The Environmental Impacts of the Operating Room

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Disclosure…Disclaimer

No disclosures

Disclaimer…I am not the expert, but an interested learner!

Dr. Duncan Meiklejohn

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Outline

- Climate change and healthcare
- The operating room…it's not just about the "stuff"
- How can you make an impact?

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"The world's health sector facilities churn out CO2 through the use of significant resources and energy-hungry equipment. This is perhaps ironic, as medical professionals our commitment is to 'first, do no harm.' Places of healing should be leading the way, not contributing to the burden of disease."

- Tedros Adhanom Ghebreyesus, Director General, World Health Organization

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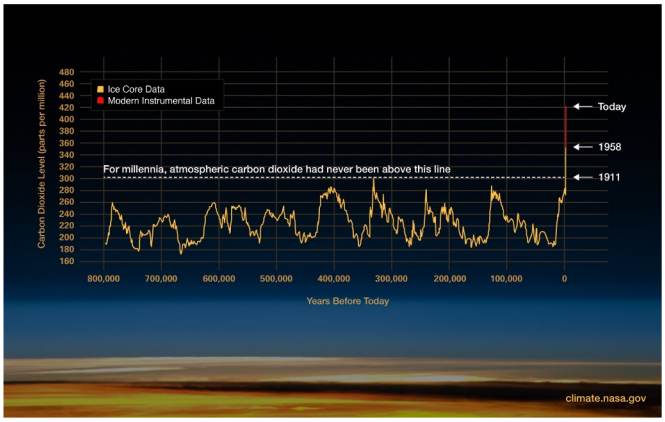
What is Climate Change?



Climate change refers to long-term **shifts in temperatures and weather patterns**…Since the 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels.

This increases CO2 levels (our greatest contributor of GHG).

https://edap.epa.gov/public/extensions/CCIDataViewer/CCIDataViewer.html
NASA Climate Change

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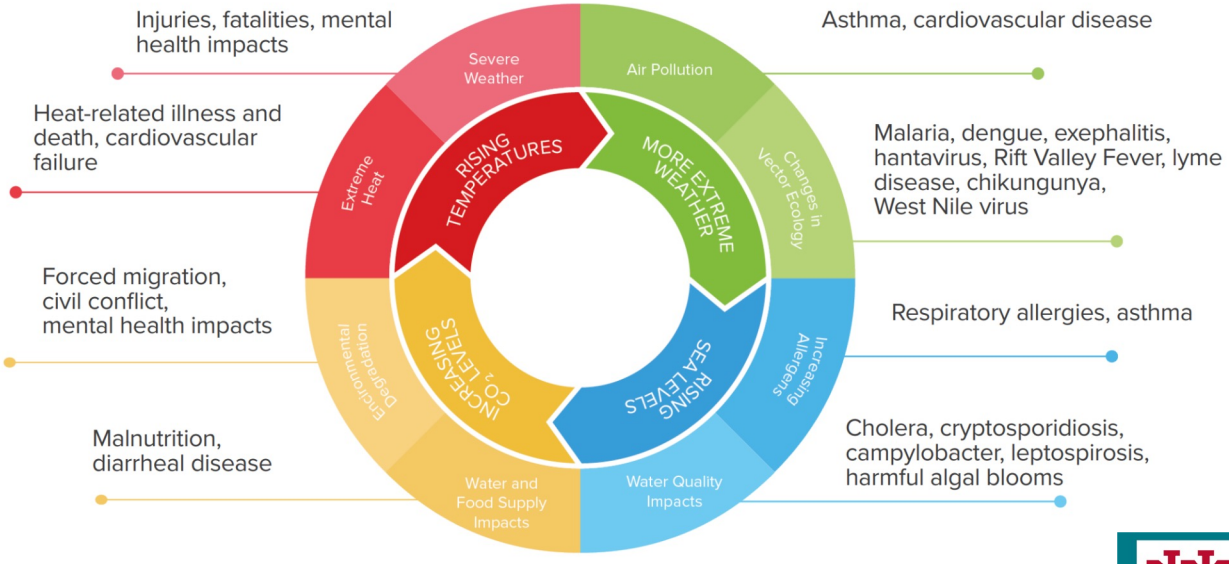

Figure 1: Impact of climate change on human health (Source: U.S. Centers for Disease Control and Prevention)

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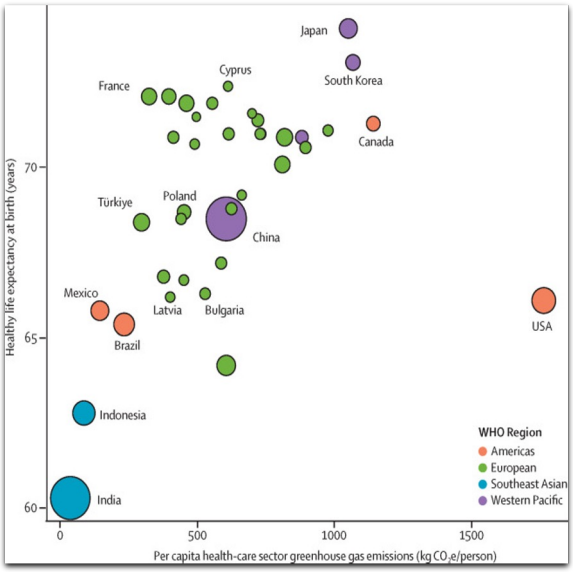
Global Healthcare Sector

- 5th in emissions worldwide if counted as its own country
- Healthcare: 10% of all US greenhouse gas emissions
- ORs are responsible for 30-70% of hospital waste
- Can consume 3-6x more energy per square foot than anywhere else in the facility



"Health Care's Climate Footprint", Health Care Without Harm, 2019 and 2022 Annual Report
Saleh et al. *Journal of Bone and Joint Surgery.* 2023
Babu et al. *Neurosurgery.* 2019
Greening the OR | Practice Greenhealth
Romanello et al. *Lancet* 2022

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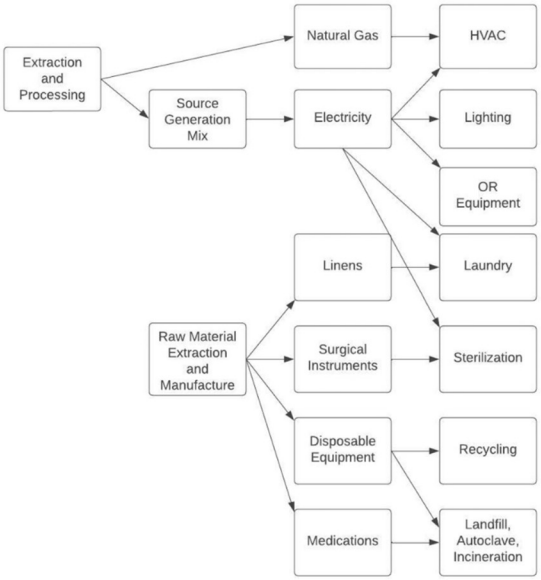
Research

- Waste audit
- Greenhouse gas emissions
  - "Carbon footprint"
- Life Cycle Assessment (LCA):
  - "Cradle to grave"
  - Multiple measures of impact



Hess and Salas *Environ Health Perspect.* 2021
Rizan et al *Ann Surg* 2020
Meiklejohn *Laryngoscope* 2024

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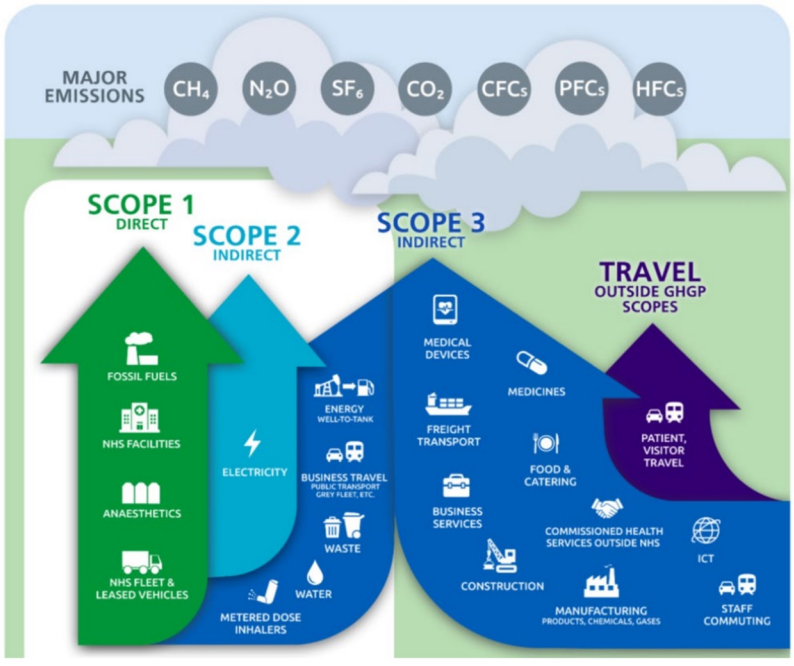

1. Direct emissions
2. Indirect emissions from energy
3. Indirect production and waste

Reducing Healthcare Carbon Emissions: A Primer on Measures and Actions to Mitigate Climate Change
AHRQ 2022

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ENERGY

- Energy accounts for more than half the GHG in the healthcare sector
- HVAC “setback”
  - Not a one size fits all

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WATER

- Meta-analysis (>5,000 subjects): waterless hand scrub = to chlorhexidine scrub, better than betadine
- Hospital system in NC: Observed 100 consecutive scrub cycles of surgeons, nurses and techs
  - Water left on; even when leaving the sink
  - Waterless scrub: 2.7 million liters annually
  - 22% to 80% conversion
  - ~$2,000/year savings (excludes towel/sewer effects)

Ho et al. *Journ Hosp Infection* 2019
Wormer et al. *Amer Surg* 2013

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MAC inhaled agent	Atmospheric lifetime (yrs)	100 yr global warming potential (compared to CO2)	Equivalent miles driven (MAC hr use at 1L/min)
Isoflurane 1.2%	3.6	539	8
Sevoflurane 2.2%	1.9	144	4
Desflurane 6.7%	14	2,540	190
Nitrous Oxide 60%	114	273	49

- Life-cycle assessments demonstrates propofol better than gas

ASA Committee on Environmental Health 2024

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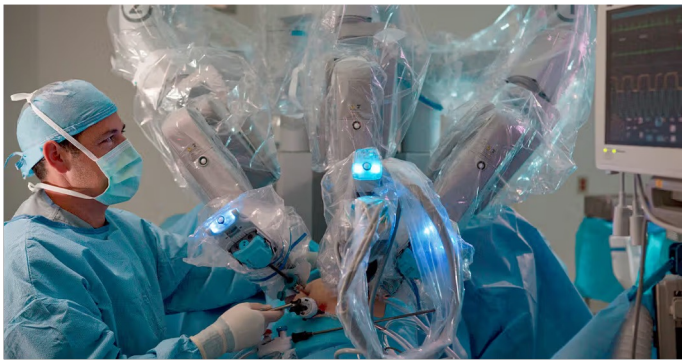
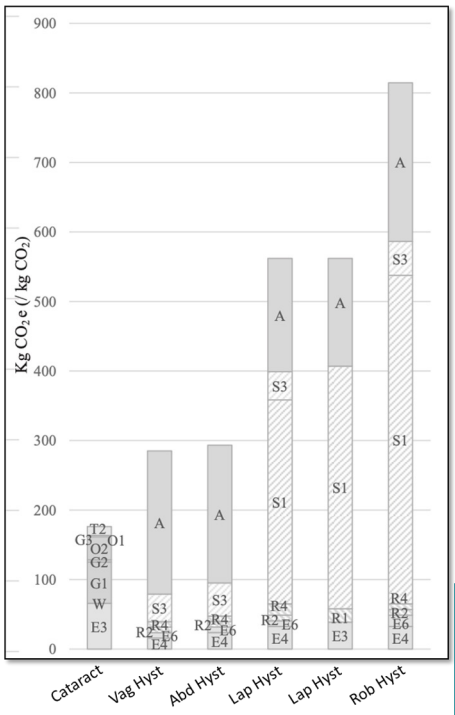


Single use instruments: one of largest contributors to carbon footprint



Rizan et al *Ann Surg* 2020

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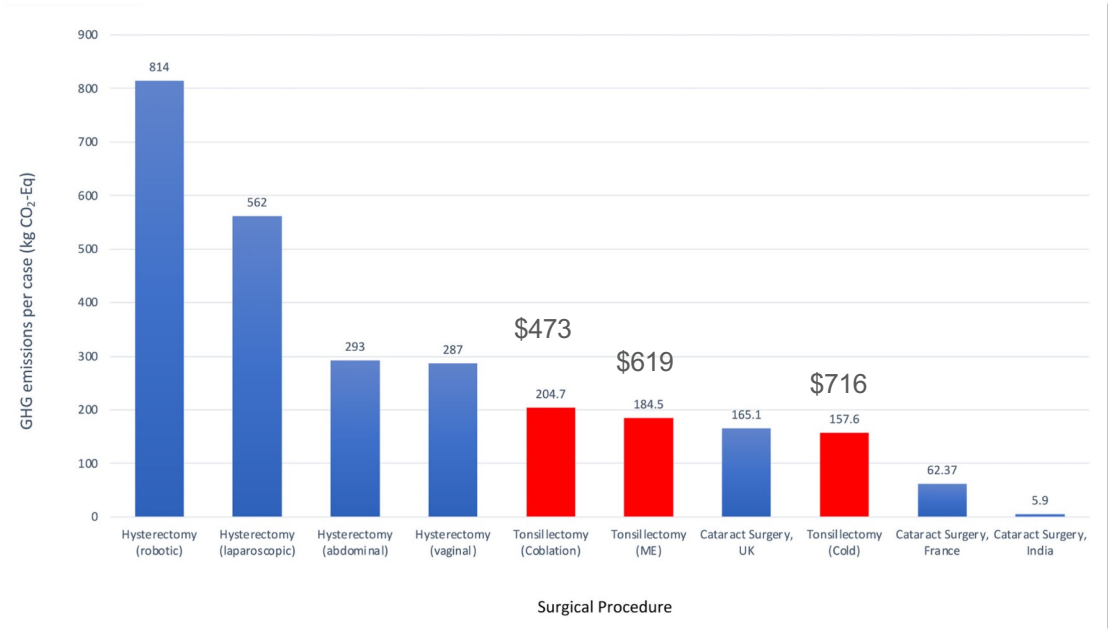

Meiklejohn *Laryngoscope 2024*

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Waste eliminated

- Back table drape
- Mayo cover
- Suction tubing
- Saline bin
- NG tube
- Towels*

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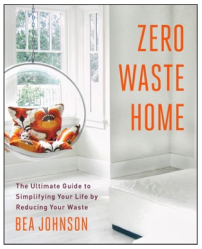
Advocacy/Resources

EPA United States Environmental Protection Agency

World Health Organization

Health Care Without Harm

PRACTICE Greenhealth



Refuse

Rethink

Reduce

Reuse

Recycle

Rot

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