Driving Environmental Sustainability in Healthcare

NUHS National University Health System

A GREEN NUHS

NUHS 2030 TARGET

25% reduction in emissions Scope 1, 2, 3

Whole-of-System Approach

1. Implement governance & structure
2. Establish the baseline
3. Determine key areas to work on
4. Set targets
5. Work with stakeholders

Delivering High Value Care with Low Carbon

GREEN and GOOD CARE

- **Reduce use of drugs and devices with high CO_2e**: anaesthetic gases, metered dose inhalers

Reduce nitrous oxide use in NUH & AH

- **Reduce waste**

New recycling stream in NUHS: disposable stainless steel instruments

HEALTHCARE CIRCULAR ECONOMY

- Transition out of "take-make-waste" linear economy
- **Design out waste**

Extending lifespan of MRI machines at NUH

ENERGY EFFICIENCY

- **Air-conditioning systems**
- **IT systems**
- **Operations**

Air change ACMV setback in NUH OTs

EMBODIED CARBON in New Builds, Facilities

- **Reduce carbon emissions over the full building lifecycle –** through energy-efficient systems, sustainable materials, and innovative designs

Sustainability by design: AH Integrated General Hospital

Like Desflurane? Let's Refrain!

Anaesthetic gases contribute to **5% of a hospital's carbon footprint**, and make up the **majority of healthcare's scope 1 emissions.**

How bad are anaesthetic gases?

Desflurane is an **anaesthetic gas** with **high global warming potential and long atmospheric lifespan.**

Agent	Atmospheric Lifetime (Years)	GWP_{100}	CO_2e per bottle (kg)
Sevoflurane	1.4	140	53
Desflurane	**14.1**	**2530**	890
Nitrous Oxide	**109**	**273**	928 (Size E)

Greening the OT

Agent	CO2e (kg)	Cost (S$)	Distance Driven (km)	Environmental Issues
Propofol (TIVA)	1	12.31	6	Aquatic life toxicity
Sevoflurane	3	2.71	19	Greenhouse gas
Desflurane	81	22.13	509	Greenhouse gas

Ref: Hu et al. The Carbon Footprint of General Anaesthetics: A case study in the UK. Resour Conser Recycl, 2021 & NUH Dept of Pharmacy

Educating staff with stickers on anaesthetic machines showing the **per-hour environmental and financial impact of desflurane and lower-carbon alternatives.**

Best way to embed sustainability?

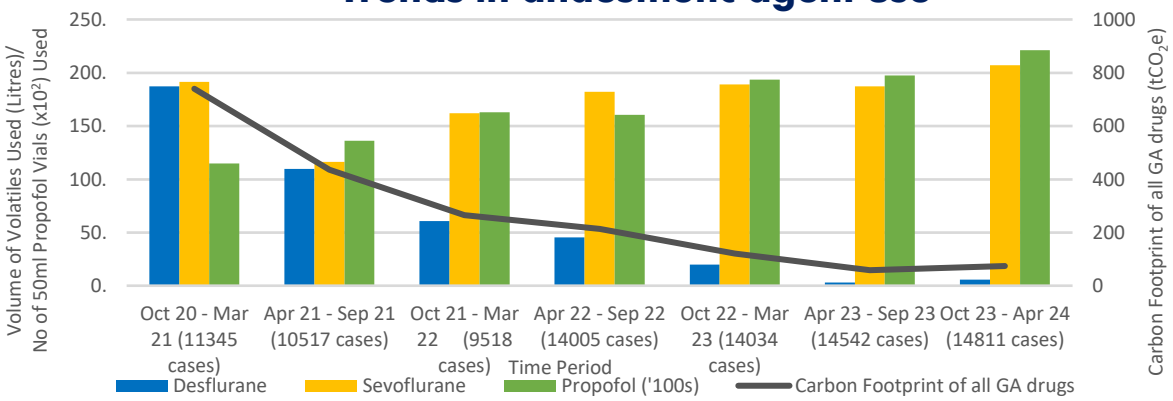
In the MMed anaesthesia exams, candidates are now expected to:
"Show an understanding of the environmental impact of anaesthetic practice including but not limited to, pharmacological agents, equipment and process of administering medical care, and the evolving solutions for these problems."

Make it part of our curriculum and exams

Have we asked patients what they want?

75% of our patients preferred an anaesthetic that emitted **lower carbon emissions** in the knowledge they may take a slightly longer time to wake up (few mins).

Trends in anaesthetic agent use



Savings

- Financial:
  S$341,900/year
- Environmental
  - 1,303 tonnes CO_2e
  - 8.22 million passenger km
  - Removing 411 cars off the road

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Reduce Metered Dose Inhalers (ReMeDI)

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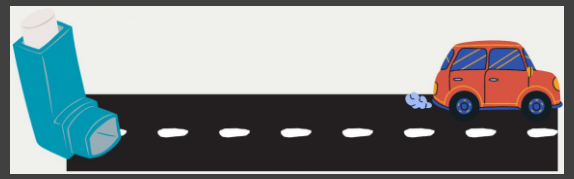
Project ReMeDI strives to minimize the environmental impact of treating asthma and chronic obstructive pulmonary disease (COPD) while maintaining patient care standards.

Did you know the carbon emission from **120** doses of a metered dose inhaler



is equivalent to a **142** km car journey?

In 2023, NUH amassed

1.05 $ktCO_2eq$*

Or 4,296 km driven by an average gasoline-powered passenger vehicle

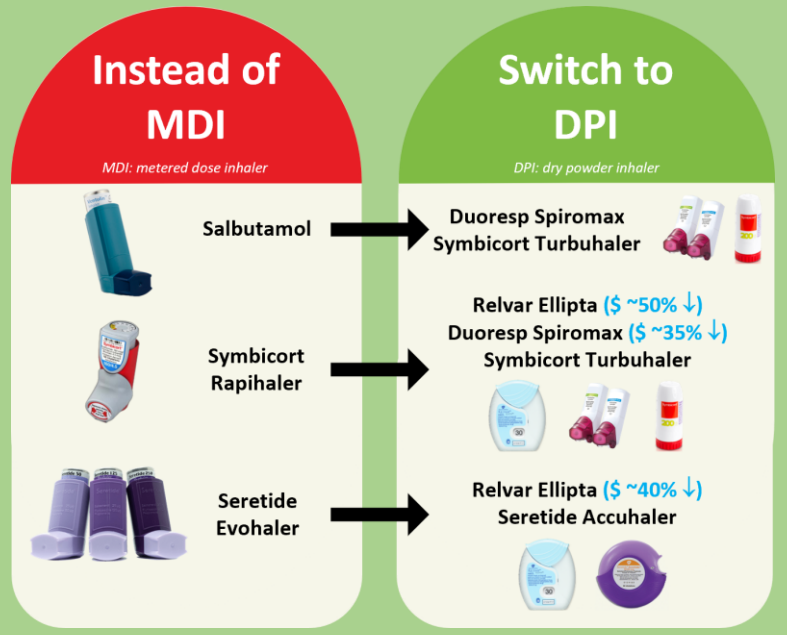
Metered Dose Inhalers (MDIs) contain a hydrofluoroalkane (HFA) propellant which contributes significantly to global warming.

MDIs' carbon footprint is **~20x** of Dry Powdered Inhalers (DPIs).

Our approach involved two key elements:

1. Educating healthcare providers on reducing MDI prescriptions and encouraging the adoption of greener alternatives like DPIs

2. Informing patients about the environmental impacts of MDIs while offering options for DPI substitutions



** Carbon equivalent for each Inhaler is obtained from PrescQIPP which employed lifecycle assessment methodology*