



Sustainability

How to reduce our carbon footprint in OR, hospital and the planet

An ESAIC Toolkit for beginners

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Glossary of terms



Carbon dioxide equivalent (CO₂e): The number of metric tonnes of CO₂ emissions with the same global warming potential as one metric tonne of another greenhouse gas.

Greenhouse gases (GHGs): Includes gases such as nitrous oxide, methane, carbon dioxide and hydrofluorocarbons.

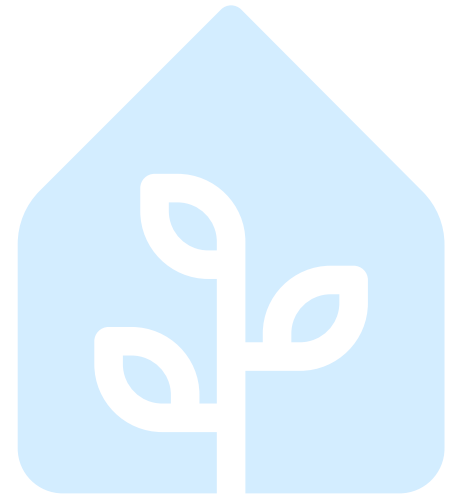
Global warming potential (GWP): A measure of how much the emissions of 1 tonne of gas will absorb over a given time period relative to the emissions from 1 tonne of CO₂.

GWPI00: Global warming potential over 100 years

Total intravenous anaesthesia (TIVA): Anaesthesia administered via intravenous administration of the anaesthetic drug propofol

HVAC: Heating, ventilation and air conditioning

AGSS: Anaesthetic Gas Scavenging System





- The carbon footprint of clinical practice accounts for 4.7% of the European total emissions of greenhouse gases (GHGs).
- The EU is the 3rd largest contributor to the global healthcare industry's carbon footprint.
- Waste from hospitals is either released unchanged or incinerated, which results in a major release of CO₂ into the atmosphere.



Why?

- The OR is a significant source of pollution in hospitals.
- Governments and international treaties have set CO₂e reduction targets.
- It is a team-building opportunity.
- Simple solutions and changes in practice can reduce our carbon emissions.



Who?

Administrators – everyone! Nurses, Support Workers, Anaesthetists, Surgeons, Pharmacists, Porters.



How?

- Be a champion, be a leader!
- Gather and talk with interested people.
- Explain the benefits for: the planet, patients, the hospital, you!
- Show them this toolkit!





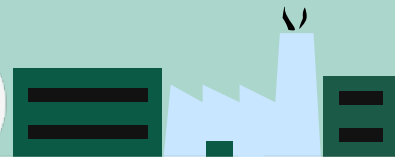
REJECT

- Avoid usage of unnecessary documents or devices
- Avoid wasting of resources and generation of waste



REDUCE

- Avoid unnecessarily drawing up of medications and maximise the potential number of doses from one container before opening a new one.
- Reduce energy consumption by turning off lights and devices when not in use
- Reduce length of hospital stays
- Use telemedicine where possible



REUSE

- Use reusable products where possible in line with local safety and hygiene protocols
- Make use of reusable drinks containers



RECYCLE

- Adapt recycling protocols to local needs



REPAIR

- Implement protocols to ensure proper device maintenance, and ensure adequate post-sale maintenance services are included when purchasing new devices





Questions to ask in your department

What is the life cycle of this new medical device?

What is the carbon footprint of new technology/practices that have been introduced?



How does our carbon footprint compare with other healthcare systems?

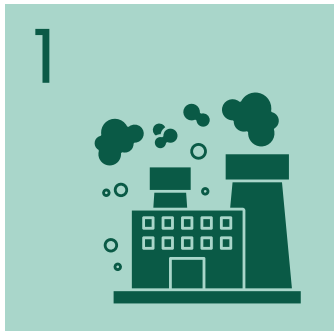
Can we learn from other healthcare systems or services?



The ESAIC Glasgow Declaration on Environmental Sustainability



- The European Society of Anaesthesiology and Intensive Care (ESAIC) developed the declaration to address the impact theatres have on the environment.
- The declaration focuses on improving sustainability in anaesthesiology and intensive care across Europe.
- The declaration divides the carbon footprint of healthcare into 4 scopes with recommendations for each.



Direct emission



Energy use
optimisation



Waste management
and supply chain



Wellbeing and self-care
enhancement

Carbon footprint

Perioperative Sustainability



The ESAIC Glasgow Declaration on Environmental Sustainability



Direct emission

- Reduce direct emission.
- Use of low-flow anaesthesia
- Consider use of TIVA and/or regional anaesthesia wherever possible.
- Avoid desflurane unless clinically indicated.
- Use of N2O only when other alternatives are not available, consider cylinder vs piped supply.



Waste management and supply chain

- Avoidance of single-use devices.
- Segregate waste to ensure a higher recycle proportion.
- Recycling of glass drug ampoules if possible.



Energy use optimisation

- Maintain theatre temperature and humidity between 18-22 and 30-60% respectively.
- Use of LED lightbulbs
- Recirculation of theatre air
- Switch off scavenging systems overnight.
- Minimum HVAC settings when not in use



Wellbeing and self-care enhancement

- Education on night-time working and fatigue.
- Night-time availability of appropriate food and beverages.
- Availability of psychological help.
- Implementation of well-being support groups.





Scope 1: Reduce inhaled anaesthetic atmospheric pollution



- Volatile anaesthetics have a much higher global warming potential (GWPI00) than carbon dioxide.
- All halogens are greenhouse gases (GHGs)
- Use N2O-free anaesthesia protocols
- Use low-flow anaesthesia and closed-circuit systems.
- Use of scavenging systems





- Many devices and systems do not need to run continuously.
- Turn off lights, computers, ventilation, and scavenging when not in use.
- Use start and end of day checklists or automate, when possible, to ensure compliance.
- Set the theatre to an optimal temperature.
- Motion sensors for lighting or taps can also save energy.



Waste bins

- Define different waste types e.g, clinical, domestic.
- Post clear graphics to help.
- Reorganize theatre waste bins to favour use of domestic waste/recycling bins.



Reduce opened and unused disposable supplies

- Think before you open.
- Use reusable devices.
- Redesign pre-packaged supply kits.

Drug waste

- Prepare drugs when needed.
- Favour smaller vials over larger ones.
- Dispose waste drugs as recommended, but not in the sink.

Reduce paper waste

- Think before you print, only print necessary documents.
- Recycle paper after use.



1 Get information

- What are the local regulations?
- Is there already a program for recycling?

2 Measure

- Obtain recyclable information materials to and calculate the predicted monetary amount of benefit for the hospital

3 Find allies

- Find doctors in the hospital who will help you e.g. lead nurses, doctors, administrators
- Consider how to motivate teams to recycle
- Contact local non-profit organisations involved in sustainability
- Make contact with local government organisations



Food and beverages

- Make use of reusable containers for food, water/tea/coffee
- Avoid single-use plastic cutlery
- Consider buying locally sourced produce for use in meals.



When attending conferences

- Decline flyers and plastic goodies
- Decline single-use badge holders



Be green

- Opt to use public transport when possible; when travelling to conferences use the train and not the plane
- When possible, attend meetings, appointments, or conferences virtually
- Reduce emails to all, each email creates 0.21grams of CO2



- Assess the ecological cost of decontamination processes with hygiene services.
- Meet with pharmacists about the life cycle of single-use devices.
- Meet with technical services about existing recycling processes and waste management already implemented in the hospital.
- Meet with companies about reprocessing opportunities and/or the life cycle of their medical devices.
- Meet with hospital administrators to review pay-back from recycling services, discuss how to improve the quality of care or quality of life at work, discuss food/beverage availability for staff and merge with already existing institutional programmes.





Other ideas – for your hospital



Theatre ventilation
setback out of hours



Review nonsterile
glove use



Video conference
clinics



Re-manufacturing
surgical devices



N2O Manifold
decommissioning



Use oral paracetamol
instead of intravenous



AGSS switch off out of
hours



Review patient
warming devices



Drugs

- Use pre-filled syringes when possible.
- Do not dispose of drugs in the sink.
- Limit preparation of "emergency drugs" - 50% of prepared drugs go unused.



Devices

- Reduce opened and unused disposable supplies.
- Choose new devices based upon their longevity.
- Favour reusable devices.
- Favour re-chargeable devices.



Energy

Turn off:

- Lights
- Computers and electrical devices Ventilation
- Set theatre temperature to an optimal level.





Other ideas – involve your surgical colleagues and infection control



Rubbing not scrubbing

- Large quantities of water, heated to a high temperature are used every day for surgical scrubbing.
- The typical scrub uses 20L of water and when we consider how many staff must wash their hands in this manner, water usage becomes very high.
- Introduction of alcohol-based hand scrubs (ABHRs) have been found to reduce water and energy consumption whilst also being as effective as traditional hand scrubbing.
- A pilot study in NHS Highland in Scotland estimated this change could result in a carbon reduction of 135 tonnes per year³.
- Some countries have adopted this already following international guidelines- is it happening in your hospital yet?

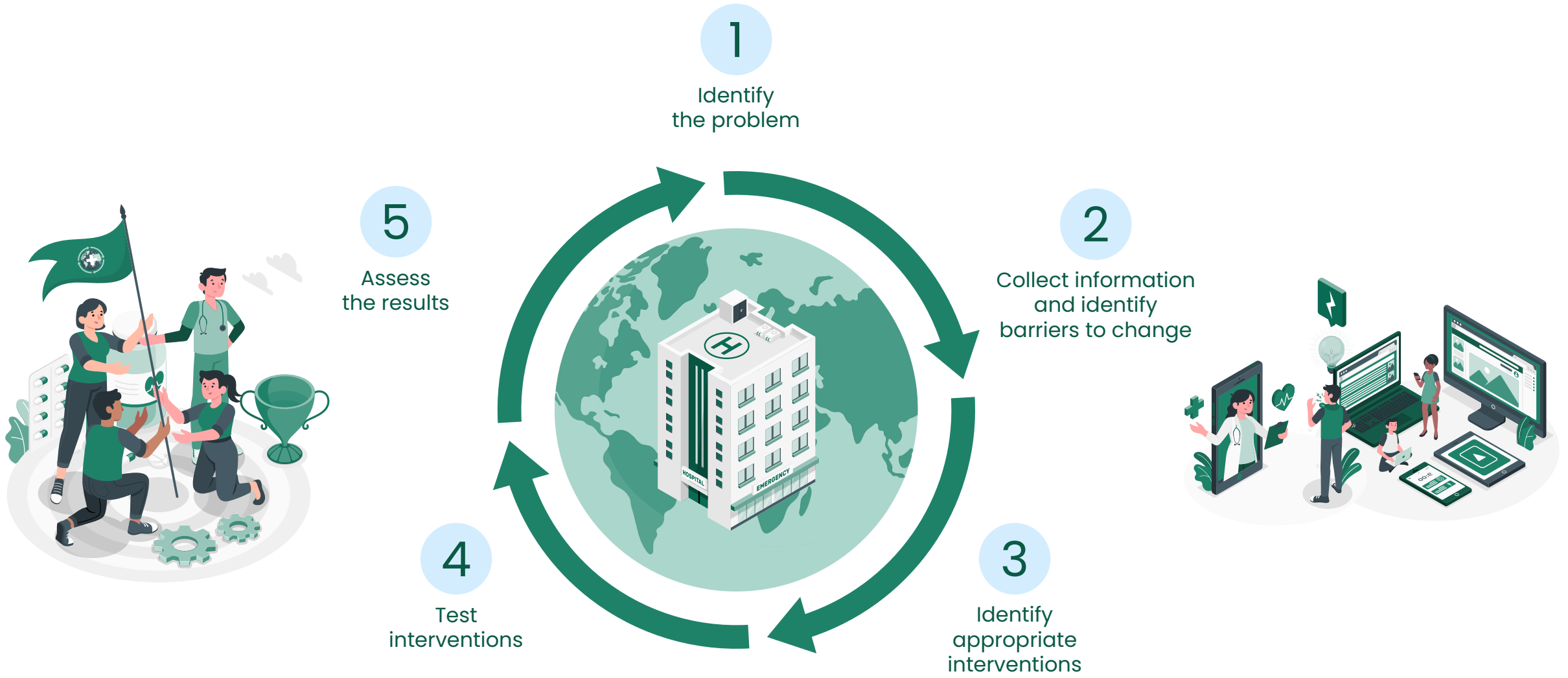


Collective responsibilities



- Should include both patients and healthcare professionals.
- Ensuring education for all healthcare professionals.
- Providing signed agreements as evidence of dedication to decreasing environmental footprint.
- Minimizing waste at every stage of the perioperative process.
- Establishing communication channels between the local task force and hospital management.
- Ensuring sustainability resources are easily accessible for everyone.
- Support and encourage good personal behaviour to optimize energy use at every opportunity.







1 Desflurane was identified as a greenhouse gas, with potentially less polluting alternatives available.

2 Barriers included concerns for patient safety and changes to established practice

3 Cost analysis showed that, in addition to its poorer environmental profile, Desflurane was more expensive than the alternatives. A literature review showed that its perceived benefits were not as clear-cut.

4 Staff education was commenced along with a poster campaign (“Go Green, Think Yellow”). Cartridges were still available, but removed from anaesthetic machines and staff were required to sign these out before use.

5 Adverse events resulting from reduced availability of desflurane were monitored through robust M&M reporting systems which highlight patient harm.

6 Desflurane use dropped to near zero within a few weeks, and its order was discontinued by pharmacy after 6 months of no use.





1. Gonzalez-Pizarro, P. et al. (2024) 'European Society of Anaesthesiology and Intensive Care Consensus Document on Sustainability', *European Journal of Anaesthesiology*, 41(4), pp. 260-277. doi:10.1097 /eja.0000000000001942.
2. Buhre, Wolfgang; De Robertis, Edoardo; Gonzalez-Pizarro, Patricio. The Glasgow declaration on sustainability in Anaesthesiology and Intensive Care. *European Journal of Anaesthesiology* 40(7);p 461-464, July 2023. | DOI: 10.1097 /EJA.0000000000001862
3. The Scottish Government (2023) NHS Scotland Climate Emergency and Sustainability: Annual report 2021 to 2022. Available at: <https://www.gov.scot/publications/annual-nhs-scotland-climate-emergency-sustainability-report-2021-22/pages/4/> (Accessed: 19 May 2024).
4. Embed rubbing not scrubbing. Available at: <https://www.nhscfsd.co.uk/media/4tznki2a/ngtp-rubbing-notscrubbing-v12-november-2023.pdf> (Accessed: 19 May 2024).

Thank you!

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Together for
improved health outcomes,
patient safety, and greater
environmental sustainability
across anaesthesiology and intensive care.



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