

Environmental impact of desflurane

February 2024

Background

Climate change poses escalating risks to public health and health service delivery. The health system has a substantial carbon footprint and there are increasing health, legal, regulatory and environmental requirements for NSW Health to decarbonise. Under the NSW Government's Climate Change (Net Zero Future) Act of 2023 we are required to reduce greenhouse gas emissions by 50% (based on 2005 levels) by 2030.

Desflurane is a greenhouse gas with a global warming potential (GWP) 3,700 times greater than carbon dioxide (CO₂) over a 20 year period.¹ Many health systems in Australia and internationally are phasing out desflurane, and its use in NSW Health has reduced substantially in recent years as anaesthetists shift to clinically equivalent and less polluting alternatives.

Removal of desflurane from the NSW Medicines Formulary

The NSW Medicines Formulary (The Formulary) Committee has endorsed a decision to remove desflurane from the Formulary, effective from Friday, **1 March 2024**. The Committee cited three reasons for the decision: the availability of safe and clinically equivalent alternatives to desflurane, the high cost of desflurane and concerns about desflurane's environmental impact. The removal of desflurane from the Formulary does not preclude the use of desflurane in NSW Health facilities. Approval to use desflurane is available via the [Individual Patient Use \(IPU\) pathway](#) from the facility's local Drug and Therapeutics Committee

The environmental impact of desflurane

Desflurane is a greenhouse gas with a global warming potential (GWP) 3700 times that of CO₂ over a 20-year time period. GWP is the internationally accepted unit for reporting greenhouse gas emissions. However, there is recent and quite complex debate in the climate literature about the use of GWP as a metric, particularly for short-lived climate pollutants (including anaesthetic gases); and there is a view that the radiative forcing may be a superior metric to compare greenhouse gases. Under either methodology, it remains a potent climate pollutant in healthcare, accounting for up to 50% of perioperative emissions and 5% of hospital emissions.

Compared to total global CO₂ emissions, desflurane's atmospheric concentration and radiative forcing is small and its lifetime is shorter (14 years). However, all sources of emissions leading to global warming need to be reduced, regardless of their relative size to CO₂. Reducing short-lived climate pollutants such as desflurane and methane make a useful contribution to climate protection, particularly when there are clinically equivalent alternatives available. Desflurane is substantially more polluting and has a longer lifetime than sevoflurane (1.4 years) and isoflurane (3.5 years).

No evidence of clinical benefit of desflurane

Peer-reviewed evidence has not demonstrated a benefit associated with desflurane in patient-centred outcomes. Whilst there is evidence to support faster emergence times (by a matter of minutes), there has not been evidence to demonstrate improved post-anaesthesia care unit (PACU) discharge times, post-operative mini-mental state sedation scores, or improved short-, medium- and long-term quality of recovery analyses. There has been no difference shown for rates of postoperative pulmonary complications, including in high-risk sub-groups (such as the morbidly obese). Time to emergence and extubation after prolonged anaesthesia in the morbidly obese has been demonstrated as no quicker with desflurane vs 'BIS titrated' sevoflurane anaesthesia.

There is evidence which identifies patient risks specific to desflurane. These include more significant hypotension/hypoperfusion than sevoflurane and increased risk of post-operative delirium. Desflurane is also a cause of airway irritation and broncho/laryngospasm and is commonly used alongside sevoflurane (rarely as an isolated agent for general anaesthesia). There has been no evidence of negative patient outcomes in jurisdictions or facilities in Australia and internationally that have actively reduced or ceased desflurane use.

Desflurane use in NSW and communications resources

As awareness has grown about the environmental impact of desflurane, its use has decreased across NSW as anaesthetists shift towards safe, clinically equivalent alternatives. In 2023/24, NSW Health introduced a new environmental sustainability key performance indicator (KPI) to drive the reduction of desflurane.

NSW Health is tracking desflurane use and providing information to reduce its use, led by the NSW Health Net Zero Anaesthetists. Digital creative assets have been designed to support implementation of the new desflurane reduction sustainability KPI. The digital assets include 8x posters, 2x email signatures, and 2x teams' backgrounds. All communication assets are available at: [Towards Net Zero digital assets](#)

Since 2019, NSW Health observed a marked reduction in desflurane utilisation, averaging a yearly decrease of 11,310 vials. This decline equates to the emissions associated with 25,000 hospital bed days, underscoring the healthcare sector's heightened commitment to environmental stewardship and fiscal responsibility. This shift towards greener and more cost-effective anaesthetic methods is further evidenced by the cessation of desflurane purchases by SCHN and Murrumbidgee LHD, alongside Lismore hospitals not requisitioning desflurane for the 2024 fiscal year. A list of NSW Hospitals that have pro-actively and significantly reduced use or ceased purchasing desflurane or that have committed to stop the use of desflurane is provided in [Appendix 1](#).

International and national efforts to phase out desflurane

Desflurane is being phased out internationally in health systems including in NHS Scotland (February 2023) and NHS England (decommissioning in 2024). The Association of Anaesthetists of Great Britain and Ireland (AAGBI) and The Royal College of Anaesthetists in the UK support these commitments to decommission desflurane. The European Union (EU) has proposed the prohibition of desflurane from January 2026.

The World Federation of Societies of Anaesthesiologists consensus statement stated that for "inhalational general anaesthesia, anaesthesia providers should use the agent with the lowest global warming potential."

In Australia, several jurisdictions have begun phasing out desflurane and several hospital groups across QLD, SA, VIC and NT have ceased ordering desflurane. WA removed desflurane from their [Statewide Medicines Formulary](#) in October 2023.

Australian and New Zealand College of Anaesthetists' (ANZCA) position

ANZCA has publicly committed to promoting environmental sustainability, including a commitment to reducing the carbon footprint of anaesthesia and providing guidance on environmentally sustainable practice in anaesthesia across Australia and New Zealand. [ANZCA's Statement on environmental sustainability in anaesthesia and pain medicine \(PS64\)](#) states that 'clinicians can reduce their impact on the environment by using agents that have a lower impact on the environment', and [ANZCA's Environmental Sustainability Audit Tool](#) 'discourage[s] use of agents with high environmental impact (desflurane, nitrous oxide)'.

National Health and Climate Strategy

Reducing and ceasing desflurane use is also consistent with the [National Health and Climate Strategy](#) (2023) which includes an objective to reduce greenhouse gas emissions from medicines and gases.

Next steps for environmentally sustainable anaesthesia

There are a range of actions needed to reduce the environmental impact of anaesthesia and perioperative care. Priority areas include reducing wastage of medicines (including propofol), reducing single-use plastics and reducing unnecessary perioperative investigations.

Further information

For further information on NSW Health's net zero transition, please visit the [Climate risk and net zero](#) website or contact the team via [email](#). For further information on the Formulary, please visit the [CEC website](#) or contact the team via [email](#)

References

1. Ryan SM, Nielsen CJ. Global warming potential of inhaled anesthetics: application to clinical use. *Anesth Analg*. 2010 Jul;111(1):92-8. doi: 10.1213/ANE.0b013e3181e058d7. Epub 2010 Jun 2. PMID: 20519425.

Appendix 1

NSW Health hospitals that have pro-actively and significantly reduced use of, or ceased purchasing of desflurane, or have committed to stop the use of desflurane include:

- CRGH
- Bankstown
- Campbelltown
- St. Vincent's
- St George
- Royal Prince Alfred
- John Hunter
- Gosford
- Nepean
- The Children's Hospital at Westmead
- Westmead
- Blacktown
- Auburn
- Nowra
- Lismore
- Western NSW Local Health District (6 sites)