

# SUSTAINABLE PERIOPERATIVE CARE

## Project Charter Summary

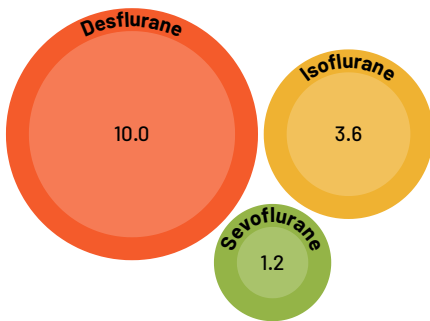
MINIMIZE DIRECT EMISSIONS

### Eliminating Desflurane

Inhaled anesthetic agents make up approximately 50% of the carbon footprint from perioperative services. The impact of anesthetic gases is measured by assessing their global warming potential over 100 years (GWP100). Desflurane has a GWP100 of 2540, compared to a GWP100 of 130 for sevoflurane, and a GWP100 of 265 for nitrous oxide.



**PROJECT CHARTER:** See the full version of the project charter for more change ideas, details, and a complete list of references.



Lifetime of anesthetic gases in atmosphere

Eliminating or minimizing desflurane use is recommended by best practice guidelines in Canada and internationally due to its high global warming potential. The Canadian Anesthesia Society has called for the elimination or minimization of desflurane (among other sustainability actions) in their [2023 Guidelines to Practice of Anesthesia](#) (see Section 10), and many hospitals have already eliminated desflurane use. Anesthesiologists in Canada usually have a choice of different anesthetic gases, thus avoiding desflurane in favour of agents with lower global warming potential and cost can have both environmental and financial benefits.

**GOAL:** Eliminate the use of desflurane as an anesthetic agent within the institution as soon as possible

**PROJECT SCOPE:** Institution-wide (or regional health authority, depending on health system configuration)

**EMISSIONS SCOPE:** Scope 1 (direct GHG emissions originating from sources controlled & owned by the organization)

### ESTIMATING IMPACT

#### ACTIVITY/OUTCOME METRIC

Total number of containers of each type of anesthetic agent used per month

- Can be sourced from pharmacy procurement data to obtain purchasing by container for desflurane, isoflurane, sevoflurane, and nitrous oxide.
- Monthly counts are recommended to observe progress, but data can be processed for any given time frame.

#### RELATED ENVIRONMENTAL METRIC

Emissions per container in kg CO<sub>2</sub>e

- Desflurane: 886 kg CO<sub>2</sub>e/240 ml GWP100: 2540
- Isoflurane: 190 kg CO<sub>2</sub>e/250 ml GWP100: 510
- Sevoflurane: 44 kg CO<sub>2</sub>e/250 ml GWP100: 130
- Nitrous Oxide: 1054 kg CO<sub>2</sub>e/3.4 kg GWP100: 310
- Propofol: 21 kg CO<sub>2</sub>e/1 kg

\*See [Project Charter](#) for references

#### ENVIRONMENTAL IMPACT

Estimation of total impact in kg CO<sub>2</sub>e

- Tally the kg CO<sub>2</sub>e for all gases
- To translate your results to stakeholders:
  - Use the [Natural Resources Canada Greenhouse Gas Equivalencies Calculator](#)
  - Divide amount in g CO<sub>2</sub>e by the average emissions/km in Canada (206 g CO<sub>2</sub>e) to obtain km driven equivalent

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### MINIMIZE DIRECT EMISSIONS

## Root Causes and Change Ideas for Eliminating Desflurane



**PLAYBOOK:**  
View the playbook for other perioperative sustainability opportunities and resources.



**VIDEO:**  
Eliminating Desflurane at NYGH with Dr. Melissa Ho

People are unaware of the magnitude of desflurane's environmental impact and of the clinical viability of alternative anesthetic gases and techniques.

#### EDUCATION & AWARENESS

- Create a poster showcasing the environmental impact of desflurane relative to other anesthetic gases, and place it in your department.
- Consult [PEACH Ontario](#)'s list of Ontario hospitals that have banned desflurane, and communicate to your team that others are ahead in this effort.
- Conduct educational rounds and initiate individual conversations with your team/colleagues to ensure they understand the significant environmental impact of desflurane. Use clinical studies to emphasize that sevoflurane is equally efficacious, cheaper and has a twenty-fold reduced GHG burden compared to desflurane. The following resources can inform your discussions:
  - [Environmental Sustainability Guidelines](#) in the Guidelines to the Practice of Anesthesia Revised Edition 2023.
  - [Reducing the carbon footprint of anesthetic gasses](#), Royal College of Anesthetists.
  - [Reducing your contribution to climate change: your choice of anesthetics matters!](#)
  - [Limiting the Environmental Impact of Anesthetic Gases](#).
- Review the Ontario's Anesthesiologists - Environmental Sustainability Working Group (OA-ESWG) Concierge Service video and share with your team.

Desflurane was introduced before sevoflurane, and many anesthesiologists continue to use it out of habit. Desflurane is effective with few immediate visible drawbacks and patients wake up faster. There is also a perception that it has an advantage in ambulatory surgery and bariatrics.

#### CLINICAL WORKFLOW

- [Administer a survey](#) to better understand desflurane use in your OR.
- Consider adding a GHG component to performance reports by extracting data on usage from your EMR and OR Reports
- Tools such as the [Association of Anaesthetists' Anesthetic Gases Calculator](#) and the [Yale Gassing Greener app](#) can assist in these calculations
- Undertake a graduated removal of desflurane
  - Medium leverage intervention:
    - Make sevoflurane the default gas on the vaporizer (This was done at North York General Hospital in Toronto, Ontario)
    - Add warning stickers about carbon intensity placed on desflurane vaporizers
    - [Use low FGF](#) of 0.5 L/min when appropriate to minimize environmental impact of all anesthetic gases
  - High leverage intervention:
    - Remove desflurane from the machine and store desflurane liquid in the Pharmacy or automated medication dispensing system outside the OR.
  - Forcing function:
    - Remove desflurane from formulary (This has already been done in [many Ontario hospitals](#))

Desflurane is continually promoted by representatives, and there is a belief that there may be difficulty procuring enough sevoflurane and that it is more expensive.

#### FINANCES & PROCUREMENT

- Create a business case to show potential monetary savings associated with increased use of sevoflurane
- Many hospitals have reported savings;
  - At Health Sciences North in Sudbury, Ontario, the cost savings of total volatile budget was \$32,000 (2016 50/50% sevoflurane/desflurane use to 2020 100% sevoflurane).
  - At Providence Health in Oregon, [selecting the lower emission anesthetic reduced costs by 70%](#).

There is a perception that emergence will be delayed with the use of agents other than desflurane, potentially slowing flow in the PACU and discharge from day surgery.

#### INFRASTRUCTURE

- Designate a locked storage space for desflurane.
- Make necessary changes to anesthetic machine to induce a graduated removal of desflurane described in the "Clinical Workflow" section.