 4AP8-2, 12AP6-6
Monitoring, intracranial pressure
3AP5-4
Monitoring, intraoperative
3AP2-4, 3AP2-7, 3AP3-3, 3AP3-7, 3AP4-1, 3AP5-5, 4AP2-4, 4AP3-9, 4AP3-10, 11AP1-8
Monitoring, neuromuscular function
3AP1-1, 9AP1-10
Monitoring, oxygen
5AP3-5
Monitoring, radiological
13AP1-3
Monitoring, spirometry
12AP1-11
Monitoring, temperature
1AP5-2
Monitoring, ultrasound
4AP5-9, 8AP1-5, 8AP2-6, 9AP6-10
Monitoring, ventilation
5AP1-4, 5AP2-3, 12AP1-9
Muscle respiratory
4AP2-3
Muscle respiratory, fatigue
12AP5-6
Muscle skeletal
9AP1-10, 9AP4-4, 9AP5-6
Muscle skeletal, contractility
8AP1-9
Muscle skeletal, diaphragm
12AP5-6
Muscle skeletal, metabolism
4AP5-3
Muscle skeletal, relaxation
3AP1-1, 9AP1-2, 9AP1-6
Muscle vascular, pharmacology
9AP6-1
Muscle vascular, responses
4AP7-5
Myasthenia gravis
1AP7-7
Neonates
5AP3-8, 5AP3-9, 7AP3-1, 10AP2-1
Nerve, damage (postoperative)
8AP7-5, 14AP1-3
Nerve, somatic
8AP2-5
Nerve, synaptosome
ESAAP2-3
Nerve, trigeminal
14AP2-7, 14AP2-11, 14AP3-1
Neuromuscular block
5AP2-11, 9AP3-3, 9AP3-10, 14AP7-10, 19AP4-8
Neuromuscular block, antagonism
1AP7-6, 1AP7-7, 5AP4-8, 8AP1-9, 9AP1-4, 9AP1-5, 9AP1-10
Neuromuscular block, atracurium
19AP4-6
Neuromuscular block, pipecuronium
9AP1-4
Neuromuscular block, propofol
9AP3-4
Neuromuscular block, recovery
3AP1-10, 4AP2-3, 9AP1-7, 10AP2-10, 11AP5-8
Neuromuscular block, rocuronium
1AP7-11, 4AP2-3, 4AP4-8, 4AP7-6, 9AP1-1, 9AP1-5, 9AP1-7, 9AP1-9, 9AP3-4, 9AP3-5, 9AP3-9, 17AP1-3
Neuromuscular block, vecuronium
1AP7-9, 9AP1-2
Neuromuscular transmission
1AP7-7
Non-steroidal anti-inflammatory drugs
9AP2-3, 9AP5-4, 10AP3-5
Operating rooms, contamination
9AP2-9
Operating rooms, exhaust systems
17AP1-7
Operating rooms, personnel
15AP1-4, 19AP5-1
Organizations, Royal College of Anaesthetists
15AP3-1
Oxygen, consumption
4AP3-7, 4AP8-3
Oxygen, cyanosis
3AP5-1
Oxygen, delivery systems
5AP1-1, 5AP1-6
Oxygen, inspired concentration
3AP6-4, 13AP1-2
Oxygen, measurement
8AP6-1
Oxygen, partial pressure
5AP1-1, 5AP3-1
Oxygen, saturation
4AP5-1, 7AP2-6, 7AP3-4, 19AP4-11
Oxygen, therapy
5AP1-2
Oxygen, tissue
4AP8-11, 7AP2-5, 7AP2-8, 8AP7-4
Oxygen, transport
3AP5-1
Pain 3AP2-7, 9AP6-8, 13AP2-4, 14AP1-6, 14AP2-1, 14AP2-5, 14AP4-2, 14AP5-4
Pain, acute
4AP4-3, 8AP1-1, 8AP2-7, 8AP4-8, 8AP7-9, 11AP5-3, 14AP1-2, 14AP1-3, 14AP2-4, 14AP5-8, 14AP6-8, 14AP6-11
Pain, chronic
11AP5-3, 11AP5-7, 14AP1-5, 14AP1-11, 14AP2-2, 14AP2-6, 14AP2-7, 14AP2-8, 14AP2-9, 14AP3-2, 14AP3-3, 14AP7-2, 14AP7-7, 14AP8-1, 14AP8-2, 14AP8-10
Pain, experimental
14AP1-5, 14AP3-4, 14AP4-3, 14AP4-4, 14AP5-4
Pain, mechanism
14AP2-2, 14AP2-5, 14AP3-2, 14AP3-3, 14AP3-6, 14AP4-1, 14AP7-1, 14AP8-1, 14AP8-2
Pain, neurolysis
14AP8-6
Pain, neuropathic
14AP2-2, 14AP2-7, 14AP2-10, 14AP3-1, 14AP3-2, 14AP3-3, 14AP3-6, 14AP3-8, 14AP3-10, 14AP4-1, 14AP4-3, 14AP4-6, 14AP7-2, 14AP8-1, 14AP8-2
Pain, paediatric
10AP1-6
Pain, pathological
14AP4-5
Pain, physiological
14AP2-4, 14AP4-1
Pain, postoperative
8AP1-7, 8AP2-8, 8AP5-1, 8AP8-10, 9AP6-9, 10AP3-8, 11AP5-5, 11AP5-7, 14AP1-3, 14AP1-4, 14AP1-9, 14AP1-11, 14AP5-1, 14AP5-2, 14AP5-9, 14AP6-1, 14AP6-2, 14AP6-3, 14AP6-6, 14AP6-7, 14AP8-5, 14AP8-8, 14AP8-9
Pain, tourniquet
14AP5-7
Parasympathetic nervous system
4AP3-8
Parasympathetic nervous system, atropine
1AP6-3, 4AP7-3
Pharmacodynamics
ESAPC1-3, 9AP6-1
Pharmacokinetics
3AP2-8, 9AP3-2, 9AP6-8
Pharmacokinetics, models
14AP5-2
Pharmacokinetics, uptake
3AP6-6
Pharmacology
ESAPC1-1, ESAAP1-4, 4AP1-2, 4AP7-2, 5AP4-2, 7AP4-8, 9AP5-2, 12AP2-8, 14AP2-4, 14AP4-4, 19AP4-11
Pharmacology, agonists adrenergic
4AP4-6, 12AP2-3
Pharmacology, agonists opioid
19AP4-10
Pharmacology, analgesics opioid
9AP6-5, 9AP6-9, 14AP4-7
Pharmacology, benzodiazepines
9AP2-2, 9AP4-8, 9AP4-9, 18AP1-2
Pharmacology, dose-response
4AP1-10, 9AP1-9, 9AP4-3, 9AP4-5, 9AP4-9, 9AP5-8, 14AP4-6, 14AP4-9
Pharmacology, synergism
2AP1-5
Physics, fluid dynamics
8AP7-3, 12AP6-6
Physiotherapy
12AP1-11
Polypeptides, cytokines
4AP6-6, 9AP5-5
Polypeptides, endorphins
14AP4-7
Position, effects
ESAAP2-1, 5AP1-5, 8AP4-2
Position, lateral decubitus
19AP1-11
Position,prone
1AP5-7, 5AP4-9, 19AP5-1
Potency, drug
14AP4-9
Pregnancy
ESAAP2-1, 11AP1-1, 11AP1-6, 11AP1-10, 11AP4-1, 11AP4-6, 11AP5-2, 13AP1-7
Premedication
10AP1-2
Protein, albumin
12AP3-1
Psychological responses
ESAPC1-4, 7AP1-1, 10AP1-10, 14AP2-8
Receptors, opioid
4AP1-6, 4AP1-7, 4AP7-4
Receptors, transmembrane
9AP4-4
Records, medical
8AP4-4, 13AP2-5
Recovery
1AP3-6, 1AP4-1, 1AP4-7, 1AP5-10, 14AP1-9, 17AP2-2, 18AP2-1
Recovery, cognitive
1AP2-1, 1AP2-3, 1AP2-5, 1AP2-6, 1AP2-7, 2AP1-7, 7AP3-6, 7AP3-9, 7AP5-7, 9AP4-7, 12AP3-3, 12AP3-9, 14AP2-9, 17AP2-9, 18AP1-4
Recovery, neurological
7AP2-9
Recovery, postoperative
1AP2-3, 1AP2-6, 1AP3-4, 1AP4-1, 1AP4-9, 1AP5-10, 1AP8-7, 3AP5-8, 10AP1-4, 10AP1-5, 17AP1-9, 17AP2-2, 18AP1-1, 18AP2-1

Recovery, psychomotor
2AP1-7
Research, anaesthesia
1AP2-2, 7AP3-10, 8AP4-8, 15AP1-2, 15AP1-6, 19AP4-3
Research, animal
3AP4-6, 4AP4-10, 7AP4-4, 7AP5-7, 12AP1-1, 14AP4-5
Risk
ESAAP2-2, 1AP5-4, 1AP8-3, 2AP2-9, 4AP6-7, 5AP2-6, 7AP5-1, 10AP1-4, 11AP5-1, 12AP3-5, 17AP2-5, 17AP4-4, 18AP2-4
Safety
1AP4-3, 1AP4-7, 7AP5-1, 11AP5-1, 13AP1-7, 17AP1-2, 17AP2-3, 17AP2-5, 17AP3-9, 17AP4-2, 17AP4-4, 17AP4-6, 19AP2-4, 19AP2-10, 19AP4-1
Safety, drug
1AP6-3, 2AP1-8, 4AP6-5, 6AP3-2, 7AP3-6, 9AP1-5, 9AP6-9
Safety, equipment
3AP6-2, 3AP6-3, 17AP3-8
Safety, techniques
1AP8-5, 11AP4-5, 17AP3-7, 19AP3-6, 19AP4-7, 19AP6-10
Screening
19AP6-5
Sedation
1AP4-6, 2AP1-2, 2AP1-8, 2AP1-11, 9AP6-4, 10AP1-2, 12AP3-10, 19AP4-1
Serotonin (5-hydroxytryptamine)
14AP3-4
Serotonin (5-hydroxytryptamine), antagonism
8AP6-2
Skin, blood flow
4AP6-3
Skin, temperature
8AP2-5
Sleep
1AP2-2, 7AP4-4
Sleep apnoea
5AP2-4, 5AP2-9
Spinal cord, sensory block
7AP4-3, 8AP5-2, 11AP1-10
Spinal cord, vertebral interspace
8AP5-8
Statistics
1AP4-5, 10AP2-9
Strabismus
2AP1-1
Stress
15AP1-4, 15AP1-8
Structure, molecular
9AP5-5
Surgery, abdominal
5AP2-2, 9AP5-5, 12AP2-7, 12AP3-4, 17AP1-3, 17AP3-6
Surgery, aneurysm
1AP6-11
Surgery, autonomic response
3AP2-7
Surgery, cardiovascular
3AP1-9, 4AP1-3, 4AP2-1, 4AP2-2, 4AP2-5, 4AP2-6, 4AP2-9, 4AP3-2, 4AP3-3, 4AP3-9, 4AP4-6, 4AP5-2, 4AP5-9, 4AP6-1, 4AP6-10, 6AP1-8, 6AP2-1, 7AP1-2, 12AP4-6, 12AP4-7, 12AP4-11, 12AP6-7, 14AP8-9, 17AP1-2
Surgery, craniotomy
7AP5-1
Surgery, day-case
2AP2-1, 8AP2-1, 8AP7-7
Surgery, endarterectomy
3AP5-9
Surgery, gastrointestinal
ESAAP1-6, 3AP5-8, 17AP2-6
Surgery, gynaecological
1AP1-1, 14AP6-1
Surgery, hepatic
8AP4-6
Surgery, laparoscopy
1AP1-2, 1AP1-4, 1AP3-7, 2AP2-2, 3AP4-1, 3AP5-4, 4AP8-10, 6AP3-10, 9AP3-3, 14AP1-8, 14AP6-7, 17AP1-3
Surgery, laparotomy
5AP3-5, 12AP5-5
Surgery, maxillofacial
17AP1-10, 17AP4-8, 19AP5-7
Surgery, metabolic response
1AP3-4, 12AP3-1
Surgery, neurological
3AP2-8, 7AP4-1, 7AP4-2, 7AP5-6, 8AP5-3
Surgery, non-cardiac
1AP5-4, 4AP6-5, 4AP6-7
Surgery, ophthalmological
8AP1-8
Surgery, orthopaedic
ESAAP2-2, 1AP6-5, 3AP3-6, 6AP1-10, 6AP2-7, 6AP2-9, 6AP2-10, 8AP2-1, 8AP2-9, 8AP3-8, 8AP7-6, 8AP7-7, 8AP7-9, 10AP1-9, 12AP4-5, 14AP1-4, 14AP1-5, 18AP2-2, 19AP5-8
Surgery, otolaryngological
10AP3-5, 17AP3-8
Surgery, paediatric
6AP1-9, 6AP3-1, 10AP1-9, 10AP3-2
Surgery, plastic
9AP6-10
Surgery, postoperative period
ESAAP1-6, 1AP8-2, 8AP5-6, 12AP1-8, 12AP4-3, 12AP4-10, 12AP5-5, 14AP8-10, 17AP2-6, 18AP1-2, 19AP1-4
Surgery, preoperative period
1AP3-10, 1AP4-2, 1AP6-11, 1AP8-6, 10AP3-3, 18AP2-8
Surgery, thoracic
1AP5-3, 4AP6-4, 4AP7-7, 5AP2-6, 5AP3-4, 5AP4-5, 5AP4-6, 9AP2-7, 14AP7-7, 14AP8-4
Surgery, thyroidectomy
1AP8-3
Surgery, transplantation
4AP7-7
Surgery, urological
4AP8-8, 6AP2-4, 8AP2-7, 8AP6-6, 18AP2-6
Surgery, vascular
4AP4-4, 7AP2-6
Sympathetic nervous system
1AP8-5, 4AP3-8, 8AP3-11
Sympathetic nervous system, dexmedetomidine
1AP4-6, 7AP3-2, 7AP5-5, 10AP1-5
Sympathetic nervous system, dobutamine
4AP3-7
Sympathetic nervous system, esmolol
4AP7-9
Sympathetic nervous system, labetalol
4AP7-9
Sympathetic nervous system, phenylephrine
4AP3-4, 4AP3-6
Temperature
1AP5-6, 12AP3-10
Temperature, body
1AP6-1
Temperature, monitoring
1AP5-6
Temperature, regulation
7AP3-3
Toxicity
ESAAP1-1, 9AP2-9, 9AP6-5
Toxicity, local anaesthetics
7AP4-3, 8AP3-8, 9AP6-2, 9AP6-7, 17AP1-1, 17AP4-1
Toxicity, neurotoxicity
7AP3-10, 7AP4-3, 9AP2-6, 10AP1-6, 18AP1-4
Transfusion
1AP6-5, 6AP1-9, 6AP2-1, 6AP2-7, 6AP2-8, 6AP3-4, 6AP3-5
Transfusion, autotransfusion
6AP2-2, 6AP3-11
Transfusion, complications
ESAAP1-2
Transfusion, stored blood
ESAAP1-2
Uterus
2AP1-9, 14AP6-1
Uterus, blood flow
11AP3-9
Uterus, oxytocin
11AP3-6
Veins, cannulation
8AP8-5, 10AP2-4, 12AP2-2, 12AP5-8
Veins, subclavian
15AP2-4
Veins, venepuncture
3AP6-1, 15AP2-4
Ventilation, airway pressure
5AP3-7
Ventilation, anaesthetics
3AP6-4, 19AP6-6
Ventilation, hyperventilation
5AP4-4
Ventilation, hypoxic response
ESAAP1-3
Ventilation, intermittent positive pressure
5AP2-2
Ventilation, mechanical
3AP4-4, 3AP6-3, 5AP1-4, 5AP1-5, 5AP4-1, 5AP4-4, 12AP1-4, 12AP1-5, 12AP1-9, 12AP6-10, 12AP6-11
Ventilation, muscle, airway
5AP4-2
Ventilation, one-lung
5AP3-3, 5AP4-6, 9AP2-7
Ventilation, positive end-expiratory pressure
5AP2-3, 5AP3-5, 17AP3-1
Ventilation, postoperative
3AP6-7, 5AP1-7, 12AP6-10
Ventilation, spontaneous
3AP6-5, 3AP6-7, 12AP1-10
Ventilation, transtracheal
19AP2-7
Ventilation, ventilation-perfusion
5AP1-10, 5AP3-8, 5AP3-9, 5AP4-7
Vomiting, antiemetics
ESAPC1-2, 1AP1-2, 1AP1-1, 1AP1-3, 1AP1-7, 2AP1-6, 9AP3-6
Vomiting, nausea
ESAPC1-2, 1AP1-5, 1AP1-6, 1AP1-7, 1AP1-8, 2AP1-1, 2AP1-6, 9AP3-11, 14AP6-7, 17AP4-8
Vomiting, nausea, anaesthetic factors
1AP1-9, 10AP3-7
Vomiting, nausea, pathogenesis
14AP5-6
Vomiting, nausea, patient factors
1AP1-1, 1AP1-8, 1AP8-2
Vomiting, nausea, surgical factors
2AP2-2

AUTHOR INDEX

Abajas R. 15AP2-5
Abdel-Aziz M. 3AP1-4
Abdel-Ghaffar M. 3AP1-4
Abdo I. 3AP5-8
Abdouloussen A. 4AP8-6
Abe K. 4AP3-6
Abelha F. 1AP2-4, 1AP2-5, 1AP2-6, 1AP2-7, 1AP4-9, 1AP5-10, 5AP2-9, 14AP1-9, 17AP2-2, 17AP2-4, 17AP2-9, 17AP3-5
Abell D. 1AP3-6, 8AP5-1, 15AP3-1, 19AP1-7
Abidi S. 4AP2-6, 8AP3-3
Abiks S. 1AP3-6
Abimussi C. 8AP1-5
Abreo Ariza A. 1AP6-5
Absalom A. 3AP1-8
Abubakra S. 5AP4-5
Acan I. 12AP1-8
Adıyeke E. 12AP1-4
Adachi T. 9AP6-4
Adachi Y. 9AP4-5, 9AP4-9
Adamus M. 11AP5-8
Adell Perez A. B. 11AP2-2
Adelmann D. 6AP1-4
Adriano M. 11AP3-9
Agamez Medina G. 19AP2-4
Agani V. 15AP1-4
Aguiar I. 17AP3-2
Aguiar Tavares da Silva B. M. 8AP1-9, 9AP1-10
Aguilera J. L. 2AP2-10
Aguilera L. 6AP1-6
Agustí S. 19AP4-5
Ahishakiye D. 4AP6-1, 4AP6-10
Ahn H. J. 8AP4-2
Ahn W. S. 8AP6-2
Aho A. J. 3AP1-2
Ajimi J. 9AP6-5
Akın Takmaz S. 10AP3-9
Akaraviputh T. 2AP2-3
Akcevin A. 10AP2-8, 4AP3-9
Akdeniz F. 14AP1-11
Akgul A. G. 19AP6-11
Akihisa Y. 19AP1-1
Albokrinov A. 8AP8-2
Albrecht M. 7AP2-11
Alcaraz G. 18AP2-4
Alcorn D. 1AP6-4, 1AP7-5, 1AP7-6
Alcover L. 7AP2-5, 7AP2-8
Aldana Díaz E. M. 7AP3-4
Alday E. 5AP2-10
Alessi M. C. 7AP1-8
Ali W. 4AP8-10
Alilet A. 8AP2-2
Aliverti A. 5AP1-8
Alkan Bozkaya T. 4AP3-9
Allen J. 11AP5-7
Almahdi B. 1AP2-2
Almansa R. 12AP2-5
Almeida A. 9AP3-9
Almeida F. 11AP1-9
Almeida Lopes A. 6AP1-9, 10AP1-9
Almendral J. 4AP7-10, 8AP3-10
Almetwalli R. R. 19AP4-9
Almudena R. ESAAP2-6
Alomà R. 2AP2-2
Alsaeed A. 10AP3-2
Alsina E. 15AP1-1, 15AP3-3
Altman E. 19AP5-6
Alvarez J. C. 6AP1-6
Alvarez L. 8AP4-11
Álvarez J. C. 12AP5-8
Álvarez-Fuente E. 12AP2-5
Alves J. 1AP8-10
Alves Ribeiro B. 17AP2-7, 19AP5-11
Aly E. 10AP3-1
Amadeu M. E. 8AP6-7
Amaral J. 5AP4-8, 8AP5-8
Amat A. 17AP3-3
Amorim P. 1AP3-8, 9AP5-2, 19AP4-10
Amour J. 13AP2-6
Anadolu O. 14AP1-11
Anadón M. J. 4AP7-10
Ananth Manohar R. 6AP1-7
Ananthasayanam A. 6AP1-7
Anastase D. 8AP4-8
Anastassiou E. 1AP3-11
Anastassiou E. D. 12AP2-9, 12AP2-10
Ando H. 4AP5-6, 9AP5-1
Andoh T. 3AP6-3, 7AP3-1, 19AP1-1
André D. 18AP1-4
Andreu E. 19AP6-9
Andriola E. 11AP2-4
Andrzejowski J. 19AP5-1
Anesidis E. 8AP1-10
Añez Simón C. 15AP3-2, 19AP6-7
Anillo Lombana V. 2AP1-9, 3AP4-8, 11AP2-11
Ansell G. 17AP1-5
Antunes L. 9AP5-9, 7AP5-7, 9AP2-6
Antunes L. M. 7AP3-8
Antunes M. J. 17AP2-4, 17AP3-5
Antunes M. V. 1AP2-4, 1AP2-5, 1AP2-6
Antypin E. 1AP3-4, 14AP5-9
Antypina N. 1AP3-4
Aoki Y. 12AP2-8
Aoragh A. 19AP3-6
Aouad M. 11AP1-7
Apan A. 12AP2-3
Apan T. Z. 12AP2-3
Aparicio Rubio I. 6AP3-6
Apps S. 2AP2-4
Aragão I. 12AP3-9
Aragón S. 6AP2-8
Arai M. 4AP5-6, 17AP4-2
Arai T. 7AP2-1
Araki H. 14AP2-4
Araujo A. 11AP2-2
Araujo R. 1AP8-10
Araújo R. 1AP8-1
Araz C. 15AP1-5, 17AP3-6
Arazo Iglesias I. 1AP7-11
Arbelaez Arango A. 1AP6-5
Archidona A. 3AP2-3
Arede M. J. 1AP4-8, 4AP6-8, 9AP3-7
Arellano M. 8AP4-11
Arellano Pulido M. 17AP4-8, 9AP2-7
Arellano Pulido R. 17AP4-8
Argilaga M. 12AP4-6
Arguis M. J. 19AP4-1
Arici G. 5AP4-9
Arima Y. 14AP5-1
Arimany J. 17AP2-5
Ariño Irujo J. J. 13AP1-2
Armero R. 12AP6-11
Arnal A. 1AP5-4
Arnal D. 19AP2-4, 5AP4-4
Arnalich A. 4AP7-5
Arnold G. 1AP4-7
Arora S. 1AP7-10
Arribas-Perez P. 12AP6-7
Arroyo R. 6AP3-3
Arslantaş M. K. 3AP5-7
Arslantaş R. 3AP5-7
Asaka W. 3AP4-1
Asakura A. 1AP8-7
Asamoto M. 14AP2-11
Asbert R. 6AP2-7
Asencio J. M. 4AP7-8
Asghar S. 8AP2-5
Assoc. Prof. Grintescu I. 14AP6-5
Assunção J. P. 1AP4-8, 4AP6-8, 9AP3-7
Atallah F. 1AP3-7
Atef H. 3AP1-4
Avdeev S. 5AP3-6
Avidan A. 17AP3-4
Avilez Padilla T. S. 6AP2-9
Awada W. 3AP5-5
Axiotis G. 4AP5-2
Aya H. 1AP6-6
Ayrian E. 7AP3-6
Azarsina H. 19AP3-2
Azcona M. 11AP2-2
Azparren G. 3AP5-1

Başar H. 10AP3-9
Bakola A. 1AP8-6
Baban M. 11AP3-5
Backman J. T. ESAAP1-1
Badenes R. 7AP2-5, 7AP2-8
Badiger S. 2AP2-4
Bae H. 12AP1-7
Baek J.-S. 9AP4-3
Baek J. 19AP4-2
Baek S.-H. 9AP2-1
Bai S.-J. 3AP5-4, 8AP3-1
Baik S.-W. 9AP2-1
Bakan M. 19AP3-7
Balaguer J. 1AP5-8, 3AP3-1, 3AP6-4
Balaguer Doménech J. 19AP4-7
Balbino M. 8AP8-4
Balcan A. 8AP3-9, 14AP7-4, 14AP7-6, 14AP8-8
Baldeon E. 14AP6-10
Baldó J. 2AP1-11, 8AP1-8, 12AP6-11
Baliuliene V. 11AP5-6
Ballesteros M. A. 15AP2-5
Baltacı B. 10AP3-9
Baltsavias I. ESAAP1-2
Bandekela P. 6AP1-8
Bang S. R. 1AP5-5, 1AP8-9
Baños V. 12AP4-6
Banovska J. 11AP4-5
Baptista A. 19AP5-11
Baraggia P. 8AP8-5
Barata A. 19AP5-3
Barbero Roldan L. 19AP6-7
Barlavie Y. 12AP4-9
Barr R. 17AP1-1
Barri J. 2AP2-2
Barrio I. M. 8AP8-6
Barrio J. 9AP3-3
Barthel G. 12AP1-2
Barthélémy C. 9AP3-1
Baskakov D. 1AP1-1
Basora M. 6AP1-10
Bastida E. 19AP4-5
Bataller A. 17AP2-5
Batista A. 1AP8-11, 11AP3-10, 14AP2-10
Bauer I. 4AP8-11
Bauer M. 1AP5-3
Baulig W. 3AP5-6
Baumann H. 4AP5-5
Baumgarten G. 3AP1-9
Bausili J. M. 18AP2-3
Bayo M. 2AP2-2
Baysal A. 9AP1-9, 12AP4-11
Beaulieu P. 10AP3-8
Beauval J. B. 1AP3-7
Becerra Á. 1AP5-6

Beck C. 4AP8-11
Beck Schimmer B. 8AP3-8
Beckers K. 14AP8-1
Bedalli F. 10AP1-2
Beiderlinden M. 12AP4-8
Beilstein B. 2AP2-1
Bein B. 4AP8-7, 7AP2-11, 14AP7-8, 19AP3-4
Bekker A. 7AP4-1, 7AP4-2
Belda F. 4AP6-6
Belda F. J. 5AP3-4, 5AP3-8, 5AP3-9, 15AP1-6
Belda Nacher F. J. 7AP2-5, 7AP2-8
Belikov V. 5AP1-2
Bellanti F. 9AP5-7
Bellido Estévez I. 7AP3-4
Belviranlı M. 9AP4-7
Ben Ameur W. 14AP1-8
Ben Hassen K. 11AP3-4
Ben Jazia K. 9AP3-11
Benet J. 17AP2-5
Benigni A. 10AP2-10
Benigni A. M. 10AP2-10
Ben-Israel N. 3AP2-7
Benítez Linero I. 10AP1-3
Benito P. ESAAP2-6
Benito Saz P. 5AP2-8
Benn J. 1AP4-7
Bennett A. 18AP2-2
Bentley A. H. 5AP1-4
Beqiri V. 10AP1-2, 18AP1-2
Berger S. 3AP2-2
Bergeron A. 10AP3-8
Bermejo J. 12AP2-4
Bermell Herranz I. 6AP3-5
Bermúdez López M. 2AP2-10
Bernardino A. 6AP1-9, 10AP1-9
Berti Ramos L. 8AP1-3
Betancor V. D. 1AP5-6
Betbesé A. 12AP4-6
Biber B. 14AP4-2
Bicalho G. P. ESAAP1-5
Billieux M.-H. 11AP3-4
Bilotta F. 1AP2-1, 7AP1-3, 7AP3-6, 10AP1-6, 12AP6-4
Bilskiene D. 10AP2-1
Binagui A. 19AP4-3
Bindelle S. 5AP2-2
Biri B. 12AP1-3
Biro P. 3AP5-6
Bisbe E. 6AP3-3, 17AP2-5
Biscoping J. 4AP5-5
Bishop P. 12AP4-3
Bismarck A. 1AP3-8
Bjerregaard J. 8AP1-1
Bjerregaard L. 8AP2-5
Bjertnaes L. 5AP2-7
Björne H. 3AP4-4, 3AP4-5
Blaha J. 11AP4-7
Blanco J. A. 8AP8-6
Blanco T. 19AP3-5
Blazquez E. 6AP2-9
Blázquez E. 17AP4-7
Blobner M. 7AP1-5, 9AP4-4, 12AP5-6
Block L. 14AP4-2
Blumenstiel J. M. 4AP1-6, 4AP1-7, 4AP7-4, 4AP8-5
Bluth T. 12AP1-10
Bobyr A. 19AP3-3
Bocchi L. 8AP2-4
Böck V. 4AP4-2
Bocos J. 3AP1-7
Boeckx S. 4AP1-3
Boehme S. 5AP1-4, 12AP1-9
Boer C. 4AP1-4, 4AP3-10
Boer W. 14AP3-3, 14AP4-1
Boettner F. ESAPC1-6
Bogdanovich A. 8AP7-9
Böhme S. 3AP5-3
Boland B. 12AP4-5
Boly C. A. 4AP3-10
Bonnet A. 11AP5-5
Bonvini J. M. 8AP3-8
Boomers O. 19AP6-1
Boonburapong P. 5AP2-6
Bopp C. 1AP6-7
Borba V. 6AP2-10
Borgeat A. 8AP3-8
Borges A. R. 19AP5-3
Borges J. 1AP2-7, 14AP1-9
Borges L. 17AP3-8
Borges R. 9AP3-9, 19AP2-10
Borges S. 19AP6-8
Borisok K. 7AP2-4
Borozdina A. 1AP2-1
Borras Ramírez R. 15AP3-2
Borrat X. 3AP2-6
Borys M. 7AP4-8, 9AP4-1, 9AP4-2
Botros S. 10AP3-1
Bouchez S. 4AP2-1, 4AP2-4, 4AP2-5, 4AP3-7
Bouhlel A. 8AP3-3
Boulogne P. 10AP3-8
Bouslama A. 9AP3-11
Bouts B. 12AP3-11
Bouwman R. A. 4AP1-4, 4AP3-10
Bouzouita W. 4AP2-6
Boyko M. ESAPC1-1, 7AP1-1, 12AP5-1
Bragança J. P. 12AP3-9
Bramma Y. L. 1AP7-5, 1AP7-6, 1AP6-4
Brandes I. 1AP5-3
Brandner B. 1AP2-2, 11AP5-3
Bräuer A. 1AP5-3
Braun P. 13AP1-4
Braun S. 8AP4-4
Braune A. 5AP4-7, 12AP1-1
Braz J. R. C. ESAAP1-5, 17AP2-3
Braz L. G. ESAAP1-5, 17AP2-3
Bretschneider M. 7AP3-5
Briceño García M. J. 1AP7-1
Brito O. 4AP4-7
Broch O. 4AP8-7
Brøchner A. C. 13AP2-3
Brogly N. ESAAP2-4, 3AP4-8, 5AP2-1, 11AP2-7, 11AP2-11, 11AP4-8, 15AP1-1, 15AP1-2, 15AP3-3, 17AP3-7, 18AP2-8
Brouqui T. 17AP3-1
Brown J. 10AP3-3
Bruder N. 7AP1-3, 7AP1-8, 12AP6-4
Brueckmann B. 9AP1-5
Bruqi B. 14AP6-11
Bruzzese A. 11AP2-4
Buckley A. 13AP1-6
Budde A. 19AP5-4
Budnyuk O. 19AP3-3
Bueno Izquierdo A. B. 1AP5-4
Buggy D. 9AP2-11
Buj I. 3AP2-5, 1AP8-8
Bukarev A. 4AP7-1
Bukauskas T. 10AP2-1
Bunchungmongkol N. 14AP8-9
Bunjaku D. 14AP6-7
Burg Y. 11AP5-5
Burkhard F. C. 4AP8-8, 6AP2-4, 8AP3-4
Busquets C. 8AP7-9
Bussemi C. B. 2AP1-8
Butin G. 4AP5-3, 4AP5-7
Bythell V. 1AP5-1

Cabral R. 13AP1-7, 17AP3-9
Cacho E. 7AP5-4, 14AP5-2
Cadiere G. B. 19AP3-6
Cahisa Mur M. 8AP6-5
Cakici S. 5AP4-9
Cakovska M. 11AP2-5
Caldas S. 19AP5-8
Calderon E. 11AP4-6
Calixto L. 2AP2-11
Caló M. N. 8AP6-1
Calvo J. M. 15AP1-1
Camkiran A. 15AP1-5
Campanero M. A. 14AP5-2
Campos S. 9AP5-9
Campos Arillo V. 7AP3-4
Camps A. 12AP5-9
Canal Alonso M. I. 17AP4-8
Candela-Toha A. 12AP6-7
Canet J. 17AP4-3
Cannesson M. 4AP6-2
Capogna G. 11AP2-4, 11AP4-4
Carbonell J. A. 5AP3-4, 5AP3-8, 5AP3-9
Carev M. ESAPC1-4
Caridade M. 19AP5-8
Carillion A. 13AP2-6
Carmona Aurioles J. 19AP2-11
Carneiro J. 11AP3-9
Carneiro S. 8AP4-1
Carrascosa F. 14AP5-2
Carrion J. L. 9AP3-3
Carstens A. 4AP8-7
Cartsens A. 19AP3-4
Carvalhas J. 13AP1-7, 17AP3-9
Carvalho A. C. G. 14AP1-2
Carvalho I. 9AP1-10
Carvalho J. 7AP1-7
Carvalho L. 4AP5-9
Carvalho N. 5AP4-7
Casas J. I. 10AP2-3
Casielles J. L. 6AP2-9
Cassinello C. 6AP2-8
Castana O. 8AP1-10
Castellví A. 12AP4-6
Castrillón S. 3AP5-1
Castro A. 8AP6-4, 11AP2-10
Castro D. 1AP8-5, 10AP3-5, 19AP6-8
Catala E. 14AP2-5
Catré D. 4AP6-8
Cattano D. 19AP3-8
Cavalcanti I. L. 14AP1-2
Cecconi M. 1AP6-6
Celebi A. 2AP1-2
Cepeda M. C. 11AP2-2
Cerny V. 3AP5-8
Cervantes O. 17AP4-3
Cervantes Rodón O. 17AP1-7
Chan M. 9AP2-8
Chandon M. 11AP5-5
Chandralekha C. 1AP7-9
Chandrasena A. 2AP2-4
Chang J. 8AP6-3
Chang J.-H. 7AP5-10
Chang Y. J. 4AP8-2
Chapellas C. 11AP4-2
Charuluxananan S. 5AP2-6
Chassot O. 8AP1-2
Chatten K. 1AP2-2
Cheah C. 12AP4-3
Chemchikh H. 4AP2-6
Chen C.-M. 14AP4-9
Chen G. S. 9AP5-8
Chen G. 4AP6-2
Chen J.-S. 5AP4-6, 11AP5-10
Chen K.-B. 7AP5-10
Chen Y. 9AP2-8
Chen Y.-H. 11AP5-10
Cheng C. 9AP2-8
Cheng Y.-J. 5AP4-6, 11AP5-10
Cheol L. 14AP7-1
Cherng C.-H. 19AP3-1
Cherpakov R. 4AP1-1

Chhabra S. 14AP1-3
Chiu C. 17AP1-9
Chiu K. M. 7AP4-6
Chizhtevskaya S. 9AP1-4
Chng J. 4AP4-6
Cho Y. Y. 4AP8-2
Chocrón I. 12AP1-11
Choi B. M. 3AP2-1
Choi E. S. 8AP6-2
Choi E. 19AP4-2
Choi I.-Y. 7AP3-2
Choi J. H. 1AP5-5, 1AP8-9
Choi J. I. 14AP3-4
Choi J. W. 8AP4-2
Choi K. T. 3AP2-1
Choi S.-H. 3AP5-4
Choi S. 10AP1-4
Choi Y. J. 1AP5-2
Choi Y. 19AP6-3
Christodoulaki K. 11AP1-4
Chu C.-C. 1AP4-5, 8AP5-6, 14AP4-9
Chu S. H. 7AP4-6
Chui P. 17AP1-9
Chumpathong S. 11AP1-1
Chung C.-J. 10AP1-4
Chung E. 4AP6-2
Chung Y.-K. 9AP6-1
Chutipongtanate A. 2AP2-3
Cindea I. 14AP7-4, 14AP7-6
Cîndea I. 8AP3-9, 14AP8-8
Cinnella G. 9AP5-7
Ciobanasu R. 12AP6-3
Ciric A. 1AP1-4
Clavey M. 4AP2-7, 4AP2-8
Clayton R. 8AP5-2
Cobrado L. 7AP1-7
Codreanu O. 12AP5-3
Coelho A. 6AP2-10
Coelho R. 4AP5-9
Cohen S. 2AP2-8
Coimbra A. M. 9AP2-6
Colilles C. 4AP6-5
Colilles Calvet C. 13AP2-2
Collins M. 4AP6-7
Colomina M. J. 6AP2-8
Colomina M. 13AP1-3
Colomina Soler M. J. 1AP6-5
Conceição L. 15AP3-5, 15AP3-6, 15AP3-7
Conde R. 8AP6-4, 8AP8-7
Consoletti L. 14AP2-6
Contreras López L. 6AP3-5
Contreras- López L. 6AP3-6
Coquin J. 4AP8-6
Cordeiro L. 1AP8-11, 11AP3-10
Corr M. 14AP3-10
Cortés X. 2AP1-11
Cortesão J. 1AP3-10, 19AP5-3
Cortez J. 14AP2-10
Coskunfirat N. 5AP4-9
Costa A. 14AP8-4
Costa D. 19AP5-8
Costa Reverté M. 6AP3-6
Costea D. 8AP3-9, 14AP8-8
Coutinho P. 1AP8-5
Cox E. 14AP8-2
Craenen A. 19AP2-1, 19AP2-8
Crawford M. 10AP3-7
Crivits M. 1AP6-1
Cros J. 10AP3-8, 11AP4-2
Cruz A. 9AP3-9
Cruz R. 1AP5-6
Cruz S. 17AP2-4, 17AP3-5
Cucereanu Badica I. 14AP6-5
Cuendet G. 19AP6-10
Cuesta Montero P. 12AP2-2
Cunha R. A. 7AP3-8
Cuper N. J. 10AP2-4
Cuvas O. 12AP2-3
Czarnetzki C. 9AP1-1
Czosnyka M. 7AP4-10
Czuczwar M. 7AP4-8

Dıncer E. 12AP1-4
Dagıstan G. 5AP4-9
Dahl J. B. 8AP1-1
Dal D. 4AP7-6
Dalal P. 19AP5-4
Dambach M. 3AP5-6
Dambrosio M. 9AP5-7, 14AP2-6
Danninger T. 8AP7-7, 17AP4-6
Dantas Rodrigues P. 8AP8-4
D'Antini D. 14AP2-6
Darcın K. 10AP2-8
Darlong V. 1AP7-9
Dartigues J. F. 18AP1-4
Dasan J. 19AP5-7
Dasan J. K. 19AP1-7
Daukste M. 6AP1-2
Davidova N. 11AP5-4
Davies S. 3AP3-8
De Andres J. 8AP1-8
De Cooman S. 3AP6-2
De Cooman S. D. 3AP6-6
De Deyne C. 4AP5-10, 12AP3-11, 12AP5-10
De Diego C. 8AP3-10
De Graaff J. 10AP2-4
De Hert S. 4AP1-3, 1AP6-1, 3AP1-5, 3AP1-8, 4AP2-1, 4AP2-4, 4AP2-5, 4AP3-7, 4AP5-1
De Hert S. G. 17AP1-2
De Kock M. 9AP2-3, 12AP4-2, 12AP4-5
De La Gala F. ESAAP2-6
De La Gala Garcia F. 5AP2-8
De La Puente N. 5AP2-10
De Miguel M. 12AP5-9, 18AP2-4
De Molina Fernández I. 15AP3-2, 19AP6-7
De Nadal M. 12AP1-11, 12AP5-9
De Naeyer S. 14AP2-7
De Salvo G. 1AP7-2
De Somer F. 4AP5-1
De Steiger R. 18AP2-1
De Ville A. 6AP1-1, 6AP3-1
De Vooght P. 14AP2-2
De Wolf A. 3AP6-2, 3AP6-6
Debaene B. 1AP6-3, 9AP3-1
Décaudin B. 9AP3-1
Deepak K. K. 1AP7-9
Defresne A. 5AP2-2
Del Blanco B. 4AP7-10, 15AP1-1
Del Cañizo J. F. 4AP1-9
Del Santo S. 8AP8-4
Delaporte A. 4AP1-8
Delatte P. 11AP4-5
Delgado- Baeza E. 4AP7-5
Delgado-Baeza E. 4AP1-9
Delgado-Martos M. J. 4AP7-5
Demeere J.-L. 3AP6-6
Demidova V. 4AP7-1
Demoulin B. 12AP1-2
Dens J. 4AP5-10, 12AP3-11, 12AP5-10
Denys W. 4AP5-1
Deodati R. 8AP2-4
Deraemaecker R. 8AP1-7
Derbent A. 14AP1-11
De-Sousa M. 1AP8-8, 3AP2-5
DesRoches J. 11AP1-2
Devillier P. 5AP4-2
Dewitte A. 4AP8-6
Dhir S. 8AP1-6
Dhouib F. 8AP3-3
Di Foggia T. 14AP2-6
Di Fraia M. 2AP1-8
Di Francesco N. 14AP2-6
Di Luca J. J. 8AP2-6
Di Trani M. 11AP2-4
Diana M. A. 17AP2-1
Diaz Martinez A. M. 19AP2-11
Diaz Martinez J. C. 19AP2-11
Díaz Rodríguez D. 17AP4-7
Dieleman J. M. 7AP1-2
Diez F. 5AP3-5
Diez-Lobo A. 6AP2-8
Dima S. O. 5AP3-7
Dimitriadis G. 14AP6-3
Dimitriou V. 9AP6-10, 19AP1-11
Dinant V. 12AP4-2
Dincer E. 12AP5-4
Dingley J. 5AP1-6
Dittmann A. 3AP1-9
Djemel W. 8AP3-3
D'Lima D. 1AP4-7
Do S.-H. 9AP4-3
Do Nascimento Jr. P. 8AP1-3, 8AP1-5
Doberenz D. 12AP3-2
Dogukan M. 9AP1-9, 12AP4-11
Doko P. 10AP1-2
Domi R. 18AP1-2
Domínguez Cenzano L. 19AP6-2
Dominguez Ruiz-Huerta A. 15AP3-3
Dondapati S. 11AP3-5
Dong P. 6AP2-6
Doronzio A. 7AP3-6
Dotsenko V. 9AP5-5
Douglas J. O. 5AP1-6
Douglas P. 5AP1-6
Douglass J. 19AP5-1
Douka V. 8AP1-7
Douma A. 19AP1-11
Dovbysh N. 7AP1-6
Dre K. 19AP1-6
Droc G. 5AP3-7, 12AP6-3
Drugova I. 18AP2-9
Drury N. 1AP6-9
Duaso E. 18AP2-3
Dubilet M. ESAPC1-1
Dubuis C. 4AP4-9
Duez C. 19AP4-8
Duffin J. 3AP4-6
Dufur M. 14AP6-10
Duger C. 14AP2-9
Dumitrascu M. 12AP6-9, 14AP7-7
Dunsire F. 4AP8-10
Duque P. 8AP4-11
Durá M. J. 15AP2-5, 15AP2-6
Durán L. 6AP2-8
Durán Gimenez-Rico L. 6AP3-9
Dürsteler C. 14AP1-5
Dusch M. 2AP2-1
Duta L. 14AP6-5
Dyomin S. 12AP5-5

Eberle B. 5AP1-9, 5AP1-10
Ebm C. 1AP6-6
Echehoumi H. 9AP3-11
Edanaga M. 8AP2-7
Eden-Green B. 11AP2-1
Edgar S. 15AP2-3
Edinger H. 14AP5-4
Edry R. 3AP2-7
Egeler C. 8AP2-9, 8AP7-3
Egi A. 14AP2-1
Egi M. 6AP2-1
Eguchi K. 3AP6-3
Eguchi S. 9AP2-2
Eichenberger U. 8AP5-3
Eikermann M. 9AP1-5
Eipe N. 19AP2-1
Ejiri K. 18AP2-5

Ekinci O. 12AP1-4, 12AP5-4
Ekpa J. 1AP6-2
El Zein R. 4AP6-7
Eleveld D. J. ESAPC1-3
Elezovic N. ESAPC1-4
Elguezábal Sangrador G. 6AP3-5
Elia N. 8AP5-5, 9AP1-1
Elías-Martín E. 12AP6-7
Elicegui A. 8AP4-11
Elkadi H. 3AP5-5
Ellerkmann R. 3AP1-9, 3AP2-8
Elmér E. 7AP4-9
Elving L. 14AP6-1
Emamdee R. 8AP8-5
Embrecht B. 4AP1-3
Emtell P. 3AP4-5
Endo T. 19AP2-3
Engel H. 12AP4-5
Enk D. 19AP2-6
Erdogan C. 10AP2-8
Erol A. 9AP1-6, 19AP1-2
Ertas Z. 19AP3-7
Ertelt-Delbridge C. 9AP4-4
Escolano F. 14AP1-5
Esen A. 19AP3-7
Eski E. 19AP5-10
España L. 5AP3-5
Espinosa N. 1AP5-4, 10AP2-3
Espinosa Roncancio J. 6AP3-5
Espinoza X. 8AP1-4
Esquenazi Najman I. 8AP1-3, 8AP1-5, 10AP3-6
Et T. 9AP1-6
Eti Z. 4AP7-6
Evgeny B. 7AP1-1

Fabregas N. 7AP1-3, 7AP5-11, 12AP6-4
Faggiani S. 17AP4-6
Fagundes F. 4AP5-9
Faisy C. 5AP4-2
Faraoni D. ESAAP1-2, 6AP1-1, 6AP1-8, 6AP3-1
Farías López R. D. I. A. 1AP7-1
Farre Nebot V. 19AP6-7
Farré Tebar C. 12AP5-8
Fassoulaki A. 14AP6-6
Fava J. 14AP2-5
Fawezy M. 3AP5-5
Fedotyshkina K. V. 5AP3-6
Fekete S. 10AP1-10
Feldman D. 3AP6-5
Feldman R. 3AP6-5
Feldman S. 13AP2-6
Feldman U. 3AP6-5
Félix L. 9AP2-6, 9AP5-9
Fellahi J.-L. 3AP3-4, 3AP3-5, 4AP5-3, 4AP5-7
Feng X. 12AP2-7
Fenzl T. 7AP4-4
Ferjani M. 12AP3-1
Fernandes C. 12AP4-10
Fernandes P. 5AP4-8, 8AP5-8
Fernandes R. 17AP3-2
Fernandez L. 19AP4-11
Fernández Alguacil A. 10AP1-3
Fernández Cortés A. I. 15AP1-7
Fernandez Francos S. 11AP4-8
Fernández Jiménez J. 17AP4-7
Fernández-Criado C. 4AP7-5
Ferrandiz M. 14AP2-5
Ferrando C. 5AP3-4, 5AP3-9
Ferreira D. A. 9AP5-2
Ferreira H. 4AP8-9
Ferreira J. 8AP1-5
Ferreira N. 7AP1-7, 11AP1-9
Ferreira P. 6AP1-9, 13AP2-4
Ferreira P. R. 10AP2-9
Ferreira T. 1AP4-8, 4AP6-8, 9AP3-7, 14AP2-8, 8AP1-9
Fesenko U. 8AP8-2
Fiala A. 13AP1-4
Figueiredo J. 5AP4-8, 8AP5-8
Figueiredo P. 12AP4-10, 17AP2-8
Filos K. 12AP2-10
Filos K. S. 9AP1-7, 11AP2-9, 12AP2-9, 12AP2-11
Fink H. 9AP4-4, 12AP5-6
Finlay J. 8AP8-5
Fino C. 8AP5-8
Fischer M.-O. 3AP3-4, 3AP3-5, 4AP5-3
Fischler M. 3AP3-7, 11AP5-5
Fisher J. 3AP4-6
Fisher M.-O. 4AP5-7
Fita G. 4AP6-5, 19AP4-1
Fitzpatrick G. 17AP1-1
Flaris N. 11AP2-9
Fleischut P. 17AP4-6
Fleming I. 6AP2-2
Fleureau C. 4AP8-6
Fligou F. 12AP2-9, 12AP2-10, 12AP2-11
Flores Mohedano R. 8AP5-7
Floriano B. 8AP1-5
Floros I. 4AP7-9
Foerster U. 12AP5-6
Foinard A. 9AP3-1
Folhadela Faria T. 17AP3-8
Follin A. 3AP3-7
Fomsgaard J. S. 8AP1-1
Fonseca J. 13AP1-7
Fonseca Moreira J. 1AP2-7, 17AP2-9
Font A. 10AP2-3
Fonte A. 10AP3-5, 12AP4-10, 17AP2-8
Fop E. 13AP1-4
Ford S. 8AP2-9
Ford S. M. 8AP7-3
Forget P. 9AP2-3, 12AP4-2, 12AP4-5
Fot E. 5AP2-7, 5AP4-1
Fotopoulou G. 19AP1-6
Foulon P. 11AP2-3
Found P. 1AP3-6
Fourcade O. 1AP3-7
Fournier R. 8AP1-2
Fox V. 19AP6-1
Fragoso P. 8AP6-6
France M.-N. 14AP5-8
Francksen H. 19AP3-4
Franco S. 11AP3-11
Frank J. 3AP6-1
Frantal S. 6AP1-4
Frasca D. 1AP6-3
Fraser J. 5AP2-4, 19AP5-1
Freiberga I. 6AP1-2
Freitas S. 1AP8-1, 1AP8-10
Fret T. 8AP7-4
Frey K. 8AP5-3
Freyder L. 17AP2-1
Frigui W. 4AP2-6
Frikha M. 8AP3-3
Frykholm P. 5AP1-8
Fudickar A. 14AP7-8
Fuertes Olivera A. 8AP5-7
Függer R. 4AP4-2
Fujii S. 4AP2-3, 6AP3-7
Fujii Y. 4AP2-3, 6AP3-7
Fujimoto T. 4AP2-9
Fujisawa S. 9AP6-4
Fujiwara S. 4AP7-2, 17AP1-10, 19AP4-4
Fujiyoshi T. 7AP2-9
Fukusaki M. 14AP2-4
Funai Y. 14AP3-5
Funaki K. 9AP3-4
Funakoshi K. 14AP4-5
Furumoto K. 9AP1-3
Gabaldón Conejos T. 8AP5-7
Gabarrell M. A. 1AP1-7
Gago Quiroga S. 17AP4-8
Galán J. 3AP5-1
Galanou L. 8AP4-7
Gallagher H. 9AP2-11
Galletti C. 1AP7-2
Gama de Abreu M. 5AP4-7, 12AP1-1, 12AP1-10
Ganapathy S. 8AP1-6
Gandara Carrasco V. 17AP4-7
Gani H. 10AP1-2, 18AP1-2
Garcia A. 18AP2-3
Garcia C. 15AP1-2
Garcia M. J. ESAAP2-6
García J. 6AP1-6
García R. 5AP3-5
Garcia del Valle S. 5AP4-4, 19AP2-4
García Huete L. 6AP3-5
Garcia Londoño A. 12AP4-4
Garcia londoño A. F. 13AP2-2
Garcia Martinez I. 8AP6-5
Garcia Padilla E. 13AP2-2
García Padilla E. 12AP4-4
Garcia Rodriguez M. J. 5AP2-8
García-Alvarez M. 12AP4-6
García-Jaramago J. L. 1AP8-8
Garcia-Lopez J. 14AP1-4
García-Olmo D. 17AP2-6
García-Orellana M. 12AP5-8
García-Pérez M. L. 5AP3-8, 5AP3-9
Garratt C. 6AP2-2
Garry D. 1AP6-2
Garutti I. 4AP6-9, 4AP7-7, 5AP1-7, 5AP4-5, 8AP4-11
Garutti Martínez I. 3AP4-7, 9AP2-7
Garví López M. 12AP2-2
Gashi S. 15AP1-4
Gätke M. R. 17AP1-3, 9AP3-10
Gavrilov A. 19AP5-6
Gavrychenko D. 6AP1-3
Gazenkampf A. 7AP1-6
Gebhardt V. 2AP2-1
Gecaj-Gashi A. 14AP6-11
Geib J. 12AP4-8
Geiger P. 8AP4-8
Geisen M. 1AP6-6
Genove M. 14AP2-5
Genovese A. 1AP7-2
Gent L. 11AP3-2
George R. 11AP1-2
Georges P. 14AP7-9
Georgiou P. 9AP1-7
Gérard J.-L. 3AP3-4, 3AP3-5, 4AP1-10, 4AP5-3
Gerasimov N. 9AP5-10
Gerber D. 5AP1-9
Gerbershagen M. U. 6AP3-2
Germay O. 4AP1-8, 4AP6-1, 4AP6-10
Gerner P. 8AP7-7
Gharsallah H. 12AP3-1
Gherghina V. 14AP7-4, 14AP7-6
Gherghina V. I. 8AP3-9, 14AP8-8
Giabbiani R. 8AP2-4
Gil Bona J. 1AP7-11, 8AP4-6, 18AP2-6
Gil Ortega J. 8AP5-7
Gillan C. 15AP2-3
Gil-Monte P. 15AP1-8
Gilsanz F. ESAAP2-4, 2AP1-9, 3AP4-8, 5AP2-1, 11AP2-7, 11AP2-11, 11AP4-6, 11AP4-8, 15AP1-1, 15AP1-2, 15AP3-3, 17AP3-7, 18AP2-8
Giménez.Milà M. 19AP4-1
Gimeno Megias M. 2AP1-9
Gin T. 9AP2-8, 17AP1-9
Gjyliqi R. 15AP1-4
Gjyzari A. 12AP3-5, 12AP3-6

Glinavou A. 9AP6-10
Go Y.-K. 4AP4-8, 8AP4-5
Göğüş Y. 4AP7-6
Goffard P. 11AP4-5
Goffin P. 5AP2-2
Goh S. Y. 11AP3-7, 12AP6-1
Gok N. C. 19AP3-9
Gokay N. S. 8AP4-9
Gomar C. 14AP6-2, 19AP4-1
Gomes B. 1AP3-8, 8AP6-7
Gomes C. 8AP6-6
Gomes L. 1AP8-5, 10AP3-5, 19AP6-8
Gomes V. 4AP6-3
Gomes Lavinas P. S. 10AP3-6
Gomes Pereira S. M. 19AP4-10
Gomez E. L. 17AP2-5
Gomez J. L. 5AP3-8
Gomez L. 3AP6-4
Gómez A. 4AP6-6
Gómez E. 12AP2-4
Gómez L. 1AP5-8
Gomez Builes J. C. 8AP7-9
Gómez Diago L. 19AP4-7
Gómez Rois M. 2AP2-10
Gómez-Herreras J. I. 12AP2-4
Gómez-Sánchez E. 12AP2-5
Gonçalves A. 6AP2-10
Gonullu M. 14AP8-10
Gonzalez M. C. 4AP7-5
González A. M. 10AP2-7, 15AP2-5, 15AP2-6
González R. 5AP3-5
González S. 15AP2-5, 15AP2-6
González García T. 19AP4-5
González Nuñez M. 15AP1-7
Gonzalez Perrino C. 6AP3-9
González Perrino C. 13AP1-2
González-Panizo J. 4AP7-10, 8AP3-10
Goose A. 1AP6-2
Gorczyca P. 15AP1-8
Gordo Lacal F. 8AP6-1
Gormakova E. 7AP5-9
Goto T. ESAPC1-2, 1AP8-7, 4AP4-10, 7AP3-1, 7AP3-10, 11AP1-3
Goudra B. 2AP2-9
Gousia C. 14AP1-7
Gouveia H. 10AP3-6
Govindarajan S. R. 1AP7-9
Gracia I. 7AP5-11
Graiño Garcia B. 5AP4-4
Grande Muñoz G. M. 4AP7-7
Graser B. 3AP4-2
Grassin-Delyle S. 5AP4-2
Gravannis A. 9AP6-10
Gray C. 1AP6-4
Grazina M. 9AP2-10
Grebenchikov O. 4AP1-1, 7AP2-4
Gredilla E. 11AP2-7
Green Heredia C. 7AP3-4
Grenet M. 5AP4-2
Grensemann J. 6AP3-2
Gries G. 1AP5-3
Griffin M. 13AP1-6
Grigoriev V. 7AP2-3
Grimberg S. 7AP3-5
Grintescu I. 8AP5-9, 12AP6-9, 14AP7-7
Grintescu I. C. 8AP4-10, 8AP6-9
Grintescu I. M. 8AP4-10, 8AP6-9
Gritsan G. 7AP1-6
Grobara P. 9AP1-5
Grogan H. 2AP1-3
Gronchi F. 4AP4-9
Grosam M. 19AP5-5
Grossgasteiger M. 3AP4-2
Grosu I. 14AP1-6, 14AP7-9
Groves P. 6AP2-2
Gruber S. 3AP5-3
Gruenbaum B. F. ESAPC1-1, 7AP1-1, 12AP5-1
Gruenbaum S. E. ESAPC1-1
Gruenewald M. 4AP8-7, 14AP7-8
Grundmann U. 19AP1-8
Gruyters I. 14AP2-2
Grytsan A. 7AP1-6
Gu G. 18AP2-1
Guadalajara H. 17AP2-6
Guasch E. ESAAP2-4, 5AP2-1, 11AP2-7, 11AP2-11, 11AP4-6, 17AP3-7
Guasch Arevalo E. 11AP4-8
Guedes de Pinho P. 9AP5-2
Guedez L. A. 1AP7-1
Gueldner A. 12AP1-1
Guenther U. 3AP1-9
Guermazi J. 14AP1-8
Guilera N. 4AP6-5
Guimarães R. 19AP3-11
Guisasola M. E. 4AP1-9
Güldner A. 5AP4-7, 12AP1-10
Gupta A. 1AP7-10
Gupta M. 10AP3-3
Gupta P. 2AP1-3, 10AP3-3
Gurevich A. 19AP5-6
Gurkan Y. 8AP8-8, 19AP3-9, 19AP6-11
Gürler M. 17AP3-6
Gursoy S. 14AP2-9
Gutierrez A. 5AP3-4, 5AP3-8, 5AP3-9
Gutiérrez S. 12AP2-4
Gutiérrez-Junco S. 12AP2-5
Gutor T. 8AP8-2
Gvozdenović A. 8AP5-4
Gwak J. 2AP1-1

Habicher M. 3AP3-6
Hachoue Z. 8AP2-6
Hacking M. 17AP1-4
Hacquebard J.-P. 4AP6-10
Hadorn F. 4AP4-9
Hadzilia S. 8AP6-8, 14AP7-10
Hagberg C. 19AP3-8
Hagen O. A. 4AP4-3
Hagihira S. 3AP1-2
Hahn M. 14AP7-2
Haile M. 7AP4-1, 7AP4-2
Hall R. 3AP5-8
Hallbäck M. 3AP4-4, 3AP4-5
Hällsjö Sander C. 3AP4-4, 3AP4-5
Ham S. Y. 1AP1-9, 4AP4-1
Hamada H. 9AP5-6
Hamada T. 14AP3-5
Hamaekers A. 19AP2-6
Hamdani M. 8AP1-2
Hamilton K. 12AP4-3
Hannivoort L. N. ESAPC1-3
Hanouz J.-L. 4AP1-10, 3AP3-4, 3AP3-5, 4AP1-2, 4AP5-3, 4AP5-7
Hans G. 5AP2-2, 5AP2-5
Hansson E. 14AP4-2
Hansson M. 7AP4-9
Hanxiang M. 7AP4-3
Haque S. 11AP3-5
Hara K. 8AP7-1
Hara M. 9AP3-2
Hara N. 7AP4-9
Haraki T. 9AP5-6
Harbar M. 8AP3-11
Hariharan V. 1AP6-2
Harlamovs V. ESAPC1-5
Hartmann E. K. 5AP1-4
Hartopp A. 11AP5-1
Harvey R. 15AP2-3
Hasak L. 18AP1-6
Hasaka M. 9AP6-2
Hasanin A. 3AP1-6, 17AP1-8
Hasegawa T. 3AP6-3
Haseneder R. ESAAP1-4
Hashiba E. 12AP6-6
Hashimi M. 14AP6-11
Hashimoto R. 14AP4-6
Hashimoto S. 9AP4-9, 9AP4-5
Hashimoto T. 7AP1-9
Haspl M. 6AP3-11
Hassan Z. 19AP1-7
Hatanaka K. 4AP3-8
Hatano T. 9AP4-5, 9AP4-9
Hattori S. 14AP8-6
Hattori Y. 12AP2-8
Hausmann O. N. 8AP5-3
Hayashi M. 5AP1-1
Hayashi T. 8AP3-7, 11AP5-2
Hayashida M. 1AP1-2
Heiberg J. 4AP3-3
Heinonen J. ESAAP1-1
Hejduk K. 11AP5-8
Helmer C. 18AP1-4
Hemeryck M. 4AP2-4, 4AP2-5
Henao L. 5AP3-4
Henderson J. 19AP1-3
Hendrickx J. 3AP6-2, 3AP6-6
Hendrikse J. 7AP1-2
Henneberg S. W. 3AP2-9
Henzler D. 3AP5-8
Heredia M. 12AP2-4
Heredia Pérez P. 17AP4-7
Heredia-Rodríguez M. 12AP2-5
Hermira Anchuelo A. 5AP4-4
Hernandez M. J. 12AP6-11
Hernández M. J. 1AP5-8, 3AP6-4
Hernández S. 17AP3-3
Hernández de Cádiz M. J. 19AP4-7
Hernandez Delgado C. 13AP2-2
Hernández Delgado C. 8AP6-1, 12AP4-4
Hernández Gutierrez P. 15AP3-2
Hernández-Pinto P. 10AP2-7
Hernando D. 8AP2-8
Herold A. 2AP2-1
Herrera Collado R. 19AP4-7
Herrero M. 4AP7-8, 8AP8-6
Herrmann I. 8AP3-8
Hervás J. 2AP1-11
Herz J. 14AP7-8
Herzog R. ESAPC1-6
Hess L. 2AP1-5, 9AP4-8
Hesse T. 2AP1-7
Heuser F. 14AP5-6
Heylen R. 8AP7-4, 4AP5-10, 12AP3-11, 12AP5-10, 14AP2-7, 14AP3-2, 14AP3-3, 14AP4-1, 14AP8-1, 14AP8-2
Hidaka M. 19AP1-3
Hidalgo F. 6AP2-8
Hidano G. 11AP3-3
Hien M. 3AP4-2
Higa K. 8AP2-3
Higuchi H. ESAAP2-1, 1AP1-5
Hill M. 17AP1-5
Hilsted K. L. 8AP1-1
Hinkelbein J. 19AP5-9
Hinojosa Jimenez A. 19AP2-11
Hinterthaner M. 1AP5-3
Hiramatsu T. 13AP2-1
Hirayama M. 18AP2-5
Hiroki T. 12AP3-3
Hiromi M. 3AP3-2
Hirose M. 1AP7-3, 14AP4-4
Hirota K. 12AP6-6
Hirotsugu O. 3AP3-2
Hisdal J. 4AP4-3
Hjortdal V. E. 4AP3-3
Hodel D. 8AP5-3
Hodzovic I. 19AP2-5, 19AP3-10
Hoeft A. 3AP2-8

Hoff I. E. 4AP4-3
Hoffmann R. 10AP2-3
Hoffmeyer P. 8AP1-2
Hohnhold-Blum P. 4AP5-5
Høiseth L. Ø. 4AP4-3
Højfeldt S. G. 13AP2-5
Hoka S. 14AP8-7
Holgado Pascual M. D. C. 19AP6-7
Hollan J. 9AP1-2
Hollmann M. 4AP1-5
Homvisasebongsa Y. 1AP8-4
Hongoh M. 9AP6-4
Honorato C. 7AP5-4
Honoré P. M. 1AP3-2
Hooker N. H. 12AP4-3
Hori K. 9AP6-2
Horiguchi T. 4AP3-6, 9AP6-7
Hoshino K. 4AP3-1
Hosokawa K. 14AP3-1, 14AP4-6
Hosten T. 19AP3-9, 19AP6-11
Hoti A. 14AP6-7
Howell S. 1AP6-11
Howell S. J. 3AP3-8
Howie A. 10AP1-7
Hristovska A.-M. 14AP6-1
Hruby Z. 2AP1-5
Hsieh H.-Y. 1AP1-8
Hsing C.-H. 1AP4-5
Hsu C.-D. 1AP1-8
Huang S. K. ESAAP2-3
Huang Y. 7AP2-11
Hughes A. P. ESAPC1-6
Huh J. 8AP6-3
Huitink H. 19AP2-8
Huitink J. 19AP2-1
Hung M.-H. 5AP4-6, 11AP5-10, 12AP1-6
Hurtado P. 7AP5-11
Hussain A. 1AP3-4, 3AP4-3, 5AP4-1
Hussein Z. 1AP5-6
Hutchins D. 12AP5-2
Huyghe N. 4AP2-1
Hwang J. 8AP6-3
Hwang L. 7AP3-2

Iacovidou N. 4AP7-9
Ichikawa J. 11AP4-3
Ickx B. 6AP1-8
Igarashi H. 15AP2-4
Ihmsen H. 19AP5-5
Ikic V. 3AP1-10
Ilies C. 14AP7-8
Imabayashi T. 4AP3-8
Imakiire N. 4AP2-9
Inacio R. 10AP2-9
Inada E. 1AP1-2
Inagaki Y. 9AP3-4
Inatomi Y. 4AP5-11
Insausti Pacheco I. 9AP2-7
Ioannidis A. 14AP1-7
Irikoma S. 11AP4-1
Irl H. ESAAP1-4
Isbir C. A. 14AP2-9
Isbye D. 13AP1-1
Ishii N. 14AP4-3
Isidoro M. 17AP2-7
Ismail S. 3AP1-4
Isono S. 14AP8-5
Ivanova V. 7AP2-3
Ivry S. 19AP5-6
Iwasaki H. 19AP1-5
Iwasaki T. 6AP2-1
Iwayama S. 1AP7-3, 14AP4-4
Izquierdo Guerrero A. 8AP6-1

Jackson J. 14AP1-3
Jæger P. 8AP1-1
Jamadarkhana S. 2AP1-3
Janeiro C. 9AP3-9
Janiak M. 6AP3-10
Jans F. 4AP5-10, 8AP7-4, 12AP3-11, 12AP5-10
Jans O. 6AP2-5
Jansen E. K. 4AP3-10
Jäntti V. 3AP1-2
Jaunalksne I. ESAPC1-5
Jaura A. 9AP2-11
Jayakumar A. 8AP2-9
Jeanne M. 3AP6-9
Jee D. 19AP4-2
Jenstrup M. 8AP2-5
Jeon Y. 1AP1-3
Jeong C. 7AP4-7, 12AP1-7
Jeong J. S. 3AP1-1, 5AP3-1
Jeong S. W. 14AP3-4
Jeong Y.-J. 8AP7-5
Jesus F. 11AP3-11
Jesus L. S. B. ESAAP1-5
Jimenez C. 4AP6-9
Jiménez C. 19AP4-5
Jiménez M. J. 19AP4-1
Jiménez Y. 17AP4-3
Jimenez Capel Y. 15AP1-7
Jimenez de la Fuente C. 17AP4-8
Jiménez Vizuete J. M. 12AP2-2
Jinushi K. 12AP6-6
Jo J. 4AP4-6
Joana B. 17AP2-9
Joannes-Boyau O. 4AP8-6
Johansson P. I. 6AP2-5, 6AP1-5
Johnson A. 1AP6-11
Joke D. B. 3AP6-1
Jones W. 1AP6-9
Joo J. 2AP1-1
Jorba R. 2AP2-2
Jordan D. 3AP2-2, 7AP3-5
Jørgensen C. 6AP2-5
Jørgensen C. C. ESAAP2-2
Joris J. 5AP2-2, 5AP2-5
Judez Legaristi D. 18AP2-6
Jung D. 1AP1-3
Jung J. W. 1AP5-5, 1AP8-9
Jung S. M. 8AP7-6
Jungwirth B. 7AP1-5
Juste Lucero M. 1AP6-5
Juul P. 17AP1-3

Kılıcaslan A. 9AP1-6
Kızılay D. 4AP7-6
Kadera V. 7AP1-5
Kadri C. L. 19AP4-11
Kaerlein K. T. 4AP1-6, 4AP1-7, 4AP7-4, 4AP8-5
Kain Z. N. 4AP6-2
Kajekar P. 15AP2-1, 19AP2-9
Kakihana Y. 4AP3-8, 12AP3-10, 12AP6-2
Kaku R. 14AP4-3
Kalala J.-P. 3AP1-5
Kalezic N. 1AP8-3
Kalidindi R. 11AP3-2
Kalidindi R. V. S. N. 18AP2-2
Kalimeris K. 4AP4-4
Kalkman C. J. 10AP2-4
Kalmar A. F. 4AP8-1, 4AP3-4, 4AP7-3
Kamata K. 3AP1-2
Kamata M. 4AP3-2
Kamiya Y. 7AP3-1, 7AP3-10, 14AP4-5
Kampe S. 14AP7-2
Kanamori R. 3AP6-8
Kanazawa K. 7AP2-10
Kanazawa T. 5AP1-1

Kang H. 4AP5-4
Kang P. S. 8AP7-6
Kang Y. L. 1AP7-8
Kang Y.-M. 4AP4-8
Kanmura Y. ESAAP1-3, 4AP2-9, 7AP3-3, 7AP4-5, 12AP6-2
Kannno M. 19AP2-2
Kapessidou P. 4AP6-1, 4AP6-10, 8AP1-7, 11AP4-5
Kapessidou Y. 4AP1-8, 19AP3-6
Kapoor A. 1AP5-1
Karaaslan K. 19AP3-7
Karaaslan P. 4AP3-9, 10AP2-8
Karaca S. 8AP4-9
Karadjova D. 11AP2-5
Karakas H. 14AP8-10
Karakaya A. 17AP1-2
Karakitsos D. 9AP6-10
Karakosta A. 11AP1-4
Karaman S. 14AP1-11, 14AP8-10
Karaman Y. 14AP8-10
Kara-Mostefa S. 4AP2-8
Karashima Y. 14AP8-7
Karathanou E. 1AP8-6
Kardum G. ESAPC1-4
Karlsson M. 7AP4-9
Karm M. H. 3AP2-1
Karmaniolou I. 11AP1-5
Karoui A. 8AP3-3
Karoutsos S. 17AP3-1
Karube N. 4AP7-2
Kasagi Y. 1AP1-2
Kasai T. 12AP6-6
Kashiwagi S. 4AP4-10
Kasuya Y. 3AP6-8, 14AP8-5
Katanolli F. 14AP6-7
Katayama M. 8AP3-7, 11AP5-2
Kato F. 9AP2-9
Katori K. 8AP2-3
Katz Y. 3AP2-7
Kawaguchi Y. 4AP6-4
Kawahito S. 9AP2-2
Kawamae K. 7AP2-10, 9AP2-9
Kawamoto M. 9AP5-6
Kawano N. 4AP3-8
Kawase H. 6AP2-1
Kaygusuz K. 14AP2-9
Kayhan Z. 15AP1-5, 17AP3-6
Kazama T. 9AP3-2
Kehlet H. ESAAP2-2, 6AP2-5, 14AP6-1
Keki S. 12AP1-3
Kellermann K. 7AP1-5
Kelly J. 11AP5-1
Kelmendi F. 14AP6-7
Ken C.-F. 9AP5-8
Kendrisic M. 8AP8-9
Keough J. 12AP1-5
Kerci M. 18AP1-2
Kerindongo R. P. 4AP1-5
Kern C. 7AP4-10
Kertscho H. 4AP8-3
Kessler T. 8AP3-4
Khare D. 15AP2-1, 19AP6-4
Khoronenko V. 1AP1-1
Kienbaum P. 7AP2-7, 12AP4-8
Kikuchi I. 1AP1-2
Kikuchi T. 12AP3-10
Kilicaslan A. 9AP4-7, 19AP1-2
Kim B. 4AP4-6
Kim C.- H. 9AP2-5
Kim C. 8AP6-3
Kim D. W. 3AP1-1, 5AP3-1
Kim E. 8AP6-3
Kim H. J. 1AP5-2, 1AP7-8
Kim H. S. 4AP8-2
Kim H. B. 8AP6-2
Kim H. W. 14AP3-8

Kim J. M. 10AP1-5
Kim J. E. 1AP1-9, 4AP4-1
Kim J.-S. 19AP4-6
Kim J. 4AP4-6, 4AP4-6
Kim K.-M. 1AP4-6
Kim K. S. 3AP1-1, 5AP3-1
Kim M.-S. 3AP5-4
Kim S. 7AP4-7, 12AP1-7, 1AP1-3
Kim T.-Y. 4AP5-4
Kim W. M. 14AP3-4
Kim Y. A. 8AP3-1
Kim Y.-D. 9AP2-5
Kim Y. 9AP3-6
Kim Y.-H. 4AP4-8
Kimura M. 14AP3-6
Kimura S. 11AP3-3
Kindgen-Milles D. 12AP4-8
King A. 8AP4-3, 10AP2-5
King D. A. 12AP4-9
King H. 17AP1-5
Kinoshita M. 3AP6-8
Kinzhalova S. 11AP5-4
Kirkebøen K. A. 4AP4-3
Kirov M. 1AP3-4, 3AP4-3, 4AP2-2, 5AP2-7, 5AP4-1, 7AP2-6
Kishira T. 4AP3-8
Kiskira O. 1AP3-11, 8AP1-10
Kiss T. 12AP1-10
Kitagawa Y. 9AP3-4
Kitahata H. 9AP2-2
Kiyama S. 11AP3-3
Klein M. 3AP4-6
Klein U. 3AP5-3
Kleinbrahm K. 6AP3-2
Kliger M. 3AP2-7
Kligunenko E. 9AP5-5
Klozova R. 11AP4-7
Klyagin A. 7AP2-6
Knapp C. 7AP1-4
Knebel P. 1AP6-7
Ko I.-G. 7AP3-2
Ko Y. K. 14AP3-8
Ko Y. 9AP3-6
Kobayashi H. 9AP6-5, 14AP4-7
Kobayashi M. 14AP2-1
Kobelyatskyy Y. 4AP4-5
Koblihova E. 12AP6-5
Kocak T. 9AP1-9
Koçak T. 12AP4-11
Koch T. 5AP4-7, 12AP1-1, 12AP1-10
Kochs E. F. 14AP5-6, 3AP2-2, 7AP1-5, 7AP3-5, 7AP4-4
Kochs E. ESAAP1-4
Kodaka M. 11AP4-3
Kodra N. 10AP1-2
Koerner I. P. 7AP2-9
Kofler O. 8AP4-4
Koga M. 4AP4-10
Kogure T. 14AP2-11
Kokki H. 9AP6-8, 9AP6-9
Kokki M. 9AP6-8, 9AP6-9
Kokubo S. 11AP4-1
Koller T. 10AP2-3
Kollmann Camaiora A. ESAAP2-4, 11AP2-7, 15AP1-1, 15AP1-2
Kolodzie K. 19AP1-4
Kolomiets L. A. 5AP3-6
Kolotoura A. 1AP3-11
Kolsi K. 14AP1-8
Komarov S. 5AP2-7
Komori M. 11AP4-3
Kondo I. 3AP5-2
Kondratjev A. N. 7AP5-8
Kondratyev A. 7AP5-6
Kondratyeva E. 7AP5-6
Kondziela D. 9AP4-2
Kongphlay S. 2AP2-3
Konkayev A. 3AP6-7
Koo B.-N. 10AP1-5
Koo M. 3AP1-7
Koopman E. 19AP2-1, 19AP2-8
Kordowicz A. 1AP6-11
Korja M. 7AP5-1
Kortas C. 4AP2-6
Kosaka Y. 4AP5-6, 9AP5-1, 17AP4-2
Kosinova M. 11AP5-8
Kosson D. 11AP1-8, 11AP2-8, 11AP3-8
Kostoglou C. 14AP6-3
Kostopanagiotou G. 4AP4-4, 11AP1-4
Kostyra M. 11AP1-8, 11AP2-8, 11AP3-8
Kotanoğlu M. 10AP3-9
Kotzerke J. 12AP1-1
Kouakou M. R. 10AP1-6
Kovacevic M. 3AP6-10
Kowalczyk R. 11AP1-8, 11AP2-8, 11AP3-8
Koyama Y. 7AP3-1, 19AP1-1
Kozek-Langenecker S. 6AP1-4
Kozina O. 9AP5-5
Krage R. 19AP2-8
Kramer C. 9AP4-4, 12AP5-6
Krämer M. 3AP3-6
Krasnenkova M. B. 8AP8-1
Krasniqi I. 14AP6-11
Kratzer S. ESAAP1-4
Krebs L. 17AP2-7
Kreka M. 12AP3-6
Kremer Y. 15AP1-3
Kretschmer A. 9AP4-4
Kreuzer M. 3AP2-2, 7AP4-4
Krikava I. 11AP5-8
Krintel Petersen A. 4AP3-3
Kristek J. 3AP1-10
Kristensen B. 14AP6-1
Kristic M. 3AP1-10
Kritikos N. 8AP1-10
Kroemker M. 4AP8-3
Ku T.-H. 9AP5-8
Kubo Y. 11AP3-3
Kubota A. 7AP2-1
Kuc A. 11AP2-5
Küçükerdönmez C. 17AP3-6
Kühlmorgen B. 7AP5-2
Kukuev E. 19AP5-6
Kulier A. 4AP4-2
Kulikov A. 7AP5-5
Kulkas A. 3AP1-2
Kumar S. 1AP7-10
Kumasaka A. 7AP2-10
Kunisawa T. 19AP1-3
Kuniyoshi H. 11AP3-3
Kuno M. 9AP6-2
Kurenkov D. 9AP1-4
Kuroiwa M. 17AP4-2
Kuroki C. ESAAP1-3, 7AP3-3
Kurzova A. 2AP1-5, 9AP4-8
Kus A. 8AP8-8, 19AP3-9, 19AP6-11
Kushnir O. 6AP1-3
Kusnirikova Z. 8AP4-3, 10AP2-5
Kutz R. 7AP1-1, 12AP5-1
Kuusisto M. 9AP6-9
Kuwaki T. ESAAP1-3, 7AP3-3, 7AP4-5
Kuzkov V. 3AP4-3, 5AP2-7, 5AP4-1, 7AP2-6
Kuznetsov D. 14AP5-9
Kvolik S. 3AP1-10
Kwak S. 12AP1-7
Kwak Y. L. 1AP1-9
Kwon H. U. 8AP7-6
Kwon J. H. 8AP4-2

Lacasta A. 18AP2-4
Ladjevic N. 1AP8-3
Lagarto F. 1AP3-8
Laglera Trebol S. 8AP4-6
Laguarda J. M. 18AP2-3
Laguillo. J. L. 6AP2-9
Lahkar A. 1AP6-2
Lai C.-W. 7AP5-10
Lalor J. 2AP2-6
Lambadariou K. 19AP1-9, 19AP1-10
Lambert C. 19AP3-10
Lamer A. 3AP6-9
Lampadariou A. 19AP1-6
Lança F. 11AP1-6, 11AP3-9
Landsverk S. A. 4AP4-3
Lange K. H. W. 8AP2-5
Lanni F. 1AP2-1, 7AP3-6, 10AP1-6
Lapa T. 9AP2-10, 13AP2-4
Lapisatepun W. 5AP2-6
Larucci L. 8AP2-4
Laso J. 4AP7-8, 8AP8-6
Laso Morales M. 12AP4-4
Laszikova E. 12AP6-5
Lauretta M. P. 1AP2-1
Lauscher P. 4AP8-3
Laustsen S. 4AP3-3
Lauwick S. 5AP2-2
Lavand'homme P. 14AP1-6, 14AP5-8, 14AP7-9, 15AP1-3
Lazarescu C. 4AP2-7, 4AP2-8
Le Goff M. 18AP1-4
Le Guen M. 3AP3-7, 5AP4-2, 11AP5-5, 17AP4-4
Leão P. 12AP4-10, 17AP2-8, 19AP6-8
Leão Saraiva P. 1AP8-5, 10AP3-5
Lee A. R. 1AP5-5, 1AP8-9
Lee A. 17AP1-9
Lee B.-J. 7AP3-2
Lee E. H. 3AP2-1
Lee H.-K. 9AP4-3, 9AP6-1
Lee H. K. 8AP7-5
Lee H. G. 14AP3-4
Lee J. J. 1AP5-5, 1AP8-9
Lee J. S. 1AP7-8
Lee J.-R. 3AP5-4
Lee J. Y. 4AP8-2
Lee J. H. 1AP5-2
Lee J. 19AP6-3
Lee J. M. 8AP6-2
Lee K.-Y. 8AP3-1
Lee K. 1AP4-6
Lee M. Y. 7AP4-6
Lee S. 1AP4-6, 2AP1-1
Lee S. H. 14AP3-4
Lee S. Y. 8AP6-2
Lee S.-Y. 4AP4-8
Lee Y.-C. 19AP4-6
Lefante J. 17AP2-1
Lefor A. T. 15AP2-4
Legallois D. 4AP1-2
Lehmann C. 3AP5-8, 11AP1-2
Lehmann L. J. 8AP2-1
Lehmann R. 2AP1-7
Lehnen N. 14AP5-6
Leibowitz A. 12AP5-1
Leiter R. 5AP1-8
Leloup von Edelsberg S. 5AP2-5
Lemoine S. 4AP1-2, 4AP1-10
Lenkin A. 4AP2-2
Lenkin P. 4AP2-2, 7AP2-6
León I. 4AP6-6
Leontopoulou S. 8AP6-8
Lerman J. 3AP6-5
Leslie G. 19AP2-5
Lessa M. A. 4AP4-7, 4AP6-3
Lesteva N. A. 7AP5-8
Lesteva N. 7AP5-8
Leutzow B. 14AP5-4
Levikov D. 4AP1-1, 7AP2-4
Levin A. 14AP5-9

Levit A. 1AP3-3
Levit D. 1AP3-3
Lewis J. 19AP6-4
Lex D. 10AP1-10
Leysen G. 4AP5-10
Li J. 12AP2-1
Li M. K. 9AP1-5
Li S. 11AP5-7
Liang E. 7AP1-9
Liao R. 8AP8-3
Liça L. 14AP2-10, 19AP5-11
Liening K. 19AP1-8
Likhvantsev V. 4AP1-1, 7AP2-4
Lim C. 9AP3-6
Lim H. S. 14AP3-8
Lima L. 4AP5-9
Lin H.-L. 7AP5-10
Lin J. Y.-M. 1AP1-8
Lin T. Y. ESAAP2-3, 7AP4-6
Lin Y.-C. 12AP1-6
Ling P. 14AP6-4
Linzner J. 4AP8-10, 19AP5-7
Liotiri D. 19AP1-11
Lipnitskaya V. V. 9AP3-5
Lipnitski A. L. 9AP3-5
Lippert F. 13AP1-1
Lisbona C. 4AP7-8, 8AP8-6
Lisbona C. J. 4AP6-9
Lister P. 1AP6-9
Litonius E. ESAAP1-1
Liu C.-A. 14AP4-9
Liu H. 17AP2-1
Liu J. 7AP3-9
Liu S.-K. 7AP5-10
Liu X. 9AP2-8
Liu Y.-F. 7AP5-10
Lizán García M. 12AP2-2
Llau J. V. 7AP2-5, 7AP2-8
Lloria E. 3AP3-1
Locatelli B. G. 10AP2-10
Loer S. A. 4AP1-4
Logier R. 3AP6-9
Lohmer J. 14AP7-2
Lolli S. 1AP2-1
LoMauro A. 5AP1-8
Longrois D. 4AP2-7, 4AP2-8
Loos N. 14AP3-2
Loosen G. 8AP2-1
Loosfeld F. 1AP6-3
Lopes A. 10AP2-9
Lopes-Pimentel Estevao P. 3AP1-7
Lopez A. 8AP1-4, 15AP3-4
López A. M. 7AP5-11
López M. 6AP1-6
Lopez Garcia V. 17AP4-3
López Garcia V. 17AP1-7
López Guerrero E. 1AP6-5
Lopez Hormiga J. 6AP3-9
Lopez Lopez M. A. 2AP1-9
Lopez Martinez M. M. 3AP4-8
López- Timoneda F. 13AP1-2
Lopez-Baena J. A. 4AP6-9
López-Gil M. T. 19AP3-5
López-Millán Infantes J. M. 17AP4-7
López-Olaondo L. 1AP1-7, 19AP4-11
López-Timoneda F. 6AP3-9
López-Vallejo M. 2AP2-2
Lotis C. 1AP8-6
Loukeri A. 14AP7-10
Loupec T. 1AP6-3
Louro da Cruz J. 8AP6-6, 17AP3-8
Lu C. W. ESAAP2-3, 7AP4-6
Lubnin A. 7AP5-5
Luca Vasiliu I. 12AP6-9, 14AP6-5, 14AP7-7
Luca-Vasiliu I. 8AP4-10
Luginbühl M. ESAPC1-3
Lukes M. 3AP5-9
Lummerstorfer M. 4AP4-2
Lund J. 8AP2-5
Lundborg C. 14AP4-2
Lundstrøm L. H. 8AP2-5, 11AP5-9, 19AP4-8, 19AP6-6, ESAAP1-6
Lyoshenko I. 6AP1-3
Lysakowski C. 9AP1-1

Moumtzi D. 1AP8-6
Macas A. 10AP2-1, 11AP5-6
Machado D. 17AP3-2
Mackersey K. 19AP6-5
Macmillan J. R. A. 19AP5-2
Madeira D. 1AP3-10, 19AP2-10, 19AP5-3
Madeira F. 1AP3-10, 9AP3-9, 13AP2-4
Madhavan B. 2AP2-4
Madrigal A. 6AP1-9, 10AP1-9, 10AP2-9
Madsbad S. ESAAP2-2
Madyanov I. 7AP2-2
Maekawa T. 14AP2-1
Maffioletti M. 10AP2-10
Mafra A. 8AP6-4, 11AP2-10
Mafra Gonçalves A. 8AP8-7
Magalhães A. 7AP5-7
Maggi G. ESAAP2-4, 2AP1-9, 3AP4-8, 5AP2-1, 11AP2-11, 11AP4-6
Maghrebi S. 14AP1-8
Magro C. 11AP3-11
Mahmoud F. 3AP1-6, 17AP1-8
Majima M. 9AP5-1
Makarov R. 11AP5-4
Makino H. 7AP1-9
Makino S. 8AP7-1
Makris A. 11AP1-5
Malahova A. 4AP7-1
Malavaud B. 1AP3-7
Malek J. 2AP1-5, 9AP4-8
Malhotra S. K. 1AP7-10
Malik M. 17AP1-4
Malinovsky J.-M. 12AP1-2
Maloney G. 1AP4-10
Mandolfino T. 1AP7-2
Manga G. 12AP6-3
Mangoyan H. 1AP4-4
Manoleli A. 8AP5-9
Manrique A. 4AP1-2, 4AP1-10
Manso F. 11AP1-9
Mantilla I. 19AP3-5
Mao J. 7AP4-3
Marachkou A. V. 9AP3-5
Marangoni E. 5AP2-3
Marangos M. 12AP2-9, 12AP2-10, 12AP2-11
Marçal Liça L. 1AP8-11, 11AP3-10
Marcelino M. 14AP8-4
Marchal F. 12AP1-2
Marco G. 1AP1-7, 1AP8-8, 3AP2-5
Marcos J. M. 5AP3-5
Marcucci C. 4AP4-9, 4AP4-9
Marcus M. 19AP3-8
Mardiyan M. 15AP2-2
Marin R. 8AP1-4
Marín S. 4AP7-7
Marinchev V. 1AP4-3
Marinho J. 8AP1-9
Marinochkina L. 7AP5-9
Markic A. 3AP6-10
Markovic D. 1AP8-3
Markstaller K. 3AP5-3, 5AP1-4, 12AP1-9
Marochkov A. 8AP3-6
Marques C. 1AP8-1, 4AP8-9
Marques M. 4AP8-9, 11AP3-9
Marques S. 10AP2-9, 13AP1-7, 15AP3-5, 17AP3-9
Marsaud J.-P. 17AP3-1
Martin J. C. 7AP1-8
Martin N. 6AP1-10
Martín M. C. 19AP4-3
Martinez A. 7AP5-4, 14AP5-2
Martinez Lopez F. 13AP2-2
Martínez López F. 12AP4-4
Martínez Maldonado E. 17AP2-6
Martinez Ubieto J. 8AP4-6
Martínez Ubieto J. 1AP7-11
Martinez-Simon A. 19AP4-11
Martin-Grande A. 12AP6-7
Martins F. 19AP5-8
Martins M. 15AP3-5, 15AP3-6, 15AP3-7, 11AP1-6
Maruyama K. 3AP6-3, 19AP1-1
Marx G. 1AP6-8
Marzouk M. 4AP2-6
Masataka Y. 1AP4-2, 1AP8-2, 12AP3-3
Masaya T. 3AP3-2
Masayasu A. 3AP3-2
Masayuki K. 3AP3-2
Mases A. 4AP6-5
Masgoret P. 14AP6-2
Mashimo T. 14AP3-1, 14AP4-6
Massó E. 15AP3-4
Masui K. 9AP3-2
Mathoulin S. 12AP4-1
Matjanov U. O. 8AP8-1
Matos F. 15AP3-5, 15AP3-6, 15AP3-7
Matsota P. 4AP4-4, 11AP1-4
Matsuda N. 9AP4-5, 9AP4-9
Matsumoto S. 14AP2-4
Matsuoka Y. 14AP4-3
Matsusaki T. 5AP1-1
Matsushima H. 15AP2-4
Matsushima T. 6AP3-7
Matsuura T. 9AP6-2
Matthews S. 19AP5-7
Matuda Y. 7AP3-10
Mayo A. H. 12AP4-9
Mayoral J. F. 8AP2-8
Mayuko H. 1AP4-2, 1AP8-2, 12AP3-3
Mazerolles M. 1AP3-7
Mazumdar M. 8AP7-7, 17AP4-6
Mazur E. 18AP2-9
Mazurok V. 5AP1-2
Mazzeo G. 1AP7-2
Mazzinari G. 8AP1-8
Mazziotta I. 12AP5-6
McBeath K. 12AP1-5
McCarthy S. 1AP4-10
McCaul C. 1AP7-7
Mcdonnell C. 10AP3-7
McPherson K. 1AP3-9
Medina Merranz S. 7AP3-4
Medova O. 4AP7-1
Meex I. 4AP5-10, 12AP3-11
Megumu Y. 14AP8-7
Mehran R. 4AP6-7
Mehrotra S. 8AP8-5
Mehta A. 11AP5-3
Meier J. 4AP8-3
Meirelles Rosa R. 8AP1-3
Meissner W. 14AP1-4
Mejia C. 12AP1-11
Mejía J. 6AP3-3
Memtsoudis S. G. ESAPC1-6, 8AP7-7, 17AP4-6
Mendes C. 9AP2-10
Mendonca C. 15AP2-1, 19AP2-9
Mendonça J. 1AP4-9, 5AP2-9
Mensch O. 12AP5-6
Merino F. 15AP2-6, 15AP2-5
Merino M. 5AP3-5
Merino Estrada P. 6AP3-9
Merjavy P. 17AP1-1
Mertes P.-M. 4AP2-7, 4AP2-8, 12AP1-2
Mesa A. ESAAP2-6

Mesa Lopez A. 5AP2-8
Mesci A. 5AP4-9
Mesquita I. 15AP3-5, 15AP3-6
Mestrum R. 14AP2-2, 14AP2-7
Meuwissen N. 14AP4-1
Meyer-Frießem C. H. 14AP6-8
Miękina J. 7AP4-8
Michard F. 1AP6-8
Migita T. 14AP2-1
Mihara T. ESAPC1-2, 11AP1-3
Mikkelsen S. 13AP2-5, 13AP2-3
Milanovic Litre D. ESAPC1-4
Milioris T. 1AP3-11, 8AP1-10
Milne A. 4AP8-10
Milne L. F. 1AP6-2
Mimaroglu C. 14AP2-9
Mimitou I. 14AP1-7
Min S. 8AP6-3
Minelli E. 8AP8-4
Mineto K. 3AP4-1
Minhas S. 3AP3-8
Minkovich L. 3AP4-6
Minoshima R. 9AP1-3
Mioduski M. 7AP4-8
Miquelay J. 3AP2-3
Mir F. 1AP3-9
Mir F. A. 12AP3-2
Mirabella L. 9AP5-7, 14AP2-6
Mirea L. 12AP6-9, 14AP6-5, 14AP7-7
Mirea L. E. 8AP4-10, 8AP6-9
Miró P. 8AP2-8
Misiolek A. 15AP1-8
Misiolek H. 15AP1-8
Mita N. 9AP2-2
Miura M. 9AP6-5, 14AP4-7
Miura Y. 7AP2-10
Miyaji T. 3AP6-3
Miyasaka K. 8AP3-7, 11AP5-2
Miyazaki T. 7AP3-10
Mizuguchi A. 8AP2-7
Mizuno Y. 4AP4-10
Mjekaj E. 12AP3-5, 12AP3-6
Mochida S. 9AP3-4
Módolo M. 17AP2-3
Moerman A. 4AP2-1, 4AP5-1
Moerman A. T. 17AP1-2
Moguilevitch M. 6AP3-4
Moinho N. 17AP3-9
Moinho N. R. 13AP1-7
Moisak I. G. 9AP3-5
Moleti M. L. 10AP1-6
Molina R. 5AP4-4
Møller A. M. 19AP4-8, ESAAP1-6
Møller M. H. ESAAP1-6
Møller Nielsen A. 13AP1-1
Molliex S. 4AP5-2
Molnar T. 12AP1-3
Moltó L. 6AP3-3
Monedero P. 14AP5-2
Monroy Parada R. J. 6AP3-9
Montalban Moreno B. 12AP2-2
Montalvo H. 3AP5-1
Monteiro T. 15AP3-7
Montero M. 4AP6-6
Montero Hernandez M. J. 7AP2-5, 7AP2-8
Montes A. 14AP1-4, 14AP1-5
Montesinos S. 3AP2-3
Montferrer N. 19AP6-9
Montferrer Estruch N. 8AP6-5
Montón N. 19AP4-3
Moore D. 1AP4-10
Moore J. 1AP4-7
Morais F. 11AP1-6
Moral M. V. 10AP2-3
Moral S. 13AP1-3
Moral V. 3AP5-1
Moralejo J. 5AP4-8
Morales L. 7AP5-2
Morales M. 6AP2-7
Moreau N. 12AP4-5
Moreira A. 1AP2-4, 1AP2-5, 1AP2-6, 1AP2-7, 17AP2-9
Moreira J. F. 1AP2-4, 1AP2-5, 1AP2-6
Morel J. 4AP5-2
Moreno C. 5AP2-11
Moret E. 17AP4-3
Moret Ruiz E. 15AP1-7, 17AP1-7
Moreto A. 1AP5-10, 14AP1-9, 17AP2-2
Morgado T. 1AP3-10
Mori T. 9AP6-2, 14AP3-5
Mori Y. 7AP4-5
Morillas-Sendín P. 4AP1-9
Morimatsu H. 1AP3-5, 5AP1-1
Morimoto Y. 4AP3-1
Morina A. 14AP6-7, 15AP1-4
Morina Q. 14AP6-7, 15AP1-4
Morioka N. 3AP6-8
Morita K. 1AP3-5, 5AP1-1, 6AP2-1, 14AP4-3
Moriyama M. 19AP1-3
Moser J. 3AP6-5
Mota P. 19AP3-11
Motsch J. 3AP4-2
Moyer J.-D. 17AP4-4
Mraovic B. 3AP1-10
Mukaida K. 9AP5-6
Mullane D. 13AP1-6
Munar F. 19AP6-9
Munar Bauze F. 8AP6-5
Muñoz G. 8AP2-6
Muñoz S. 13AP1-3
Muñoz Rodriguez L. 1AP7-11
Muñoz-Rodriguez L. 18AP2-6
Münster T. 19AP5-5
Muntyan I. 19AP6-5
Mupedziswa N. 2AP1-3
Murase R. 9AP1-3
Murata E. 14AP4-4
Murozono M. 7AP2-1
Musauer M. 14AP1-2
Myoga Y. 8AP8-10

Naas I. 12AP3-1
Naco M. 10AP1-2, 18AP1-2
Naço M. 12AP3-6
Nadella V. 10AP3-3
Nagahara Y. 17AP4-2
Nagai M. 3AP6-8
Nagase H. 4AP1-7, 4AP7-4
Nagy L. 12AP1-3
Nakae A. 14AP3-1, 14AP4-6
Nakahara M. 12AP6-2
Nakai K. 14AP3-1, 14AP4-6
Nakamura K. 12AP3-10, 12AP6-2, 8AP7-1
Nakamura Y. 17AP1-10, 19AP4-4
Nakane M. 7AP2-10
Nakashima K. ESAAP2-1
Naline E. 5AP4-2
Nara Y. 9AP5-1
Narvaez de Linares A. 19AP2-11
Nathan N. 11AP4-2, 17AP3-1
Nathan-Denizot N. 10AP3-8
Nathanson M. 5AP2-4, 7AP1-3, 12AP6-4
Naveda Sanchez R. D. 1AP7-1
Neale E. 2AP1-6
Nedashkovsky E. 14AP5-9
Negron-Gonzalez M. 2AP2-8
Nellgård P. 19AP2-7
Neukirchen M. 7AP2-7
Neuloh G. 3AP2-8
Neururer S. 13AP1-4
Neuvonen P. J. ESAAP1-1
Neves I. 1AP8-1
Newman S. 1AP2-3, 1AP4-1, 18AP2-1
Ng K. C. 1AP3-9
Ng O. 11AP3-7
Ng S. Y. 12AP6-1
Nicolae G. 8AP3-9, 14AP7-4, 14AP7-6, 14AP8-8
Nicolayenko E. 9AP1-4
Nielsen C. 14AP6-1
Nielsen C. V. 9AP3-10
Nieoczym D. 9AP4-1
Nieves Alonso J. M. 5AP2-10
Nihara Y. 12AP3-10
Niiya T. 19AP2-2
Nikitina Zake L. ESAPC1-5
Nikolakopoulos N. 4AP4-4
Nikolova Z. 14AP6-11
Niokou D. 11AP1-4
Nishiike S. 13AP2-1
Nishikawa K. 9AP6-2, 14AP3-5, 18AP2-5
Nishikawa T. 4AP3-6, 9AP6-7
Nishiyama K. 11AP4-3
Nistal Nuno B. 7AP4-1, 7AP4-2
Nitahara K. 8AP2-3
Noé L. 8AP2-8
Nogawa R. 18AP2-5
Nogueira A. M. 14AP8-4
Nogueira M. 1AP3-8
Noguera C. 13AP1-3
Nommensen J. 4AP8-11
Nomura T. 19AP2-3
Nørskov A. K. 11AP5-9, 19AP6-6
Norton M. 1AP2-4, 1AP2-5, 1AP2-6, 17AP2-4, 17AP3-5
Noskova P. 11AP4-7
Novel Carbo L. 8AP4-6
Nowacka E. 6AP3-10, 11AP1-8, 11AP2-8, 11AP3-8
Nozaki-Taguchi N. 14AP8-5
Nozomi O. 1AP4-2, 1AP8-2, 12AP3-3
Ntouma P. 1AP8-6
Ntritsou V. 14AP1-7, 14AP6-3
Nurka T. 12AP3-5
Nurullahoglu Atalık E. 9AP4-7

Obata H. 14AP3-6
Obraztsov M. 7AP2-6
Oda S. 9AP2-9
Oda Y. 14AP7-5
Odou P. 9AP3-1
Oei G. T. M. L. 4AP1-5
Oh C.-S. 4AP5-4
Ohara S. 1AP1-5
Ohnesorge H. 19AP3-4
Ohri I. 18AP1-2
Ohta T. 19AP2-3
Ohtaroglu C. 8AP8-8
Oishi H. 12AP2-8
Ojeda Cabrera J. 8AP4-6
Ok S. H. 8AP7-5
Ok S.-H. 9AP6-1
Oka T. 14AP4-7
Okada K. 14AP2-1
Okahara S. 5AP1-1
Okamoto H. 4AP5-6, 9AP5-1, 17AP4-2
Okamura K. 11AP4-3
Okudan N. 9AP4-7
Okutani R. 1AP1-2, 14AP5-1, 14AP7-5
Oldner A. 3AP4-4, 3AP4-5
O'Leary R. A. 1AP7-7
Oliva V. 8AP1-5
Oliva Morera J. C. 8AP6-1
Oliveira C. 8AP6-6
Oliveira D. 15AP3-5, 15AP3-6, 15AP3-7
Oliveira F. 1AP4-8, 4AP6-8
Oliveira V. 9AP3-7
Oliveiros B. 6AP1-9, 10AP1-9

Oller Sales B. 15AP1-7
Olmedilla L. 4AP6-9, 4AP7-8, 5AP1-7
Olmedilla Arnal L. 3AP4-7, 17AP4-8
Ologoiu D. 8AP5-9
Omae T. 4AP2-9
Omera M. 3AP1-4
Omerovic A. 3AP2-2
Omiya H. 14AP4-3
Ongiem A. 2AP2-3
Ono K. 15AP2-4, 9AP6-4
Onrubia X. 2AP1-11, 12AP6-11
Ordóñez-Llanos J. 12AP4-6
Oremus K. 6AP3-11
Oreshnikov E. 7AP2-2, 7AP2-3
Oreshnikova S. 7AP2-2, 7AP2-3
Origer P. 4AP1-8, 4AP6-1, 4AP6-10, 11AP4-5
Orlandi S. 8AP2-4
Ormonde L. 11AP1-6
Ortega J. 4AP6-6
Ortega Lucea S. 1AP7-11, 18AP2-6
Ortiz J. C. 8AP2-8
Osamu K. 8AP7-1
Osinkin D. 1AP4-3
Osterberg-Deiss T. J. 19AP1-4
Ostrowski S. R. 6AP1-5
Osugi T. 1AP7-3
O'Sullivan M. 10AP3-7
Otaki K. 9AP2-9
Otelcioglu S. 19AP1-2
Ottens T. 7AP1-2
Ouattara A. 4AP8-6
Ouni Z. 12AP3-1
Owczuk R. 18AP1-6
Ozaki M. ESAAP2-1, 3AP6-8, 7AP1-9
Ozdemir Kol I. 14AP2-9
Ozgultekin A. 12AP1-4, 12AP5-4
Ozolina A. ESAPC1-5, 6AP1-2
Ozvardar Pekcan Y. 2AP1-2, 19AP5-10

Paal P. 13AP1-4
Pacheco M. 1AP8-5, 10AP3-5, 12AP4-10, 17AP2-8, 19AP6-8
Paiva A. 6AP2-10
Palmeira A. 9AP5-2
Palmqvist D. F. 9AP3-10
Pammer M. 4AP4-2
Panagopoulou A. 14AP7-10
Pandazi A. 4AP4-4, 11AP1-4
Pandey R. K. 1AP7-9
Paños M. 13AP1-3
Paños Gozalo M. L. 19AP6-2
Pantazopoulos C. 4AP7-9, 19AP1-9, 19AP1-10
Pantazopoulos I. 4AP7-9
Pantoflicek T. 12AP6-5
Pap D. 1AP7-4
Papadimitriou-Olivgeris M. 12AP2-9, 12AP2-10, 12AP2-11
Papadopoulos G. 11AP2-9
Papagiannopoulou P. 14AP1-7
Papaioannou A. 1AP3-11
Parakkamodom S. 11AP1-1
Paraskeuopoulos T. 8AP1-10
Parente D. 7AP1-7
Parera A. 14AP2-5
Parise-Roux D. 12AP6-7
Park G.- E. 8AP7-5
Park H. J. 14AP3-10
Park K.-E. 9AP6-1
Park S. J. 19AP4-2
Park S. 9AP3-6, 10AP1-4
Park S.-J. 9AP4-3
Park W. S. 1AP1-9
Parlanti J.-M. 4AP2-8
Parra L. 15AP3-4
Parra Garcia L. 2AP2-2
Parry N. 6AP2-2
Partida González C. 17AP2-6
Partyla T. 14AP5-4
Pascu D. 14AP7-6
Pascual Arellano M. 8AP6-5
Pascual Bellosta A. M. 1AP7-11
Pascual Bellosta A. 18AP2-6
Passant C. 19AP3-10
Pastijn E. 19AP3-6
Pastijn I. 4AP6-1
Patel A. 1AP3-9, 19AP1-7
Patel N. 11AP5-3
Patel P. 19AP6-1
Patel S. 4AP8-10
Patet C. 7AP4-10
Patil J. J. 8AP7-3
Patrubani A. G. 8AP1-7
Paul J. T. 12AP4-1
Paulino A. 1AP8-10
Pavelescu C. 14AP7-7
Pavelescu D. 8AP4-10, 8AP6-9, 12AP6-9, 14AP7-7
Pavicic A. M. 3AP6-10
Pavlikova J. 3AP5-9
Pavlovic D. 2AP1-7, 14AP5-4
Pavon A. 14AP6-10
Pavón A. 17AP3-3
Pecek B. 9AP1-2
Pechenyk S. 8AP8-2
Pechhold M. 1AP1-6
Pechpaisit N. 11AP1-1
Pedigone C. M. C. ESAAP1-5
Pehora C. 10AP3-7
Peixoto F. 9AP5-9
Peker G. 10AP3-9
Pelaez E. 12AP5-9
Pelavski A. 18AP2-4
Pelegrín F. 9AP3-3
Pellegrini M. 8AP1-4
Pelosi P. 5AP4-7, 12AP1-1, 12AP1-10
Penders J. 14AP3-2, 14AP3-3, 14AP8-1, 14AP8-2
Pentilas N. 19AP1-11, 9AP6-10
Peperstraete H. 17AP1-2
Perdomo J. M. 15AP3-4
Pereira A. I. 11AP3-6
Pereira A. 6AP1-10
Pereira H. 5AP2-11
Pereira L. 17AP3-9, 15AP3-6, 5AP2-11, 1AP5-10, 14AP1-9, 17AP2-2
Pereira M. 13AP1-7, 7AP5-7, 8AP6-4, 8AP8-7, 11AP1-9, 11AP2-10
Perelló Cerdà L. 7AP5-11
Perera Sarri R. 8AP6-5
Pérez C. 5AP2-10
Pérez I. 13AP1-3
Pérez O. 10AP2-7
Perez Bergara E. 14AP6-10
Pérez Bergara E. 17AP3-3
Perez Peña J. 3AP4-7
Perez Peña J. M. 5AP1-7
Pérez-Herrera E. 6AP1-6
Perez-Navarro G. I. 18AP2-6, 8AP4-6
Perez-Peña J. M. 4AP6-9
Pérez-Peña J. M. 4AP7-8
Pérez-Tejón G. 10AP2-7
Periñán Blanco R. 15AP3-2
Perner A. 6AP1-5
Perruchoud C. 19AP6-10
Pesian S. 7AP1-4
Pesteil F. 17AP3-1
Pestel G. 3AP3-3
Petinaki E. 12AP2-11
Petit J. 14AP7-9
Petit P. 8AP2-2
Petsas A. ESAAP2-5
Philip P. 12AP4-7
Piacherski V. 8AP3-6
Piachersky V. 9AP3-5
Picker O. 4AP8-11
Pickering J. 12AP4-7
Picó Rodríguez C. 8AP5-7
Pico Veloso J. 2AP2-10
Pidhirnyy Y. 8AP3-11
Piepho T. 3AP3-3
Pifarré J. 1AP8-8, 3AP2-5
Pignaton W. 17AP2-3
Pili-Floury S. 8AP2-2
Pinheiro C. 8AP6-4, 8AP8-7, 11AP3-6
Pinheiro N. 11AP1-9
Pinho C. 5AP2-11, 14AP1-9
Pinho Mendes Pereira A. C. 10AP3-6
Piñol S. 1AP5-4
Pinto C. 8AP4-1
Pipanmekaporn T. 5AP2-6, 14AP8-9
Pirenne S. 5AP2-5
Pires A. 1AP8-11
Pita I. 5AP4-8, 8AP5-8
Pitkänen H. 9AP6-8
Piwowarczyk P. 7AP4-8, 9AP4-1, 9AP4-2
Pjević M. 1AP7-4
Planas A. 5AP2-10
Plaschke K. 1AP6-7
Plaud B. 17AP4-4
Ploner F. 4AP8-5
Pocknall C. 11AP5-1
Podgorbunskikh A. 1AP3-3
Poelaert J. 1AP3-2
Poelart J. 5AP1-5
Pogatzki-Zahn E. M. 14AP6-8
Polanco-Garcia M. 8AP7-9
Polh D. 9AP1-2
Polinelli F. 10AP3-6
Polo Gil M. 14AP6-10, 17AP3-3
Polta S. 7AP4-4
Ponsonnard S. 11AP4-2, 17AP3-1
Poonawala Y. 11AP2-6
Popescu M. 5AP3-7
Popescu R. 8AP3-9, 14AP8-8
Popovska S. 11AP2-5
Pöpping D. M. 8AP5-5
Pospiech A. 15AP1-3
Poterman M. 4AP3-4, 4AP7-3, 4AP8-1
Potouridou M. 11AP1-5
Potręć B. 9AP4-2
Pozdnjakov O. 9AP5-10
Prassler S. 3AP5-6
Prats M. 7AP5-2
Prazak J. 12AP6-5
Preckel B. 4AP1-5
Prieto M. 8AP2-8
Priman T. 9AP1-2
Priori R. 5AP1-8
Priston M. 3AP2-8
Proost J. H. ESAPC1-3
Prückner S. 8AP4-4
Puchades R. 2AP1-11
Puchalska E. 11AP1-8, 11AP3-8
Puchol J. 3AP3-1
Pueyo F. J. 1AP1-7
Pueyo J. 19AP4-11
Puga A. 11AP1-6
Puig J. 4AP8-4, 5AP3-8, 5AP3-9, 15AP1-6
Puig L. 14AP1-5
Puig M. 14AP1-4
Pumberger M. ESAPC1-6
Punj J. 1AP7-9
Punjasawadwong Y. 5AP2-6
Purdell-Lewis J. A. G. 1AP6-11
Purser S. 1AP4-1
Putensen C. 3AP1-9
Putineanu D. 14AP7-9
Putzer G. 13AP1-4

Puylaert M. 14AP2-2, 14AP2-7
Puyo Olmo M. 17AP1-7

Quadros L. 19AP5-3
Quesada A. 15AP2-6
Quintana-Villamandos B. 4AP1-9, 4AP7-5
Quintaneiro C. 12AP3-9
Quintela O. 8AP3-10
Quinteros Hinojosa F. 18AP2-8

Rabanal J. M. 15AP2-6
Rabichoffski A. 4AP5-9
Racheli N. 3AP2-7
Radočaj T. 8AP5-4
Radwan T. 3AP5-5
Ragazzi R. 5AP2-3
Raimundo A. 14AP2-8
Raj N. 10AP1-7
Rajsman G. 12AP2-6
Rakipovic A. 3AP1-10
Ramasco F. 5AP2-10
Ramirez C. 8AP2-6
Ramirez L. 10AP3-8
Rammes G. ESAAP1-4
Rancic Zuric I. 3AP6-10
Rangel F. P. 14AP1-2
Ranta V.-P. 9AP6-8, 9AP6-9
Rasmussen L. S. 18AP1-3, 13AP1-1, 17AP1-3, 6AP1-5
Rasmussen Y. 14AP6-1
Rasul R. 8AP7-7
Rauch H. 3AP4-2
Ravussin P. 7AP4-10
Rebet O. 3AP3-4, 3AP3-5
Reboso J. A. 19AP4-3
Recarte Rico M. 17AP2-6
Reddi D. 11AP5-3
Reesink K. D. 4AP3-10
Rehberg B. 11AP3-4
Reichl S. U. 14AP6-8
Reinaldo J. A. 15AP1-2, 17AP2-6
Reintam Blaser A. 12AP3-4
Reis A. T. 9AP1-10
Remond M. 7AP1-4
Renner J. 4AP8-7, 19AP3-4
Reponen E. 7AP5-1
Reus E. 19AP1-8
Revelo M. 18AP2-8
Revuelta M. 14AP2-5
Reyes F. ESAAP2-6
Reyes Fierro A. 5AP2-8
Reyes García R. 6AP3-6
Reyes Osorio F. E. 5AP2-8
Reyntjens K. 1AP6-1
Rezneac L. 12AP5-3
Rhodes A. 1AP6-6
Riba Pola J. 18AP2-3
Ribeiro B. 14AP2-10, 11AP3-10
Ribeiro P. 7AP3-8
Riber C. 17AP1-3
Richardson J. 2AP1-6
Richardson M. 18AP2-1
Riedel B. 4AP6-7
Riga M. 4AP4-4
Rigby A. 15AP3-1
Riggenbach C. 5AP1-10
Rimaitis K. 11AP5-6
Rinaldi G. 2AP1-8
Riou B. 13AP2-6
Ritchie K. 18AP1-4
Rivas G. 12AP5-8
Rizzuto C. 5AP2-3
Ro Y. J. 1AP5-2
Robinson C. 8AP5-2
Roca M. 18AP2-4
Rocha C. 17AP3-8
Roche M. 2AP2-4
Rochera M. I. 18AP2-4
Rodiera C. 3AP2-3
Rodiera J. 3AP2-3
Rodrigues G. 12AP3-9, 11AP2-10
Rodrigues L. 19AP5-11
Rodrigues M. G. 8AP8-7, 8AP6-4
Rodrigues M. 11AP3-10, 19AP5-11
Rodrigues N. 1AP3-8
Rodriguez P. 5AP4-4
Rodriguez U. 14AP1-5
Rodríguez A. 1AP5-6, 7AP5-2
Rodríguez B. 1AP7-1
Rodríguez C. 6AP3-3
Rodriguez Gimillo P. 2AP1-11, 8AP1-8, 12AP6-11
Rodriguez Rubio L. 12AP2-2
Rodríguez-Bernal G. J. 4AP1-9
Rodriguez-Pont A. 4AP6-5
Roh W. 4AP4-6
Roigé J. 17AP2-5
Rojas R. 11AP4-6
Roje Z. ESAPC1-4
Rojilla S. 5AP4-5
Roman A. 4AP1-8, 4AP6-1
Romera A. 19AP3-5
Romero E. 8AP1-8
Ronenson A. 11AP1-10
Rosa B. 15AP3-4
Rosa G. 1AP2-1, 7AP3-6, 10AP1-6
Rosal Martins M. 15AP1-3
Rosenberg J. 17AP1-3
Rosenberg P. H. ESAAP1-1
Rosenberger P. 4AP8-3
Rosendal C. 3AP4-2
Rosenstock C. V. 19AP6-6, 11AP5-9
Rosinia F. 17AP2-1
Rossi A. 7AP4-10
Roten N. 11AP3-4
Roteta L. 11AP2-2
Roth R. 19AP4-3
Rothen H. U. 5AP1-9, 5AP1-10
Rovira I. 19AP4-1
Rovira L. 7AP2-5, 7AP2-8
Rovsing M. L. 1AP5-7
Rowley R. 8AP8-5
Royse C. 1AP2-3, 1AP4-1, 18AP2-1
Ruggeri L. 11AP4-4
Ruggiano P. 8AP2-4
Rugyte D. C. 10AP2-1
Ruiz-Granado P. 12AP2-5
Rump A. 3AP3-3
Ruzsics I. 12AP1-3
Ryabinina I. A. 9AP3-5
Rypulak E. 9AP4-1, 9AP4-2
Ryska M. 12AP6-5
Ryska O. 12AP6-5
Ryu J.-H. 9AP4-3

Sá A. 11AP1-6
Sá J. 2AP2-11, 19AP4-10
Sá Couto P. 8AP6-7
Sabaté A. 3AP1-7
Sabaté M. 12AP1-11
Sabaté S. 1AP5-4
Sabaté Pes A. 6AP3-6
Sabirov D. M. 8AP8-1
Sabljak V. 1AP8-3
Sacases R. 3AP2-5
Saeki K. 14AP4-5
Saeteng S. 5AP2-6
Sagiroglu G. 9AP1-9
Saiti A. 8AP6-8
Saito S. 14AP3-6
Saitou J. 12AP6-6
Sakai A. 14AP2-4
Sakamoto E. 4AP7-2, 19AP4-4
Sako S. 19AP1-5
Sakulpacharoen N. 2AP2-3
Sakuma S. ESAAP2-1, 1AP1-5
Sala- Blanch X. 8AP1-4
Salazar A. 17AP3-7, 18AP2-8
Salazar F. 6AP1-10
Salazar Y. 14AP1-5
Saldanha L. 11AP3-11
Saleh O. 6AP1-3
Saleh Abdo I. 11AP1-2
Salgado M. 4AP4-7
Salgado M. A. M. 4AP4-7
Salim M. 7AP1-4
Salito C. 5AP1-8
Salvador Bravo M. 17AP3-3
Salzwedel C. 4AP8-4
Samain E. 8AP2-2
Samaranch-Palero N. 12AP6-7
Samejima Y. 11AP4-3
Samoila B. 14AP7-4, 14AP7-6
Sampaio C. 11AP2-10
Samy W. 17AP1-9
San Miguel G. 9AP3-3
Sánchez A. 3AP3-1, 3AP6-4
Sánchez Carrillo F. 10AP1-3
Sánchez Hernández A. 1AP5-8
Sánchez Martín C. E. 13AP1-2
Sanchez-Etayo G. 6AP1-10
Sánchez-Etayo G. 8AP7-9
Sánchez-Ledesma M. J. 1AP1-7
Sander M. 3AP3-6
Santa Barbara R. 1AP8-10
Santa Bárbara R. 1AP8-1
Santa Cruz J. 11AP2-2
Santaliestra J. 3AP2-3
Santana L. 7AP5-2
Santiveri X. 12AP5-8
Santos A. 1AP4-9, 5AP2-9
Santos C. C. 11AP3-6
Santos J. 4AP8-9
Santos M. J. 9AP2-10, 19AP5-8
Santos T. 11AP3-6
Santos V. 4AP8-9
Sanyal J. 4AP8-10
Sanz M. 19AP4-11
Sanz-Sanjosé E. 13AP1-2
Sápi E. 10AP1-10
Sapio F. 2AP1-8
Saraçoğlu T. 4AP7-6
Saridaki A. 19AP1-9, 19AP1-10
Saridaki A.-M. 19AP1-6
Sasaki N. 9AP1-5
Sasara T. 14AP8-5
Sato K. 14AP2-11
Sato T. 4AP6-4
Saud F. 19AP5-2
Savan V. 6AP1-1, 6AP3-1
Saveleva J. 11AP1-10
Savoldelli G. 11AP3-4
Scarlatescu E. 12AP6-3
Schaden E. 6AP1-4
Schäfer M. 7AP2-7
Schaible A. 1AP6-7
Scharbert G. 6AP1-4
Schauer A. 19AP2-8
Scheeren T. W. L. 4AP8-1, 4AP3-4, 4AP7-3
Schick V. 4AP6-7
Schiefer J. 12AP5-11
Schier R. 4AP6-7
Schindler C. 8AP5-3
Schiraldi R. ESAAP2-4, 2AP1-9, 3AP4-8, 5AP2-1, 11AP2-7, 11AP2-11, 11AP4-6, 11AP4-8, 15AP1-2, 17AP3-7, 18AP2-8
Schlegel E. 4AP5-5
Schmidtmann I. 3AP3-3

Schmitt H. 19AP5-5
Schmitt Z. 8AP1-7
Schmittner M. D. 2AP2-1, 8AP2-1
Schmucker E. 19AP6-9
Schnabel A. 14AP6-8
Schneider E. 14AP5-6
Schneider G. 3AP2-2, 7AP3-5
Schnupp V. 3AP3-3
Schoenherr T. 14AP7-8
Schoettker P. 19AP6-10
Schollaert C. 3AP6-2
Scholtès J.-L. 14AP5-8
Scholz J. 7AP2-11
Scholz S. 3AP3-6
Schuler R. 8AP3-8
Schulz C. M. 14AP5-6
Schwan K. 1AP6-7
Schwarz A. 19AP5-4
Scott J. 11AP5-1, 1AP6-11
Seidlova D. 11AP4-7, 11AP5-8
Seixas T. 11AP3-10, 14AP2-10, 19AP5-11
Sekiyama H. 14AP2-3, 14AP2-11
Seligson D. 14AP1-3
Sellors J. 10AP3-3
Selman A. 2AP2-4
Semenova T. 1AP3-4
Sen S. 12AP6-10
Sengès P. 11AP4-2
Seo H. J. 1AP5-2
Seok J.-H. 4AP5-4
Serrano Gonzalvo V. 19AP6-7
Serviddio G. 9AP5-7
Sevilla R. 8AP8-6, 4AP7-10, 8AP3-10
Shaibakova V. 4AP1-1, 7AP2-4
Shaida O. 4AP4-5
Sharafudeen S. 1AP3-6, 6AP2-2, 8AP5-1, 19AP1-7, 19AP5-7
Sharipova V. H. 8AP8-1
Sharma M. 19AP2-9
Shcherbakov S. 6AP1-3
Sheffy N. 12AP4-9
Shehu T. 15AP1-4
Shi C. 5AP1-4
Shibata S. 9AP6-4
Shiekh M. 12AP3-2
Shiels S. ESAAP2-5
Shigematsu K. 8AP2-3
Shim Y. H. 1AP1-9, 1AP7-8, 4AP4-1
Shimajiri T. 14AP8-5
Shimizu K. 6AP2-1
Shin I.-W. 9AP6-1
Shin S.-W. 9AP2-1
Shin W. 19AP6-3
Shin Y. S. 14AP3-8
Shinde P. 17AP4-5
Shiokawa H. 14AP8-7
Shiozaki K. 1AP3-5
Short A. 19AP2-5
Shpata V. 12AP3-5, 12AP3-6
Shunichi T. 1AP1-5
Sia A. T. H. 11AP5-7
Siampalioti A. 9AP1-7
Siddik-Sayyid S. 11AP1-7
Sierra P. 1AP5-4, 4AP6-5
Sierra Casado E. 1AP6-5
Silva A. 1AP4-9, 5AP2-9, 9AP5-2
Silva C. 19AP2-10, 19AP5-3
Silva H. B. 7AP3-8
Silva M. 19AP4-10
Silva M. G. 8AP1-4, 8AP2-6
Silva R. 11AP3-11
Silva Duarte J. 14AP2-10
Sim K. 12AP1-5
Sim W. S. 8AP4-2
Simões M. 9AP2-10
Simon T.-P. 1AP6-8
Simón C. 4AP7-7, 5AP4-5
Simón Adiego C. 9AP2-7
Simsek A. 12AP5-4
Singeisen H. 8AP5-3
Sinz L. 19AP5-4
Sirithaweesit C. 11AP1-1
Sison R. 2AP2-8
Sitkin S. 2AP1-10, 9AP5-10, 11AP1-10, 18AP2-9
Sitnikov A. 4AP7-1
Sivevski A. 11AP2-5
Siyuan Y. 14AP6-4
Sjövall F. 7AP4-9
Skelton V. 6AP2-2
Sklavou C. 11AP2-9, 12AP2-9, 12AP2-10
Skovgaard Olsen K. 1AP5-7
Sliva J. 9AP4-8
Slivin O. 5AP1-2
Slooter A. J. 7AP1-2
Smairi S. 9AP3-11
Smaoui M. 14AP1-8
Smetkin A. 4AP2-2, 5AP2-7, 3AP4-3
Sng B. L. 11AP5-7
Soares J. C. 1AP8-5, 10AP3-5, 19AP6-8
Socała K. 9AP4-1, 9AP4-2
Sockalingam I. 19AP6-1
Soehle M. 3AP1-9, 3AP2-8, 7AP1-3, 12AP6-4
Soh S. R. 1AP7-8
Sohn J.-T. 9AP6-1
Sokolova M. 7AP2-6
Solak M. 8AP8-8, 19AP3-9, 19AP6-11
Solaz C. 1AP5-8, 3AP3-1, 3AP6-4
Solaz Roldán C. 19AP4-7
Soler E. 6AP1-6
Soliman H. 17AP1-8
Soliveres J. 1AP5-8, 3AP3-1, 3AP6-4
Soliveres Ripoll J. 19AP4-7
Solorzano P. 17AP3-7
Sondore A. 6AP1-2
Sonoda S. 14AP4-4
Sonoda Y. 12AP3-10
Sonzogni V. 10AP2-10
Sorci M. 19AP6-10
Sørensen A. M. 6AP1-5
Sørensen L. P. 13AP2-5
Soro M. 5AP3-4, 15AP1-6
Soro García M. 8AP5-7
Sosa Nicora J. C. 18AP2-3
Sostaric S. 6AP3-11
Sousa A. 4AP5-9
Sousa E. 9AP5-2
Sousa G. 17AP2-4, 17AP3-5
Soxhuku A. 12AP3-5, 12AP3-6
Spadaro S. 5AP2-3
Spasovski S. 11AP2-5
Spielauer I. 3AP5-3
Spiliopoulou I. 12AP2-11
Spina L. 2AP2-8
Spotti A. 10AP2-10
Sramek V. 3AP5-9
Städing D. 2AP1-7
Staehr-Rye A. K. 17AP1-3
Staffa R. 3AP5-9
Staikou C. 14AP6-6
Stamatakis E. 14AP7-10
Stamatis G. 14AP7-2
Stambouli N. 12AP3-1
Stammatakis E. 8AP6-8
Stankovic V. 9AP1-2
Starkopf J. 12AP3-4
Stefaniotou A. 19AP1-9, 19AP1-10
Stein K. 2AP1-5
Steiner L. 7AP4-10
Steinfath M. 4AP8-7, 7AP2-11
Steinmetz J. 18AP1-3
Steringer-Mascherbauer R. 4AP4-2
Sterr J. 3AP3-6
Stevens E. 4AP1-8, 4AP6-10
Stevens J. L. 2AP2-6
Stewart L. 1AP6-4
Steyaert A. 14AP5-8
Stigler M. 7AP1-5
Stirparo S. 11AP2-4, 11AP4-4
Stojanovic M. 1AP8-3
Stojanovic Stipic S. ESAPC1-4
Stourac P. 11AP4-7, 11AP5-8
Strande S. 19AP4-8
Stratigopoulou P. 4AP7-9, 19AP1-9, 19AP1-10
Streitberger K. 1AP6-7
Strike E. ESAPC1-5, 6AP1-2
Struys M. M. R. F. 3AP1-8, ESAPC1-3, 4AP8-1, 4AP3-4, 4AP7-3
Struys M. 3AP1-5, 3AP2-6, 3AP6-2, 3AP6-6
Studer U. E. 4AP8-8, 6AP2-4
Stueber F. 4AP8-8, 6AP2-4
Stundner O. ESAPC1-6, 8AP7-7
Stypmann J. 4AP1-6
Suárez C. 10AP2-7
Suárez E. 17AP4-3
Suárez V. 1AP5-6
Suárez Edo E. 17AP1-7
Suball M. 11AP4-5
Subbotin V. 4AP7-1
Subrahmanyam R. 19AP2-9
Sudhir G. 17AP4-5
Sugimura K. 8AP7-1
Sugita S. 4AP6-4
Suk P. 3AP5-9
Sulser S. 3AP5-6
Sumikawa K. 14AP2-4
Sumitani M. 14AP2-11
Summavielle T. 7AP5-7
Sun H. S. 1AP1-8
Superlano Romero R. M. 1AP7-1
Suraseranivongse S. 11AP1-1
Suskeviciene I. 10AP2-1
Suslov V. 19AP3-3
Sütő B. 12AP1-3
Sutton L. 1AP6-6
Suzuki A. 19AP1-3, 19AP1-5
Suzuki N. 3AP5-2
Suzuki T. 9AP6-5, 14AP4-7
Svitlyk H. 8AP3-11
Svitlyk Y. 8AP3-11
Syed S. 2AP2-8
Sysiak J. 9AP4-1
Szegedi L. 5AP1-5
Székely A. 10AP1-10
Székely E. 10AP1-10
Sztark F. 18AP1-4
Šehović M. 8AP5-4

Tabata M. 14AP4-4
Tada Y. 7AP1-9
Tagari P. 9AP1-7
Taj K. 1AP3-7
Takagi S. ESAAP2-1
Takagi Y. 19AP2-3
Takahama Y. 19AP2-3
Takahashi K. 19AP2-2, 8AP2-3
Takahashi M. 19AP2-2
Takahashi N. 7AP4-5
Takahashi S. 9AP6-5, 14AP4-7
Takahashi Y. 7AP3-3
Takahiko T. 1AP4-2, 1AP8-2, 12AP3-3
Takaishi K. 9AP2-2
Takaki S. 12AP4-7
Takamiya T. 3AP5-2
Takarada J. 14AP8-6
Takebe M. 12AP2-8
Takeda A. 7AP2-1

Takeda J. 9AP1-3
Takeda S. 1AP1-2
Takiguchi M. 14AP4-5
Takó K. 10AP1-10
Tamayo E. 12AP2-4
Tampo A. 19AP1-3, 19AP1-5
Tamura T. 9AP4-5, 9AP4-9
Tanaka T. 14AP3-1
Tanaka Y. 13AP2-1
Tang C.-Y. 9AP5-8
Taniguchi A. 14AP4-3
Taniguchi Y. 3AP2-4
Tanioku T. 18AP2-5
Tanno M. 1AP1-5
Tarabrin O. 6AP1-3, 19AP3-3
Tashiro S. 7AP4-5
Tatara T. 1AP7-3, 14AP4-4
Taurá P. 14AP6-2
Tavares E. 1AP3-10, 9AP3-9, 13AP2-4
Tavernier B. 3AP6-9
Tavlan A. 9AP1-6, 19AP1-2
Teixeira C. 12AP3-9
Tena B. 14AP6-2
Teo A. P. C. 11AP5-7
Terao Y. 14AP2-4
Terradas R. 12AP5-8
Terradillos E. 8AP4-11
Tesniere A. 17AP4-4
Thabet S. 12AP3-1
Theisen M. M. 4AP1-6, 4AP1-7, 4AP7-4, 4AP8-5
Theodoraki K. 14AP6-6
Theusinger O. 3AP5-6
Thienpont E. 14AP1-6
Thiran J.-P. 19AP6-10
Thomsen J. L. 9AP3-10
Thong S. Y. 11AP3-7, 12AP6-1
Tian M. 14AP1-1, 18AP1-1
Tibiriça E. 4AP4-7
Tibiriçá E. 4AP6-3
Tiganiuc L. 8AP5-9
Tio M. 6AP1-10
Tiò M. 8AP7-9
Titapant V. 11AP1-1
Titi L. 10AP1-6
Tochikubo J. 9AP4-5, 9AP4-9
Toda M. 4AP5-6, 17AP4-2
Toda Y. 6AP2-1
Todman E. 17AP1-4
Toemboel F. P. 12AP1-9
Tojo K. ESAPC1-2
Toker K. 8AP8-8, 19AP3-9, 19AP6-11
Tokic Crnic N. 9AP1-2
Tokinaga Y. 19AP2-2
Tokumine J. 15AP2-4
Tola G. 11AP4-4
Tolonen A. 9AP6-8, 9AP6-9
Tom G. 1AP3-6
Toman H. 9AP1-9, 12AP4-11
Tomanovic N. 8AP8-9
Tomasz H. 3AP2-4
Tomé Â. R. 7AP3-8
Tomescu D. 5AP3-7, 12AP6-3
Tominaga Y. 7AP3-10
Tomioka S. 9AP2-2
Tomoaki Y. 1AP4-2, 1AP8-2, 12AP3-3
Tomulic Brusich K. 12AP1-8
Tonkovic D. 3AP6-10
Topal A. 9AP1-6, 19AP1-2
Tope C. 17AP4-6
Topuz U. 19AP3-7
Torisaen L. 1AP3-2
Torres J. 17AP3-2
Tramèr M. 9AP1-1
Tramèr M. R. 8AP5-5
Tranche I. 5AP1-7, 19AP3-5
Tranche Álvarez-Cagigas I. 3AP4-7
Trembach N. 7AP5-9
Treschan T. 12AP4-8
Treskatsch S. 3AP3-6
Triglia T. 7AP1-8
Trimarchi G. 1AP7-2
Troconiz I. 14AP5-2
Tsao Y.-M. 9AP5-8
Tse J. 2AP2-8
Tseng A. C.-C. 1AP1-8
Tsentsiper L. 7AP5-6
Tsinari K. 19AP1-6, 19AP1-9, 19AP1-10
Tsiotsi P. 9AP1-7
Tsoleridis S. 8AP4-7
Tsoleridis T. 8AP4-7
Tsubokawa T. 4AP2-3, 6AP3-7
Tsuchida H. 13AP2-1
Tsukamoto M. 4AP7-2, 17AP1-10, 19AP4-4
Tullo L. 9AP5-7
Tuncali B. 2AP1-2, 19AP5-10
Tuncer Uzun S. 9AP1-6
Tuominen H. 7AP5-1
Turan G. 12AP1-4, 12AP5-4
Turan M. 14AP8-10
Tytgat N. 5AP1-5
Tzabazis A. 19AP5-5
Tziris N. 14AP6-3

Uchida M. 14AP5-7
Uchida O. 9AP3-2
Uchimoto K. 7AP3-10
Uchino H. 7AP4-9
Udina E. 6AP2-7
Ueda M. 14AP7-5
Uka S. 14AP6-11
Ullrich R. 3AP5-3, 12AP1-9
Umbrain V. 1AP3-2
Ungureanu R. 8AP6-9
Unlukaplan A. 4AP3-9
Unlusoy O. 8AP4-9
Untergehrer G. 7AP3-5
Urner M. 8AP3-8
Usenko L. 12AP5-5
Usichenko T. 2AP1-7, 14AP5-4
Utsumi I. 3AP2-4
Uvarov D. 1AP3-4, 14AP5-9
Uvelin A. 1AP7-4
Uyar M. 14AP1-11, 14AP8-10

Vaida S. 19AP5-4
Valcárcel Fernández M. 6AP3-5
Valencia J. F. 3AP2-6
Valencia L. 7AP5-2
Valencia Chavez C. V. 4AP5-5
Valencia Murillo J. F. 3AP2-9
Valentim A. 14AP2-8
Valentim A. M. 7AP5-7
Valero R. 7AP5-11
Välitalo P. 9AP6-8, 9AP6-9
Valldeperas Ferrer S. 8AP6-1
Valle R. 2AP2-10
Valle S. 2AP2-10
Vallet B. 3AP6-9
Valsamidis D. 8AP6-8, 14AP7-10
Valverde Junguito J. L. 7AP3-4
Van Aelbrouck C. 6AP1-8
Van Aken H. K. 4AP1-6, 4AP1-7, 4AP7-4, 4AP8-5
Van Bylen B. 14AP3-3
Van de Velde M. 8AP7-4
Van den Akker R. F. P. 4AP1-4
Van den Brom C. E. 4AP1-4
Van Den Eynde S. 1AP3-2
Van der Beek T. 19AP2-6
Van der Elst S. 14AP5-8
Van der Linden P. ESAAP1-2, 6AP1-1, 6AP3-1
Van Der Linden P. 11AP2-3
Van der Velde M. I. 4AP3-4, 4AP7-3
Van der Werff D. B. M. 10AP2-4
Van Dijk D. 7AP1-2
Van Groeningen D. 19AP2-1, 19AP2-8
Van Herwerden L. A. 7AP1-2
Van Lantschoot A. 12AP5-10
Van Poucke S. 3AP6-1
Van Zundert J. 14AP2-2, 14AP2-7, 14AP3-2, 14AP3-3, 14AP4-1, 14AP8-1, 14AP8-2
Van Zundert T. 19AP3-8
Vanags I. ESAPC1-5, 6AP1-2
Vandenberghe S. 5AP1-9
Vandenbroeck V. 8AP1-7
Vandenheuvel M. 4AP3-7
Vander Laenen M. 14AP3-2, 14AP8-1, 14AP8-2
Vander Straeten S. 4AP1-3
Vandewiele K. 4AP2-4, 4AP2-5
Vane L. A. 14AP1-2
Vanelderen P. 8AP7-4, 14AP2-2, 14AP2-7, 14AP3-2, 14AP3-3, 14AP4-1, 14AP8-1, 14AP8-2
Vanhengel K. 12AP5-10
Vanlersberghe C. 1AP3-2
Vara E. 4AP7-7, 5AP4-5
Varadarajan B. 5AP1-9, 5AP1-10
Varas Ameigeiras E. 9AP2-7
Varosyan A. 1AP4-4, 15AP2-2
Vasconcelos G. 10AP3-6
Vasilakos D. 14AP6-3
Vasileiou I. 19AP1-6
Vasilescu M. 8AP4-10, 8AP6-9
Vasilkov V. 1AP4-3
Vassilas N. 1AP3-11
Veiga P. 11AP1-9
Velly L. 7AP1-3, 7AP1-8, 12AP6-4
Venâncio C. 7AP5-7, 9AP5-9
Vendemiale N. V. 7AP5-8
Venkat N. 11AP5-1
Verburgh P. 4AP2-4, 4AP2-5
Vercauteren M. 4AP1-3
Verçosa N. 14AP1-2
Vereecke H. E. M. 3AP1-8, ESAPC1-3
Vereecke H. 3AP1-5, 3AP2-6
Verma S. 11AP2-1, 11AP3-2
Vester-Andersen M. ESAAP1-6
Vicente F. 1AP8-10
Vicente R. 4AP6-6
Vichitvejpaisal P. 2AP2-3
Vicković S. 1AP7-4
Vico M. 1AP4-8, 4AP6-8, 9AP3-7
Videc Penavić L. 8AP5-4
Vieira A. 19AP3-11
Vieira V. 19AP3-11
Vilalta T. 8AP1-8
Vilardell M. E. 19AP6-9
Vilchez A. 5AP1-7
Vilchez Monge A. L. 3AP4-7
Vilela H. 4AP8-9
Vilke A. 10AP2-1
Villabona G. 10AP2-7
Villagran M. J. 5AP2-1
Villalba P. 1AP1-7, 1AP8-8, 3AP2-5
Villalonga R. 15AP3-4
Villalonga Vadell R. 15AP3-2
Villar T. 6AP3-3
Villarino L. 12AP5-9
Villaverde I. 19AP6-9
Vimalanathan C. 11AP2-1
Viskovic Filipcic N. 12AP1-8
Vissers K. 14AP4-1
Vivona G. 2AP1-8
Vivona L. 2AP1-8

Vogt A. 5AP1-9, 5AP1-10
Volders P. 8AP7-4
Volkova I. 14AP5-9
Vollmer C. 4AP8-11
Voloshchuk R. 8AP8-2
Volta C. A. 5AP2-3
Von Dossow-Hanfstingl V. 8AP4-4
Vondra Sedlacek J. 12AP1-8
Vos J. J. 4AP8-1
Votava M. 9AP4-8
Voutsina A. 11AP2-9
Vural Gokay B. 4AP3-9, 8AP4-9, 10AP2-8

Wada K. 7AP1-9
Wadhwa A. 14AP1-3
Wadhwani R. 19AP5-2
Wadhwani R. N. 1AP3-6, 8AP5-1, 19AP1-7
Wagle S. 11AP1-10, 18AP2-9
Wagner K. J. 14AP5-6
Waldau T. ESAAP1-6
Walker J. D. 9AP5-4, 17AP1-6, 17AP4-1
Walldén J. 1AP1-6
Wand S. 1AP5-3
Wang J.-J. 1AP4-5, 8AP5-6, 14AP4-9
Wang J. 7AP2-9
Wang M. 5AP3-3
Wang R. 5AP3-3
Wang S. J. ESAAP2-3
Wang X. 14AP1-1, 7AP3-9
Wappler F. 6AP3-2
Warren G. 10AP3-1
Watanabe &. 4AP4-10
Watanabe M. 9AP6-5
Watson D. 1AP6-11
Webber L. 17AP2-1
Weber N. C. 4AP1-5
Weber T. P. 4AP1-6, 4AP1-7, 4AP7-4, 4AP8-5
Wei H. 12AP2-7
Wei I. 1AP4-7
Wei W. 14AP6-4
Weinheimer O. 12AP1-9
Weinreich G. 14AP7-2
Weiss C. 2AP2-1, 8AP2-1
Welter S. 14AP7-2
Wendt M. 2AP1-7
Weng S.-F. 1AP4-5, 8AP5-6
Weninger E. 8AP4-4
Wenk M. 8AP5-5
Weott P. A. 19AP1-4
Werdehausen R. 7AP2-7
Werth M. 19AP1-8
Westerhof B. E. 4AP3-10
Wetsch W. A. 19AP5-9
Wetterslev J. 11AP5-9, 19AP4-8, 19AP6-6
Whitehouse T. 12AP4-1
Widyn J. 6AP3-4
Wild U. 6AP3-2
Wilkinson D. 1AP2-3
Willems A. ESAAP1-2, 6AP1-1, 6AP3-1
Williams D. J. 5AP1-6, 8AP7-3, 9AP5-4, 17AP1-6, 17AP4-1
Williams Z. 1AP4-1, 18AP2-1
Wilson E. 19AP6-4
Wilson R. J. T. 3AP3-8
Wilwerth M. 11AP2-3
Windeløv N. A. 6AP1-5
Winkelmann J. 8AP4-8
Wlaź A. 7AP4-8
Wohlgemuth R. K. 6AP1-4
Wolf C. 3AP2-8
Wong E. 11AP2-6
Wong M. 12AP1-11
Woo T. 9AP1-5
Wouters P. 1AP6-1, 4AP2-1, 4AP2-4, 4AP2-5, 4AP3-7, 4AP5-1
Wouters P. F. 17AP1-2
Wrobel M. 19AP1-8
Wu X. 14AP1-1
Wuethrich P. 4AP8-8, 6AP2-4
Wuethrich P. Y. 8AP3-4
Wujtewicz M. 18AP1-6
Wyffels P. 3AP1-5
Wyler B. 3AP1-5, 3AP1-8

Xanthos T. 4AP7-9
Xara D. 1AP4-9, 5AP2-9
Xie Z. 18AP1-1
Xiong L. 14AP1-1
Xiong X. 7AP4-3
Xu T. 7AP4-3
Xu X. 14AP1-1
Xue Q. 12AP2-7
Xue Z. 14AP1-1

Yılmaz B. 14AP1-11
Yahya S. 12AP4-7
Yaksh T. L. 14AP3-10
Yamada R. 19AP1-1
Yamada T. 9AP1-3, 14AP3-5
Yamada Y. 14AP2-11
Yamaguchi K. 12AP6-2, 12AP3-10
Yamakage M. 19AP2-2, 8AP2-7
Yamamoto K. 4AP2-3, 6AP3-7
Yamasaki H. 14AP3-5
Yamauchi M. 8AP2-7
Yamaura K. 14AP8-7
Yamazaki F. 4AP6-4
Yamazaki M. 12AP2-8
Yanaru T. 8AP2-3
Yañez Vilas J. I. 19AP2-11
Yang C. W. 8AP7-6
Yang H. S. 1AP5-2
Yang H. 19AP6-3
Yang H.-S. 4AP5-4
Yang J. 7AP3-9
Yang L. 4AP6-2
Yang S.-F. 9AP5-8
Yaseen K. 3AP1-6
Yashima N. 9AP2-9
Yasuda T. 12AP6-2, 9AP5-6
Yasuharu K. 3AP3-2
Yates D. 3AP3-8
Yeo Y. G. 3AP2-1
Yi J.-W. 7AP3-2
Yilmaz M. 5AP4-9
Yimrattanabowon P. 1AP8-4
Yli-Hankala A. 3AP1-2
Yogo H. 14AP8-5
Yoh H. 3AP4-1
Yokomizo T. 9AP5-1
Yokose M. 11AP1-3
Yokota M. 14AP8-6
Yokoyama T. 4AP7-2, 17AP1-10, 19AP4-4
Yombi J.-C. 12AP4-5
Yon J. 1AP4-6
Yon J.-H. 4AP5-4
Yonemitsu T. ESAAP1-3, 7AP4-5
Yoo B. 1AP4-6
Yoo K. 7AP4-7
Yoon J.-U. 9AP2-1, 9AP2-5
Yoon J.-Y. 9AP2-1, 9AP2-5
Yoon M. H. 14AP3-4
Yoon-Kang S. 14AP7-1
Yoshikawa A. 4AP2-9
Yoshikawa M. 9AP6-5, 14AP4-7
Yoshimoto M. 9AP6-7
Yoshinuma H. 8AP7-1
Yoshitsugu Y. 14AP2-3
Yost C. S. 19AP1-4
Youn A. 4AP4-8, 8AP4-5
Yousfi Y. 14AP1-8
Youssef B. 11AP4-2
Yu B. 12AP2-7
Yüce A. 19AP6-10
Yumoto Y. 4AP3-8

Zaballos M. 4AP7-10, 8AP3-10, 19AP3-5, 19AP4-5
Zabolotskikh I. 7AP5-9
Zachariadou C. 14AP1-7, 14AP6-3
Zachomitros F. 1AP8-6
Zaharov V. 4AP2-2
Zahn P. K. 14AP6-8
Zahry G. 3AP5-5
Zakharov V. 3AP4-3
Zamaro-Michalska A. 6AP3-10
Zamparini G. 4AP5-3, 4AP5-7
Zancajo Torrecillas J. J. 13AP2-2
Zancajo Torrecillas J. 12AP4-4
Zani G. 5AP2-3
Zaric D. 8AP1-1
Zaslansky R. 14AP1-4
Zavackiene A. 11AP5-6
Zelinkova H. 11AP4-7
Zeng Q. 12AP2-7
Zeyneloglu P. 2AP1-2
Zhang B. 18AP1-1
Zhang F. 12AP2-7
Zhang K. ESAAP2-1
Zhang Y. P. 7AP3-6
Zhang Y. 7AP4-3
Zhen Y. 18AP1-1
Zheng F. 12AP1-2
Zhu L. 4AP1-2, 4AP1-10
Zitta K. 7AP2-11
Zivaljevic V. 1AP8-3
Zlotnik A. ESAPC1-1, 7AP1-1, 12AP5-1
Zogogiannis I. 9AP6-10, 19AP1-11
Zoltan E. 12AP4-7
Zotou A. 9AP1-7, 11AP2-9
Zuckerman G. 3AP2-7
Zugasti O. 14AP6-10
Zuo Y. X. 4AP6-2
Zwierzchowska A. 11AP2-8
Zwisler S. T. 13AP2-3
Zwissler B. 8AP4-4

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