When will we call time on desflurane?

Brooks, Peter; Absalom, Anthony R

Published in:
British Journal of Anaesthesia

DOI:
10.1016/j.bja.2022.06.026

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license. More information can be found on the University of Groningen website: https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment.

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
higher compared with sevoflurane, we can expect the greatest environmental effects by using anaesthesia gas capture systems for desflurane. Implementation of inhaled anaesthesia gas capture systems can be a relevant measure to reduce the CO2e footprint while maintaining the current portfolio of anaesthetic drugs.

**Acknowledgements**

The authors thank John J. Bellamente for language and grammar editing.

**Declarations of interest**

PK has served as a consultant for Air Liquide, Baxter, Orion, and Tevar ratiopharm. MSS has received grants for investigator-initiated trials not related to this study from Merck & Co. MSS and PK are associate editors for BMC Anesthesiology. The funders had no role in the study design and conduct, the collection, management, analyses, and interpretation of the data, the preparation, review, or approval of the manuscript, or the decision to submit the manuscript for publication. JH, TB, AG, MH, TMT, and MSS have no conflicts of interest. The gas capture technology (CONTRAfluran, Sensofuran) was provided by Christian Ewers (ZEOZYS, Luckenwalde, Germany).

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bja.2022.04.009.

**References**


Editor—Recently, Hinterberg and colleagues reported the results of an analysis of the efficiency of desflurane recapture by a commercially available system during 80 consecutive anaesthetics lasting on average 4 h. The rationale for their study is obvious. The global warming effects of desflurane are well known, so when desflurane is used, attempts to prevent it from reaching the atmosphere are sensible.

Hinterberg and colleagues used relatively low fresh gas flows (median 0.8 L min⁻¹) to administer a median of 0.8 × MAC₅₀, resulting in administration of 6902 g of desflurane. The weight of the 80 charcoal cannisters used by the recapture system increased by a total 2509 g, of which 1727 g was desflurane (the remainder was water). The system therefore did not recapture 5175 g of desflurane, which has a global warming potential over 100 yr (GWP100) equivalent to 13 144 kg of CO₂ (assuming a GWP100 of 2540 for desflurane). A rough estimate is that for this experiment, the amount of uncaptured desflurane resulted in the same environmental damage as driving a medium-sized car: 130 000 km.

This raises the question: why did the system only recapture 25% of the administered desflurane, and how much improvement is possible? Metabolism of desflurane is minimal, and with modern anaesthetic machines and tracheal tubes, leaks during anaesthesia should be minimal. Overall efficiency of recapture will therefore depend on the amount of desflurane exhaled after emergence from anaesthesia (when

---

**When will we call time on desflurane? Comment on Br J Anaesth 2022; 129: e79–e81**

Peter Brooks¹ and Anthony R. Absalom²,*

¹Anaesthetic Department, Chelsea and Westminster Hospital, London, UK and ²Department of Anesthesiology, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

*Corresponding author. E-mail: a.r.absalom@umcg.nl

**Keywords:** desflurane; environment; equipment; global warming; sustainability; volatile anaesthetics

---

DOI of original article: 10.1016/j.bja.2022.04.009.
the patient is no longer exhaling into the anaesthetic circuit), and the efficiency of recapture during anaesthesia. As Hinterberg and colleagues point out, despite the fact that desflurane is our least water-soluble volatile agent, a considerable proportion will still be in the body at the moment of tracheal extubation. Based on data provided by Lockwood, we estimate that a patient who receives 0.8 MAC of desflurane for 4 h will have absorbed ~20 g of desflurane. After administration is stopped, clearance from the lungs will only have eliminated 5 g of this absorbed amount by the time of emergence from anaesthesia. This means that the 80 patients in the study of Hinterberg and colleagues would have likely breathed out ~1200 g in the hours after extubation. Of the maximum amount that could have been recaptured before extubation (5700 g), the system did not recapture 4000 g. There is clearly room for improvement, but even with a perfectly efficient system, recapture will remain a strategy that adds to the already high costs of desflurane, but will never be able to mitigate completely the environmental harm caused by the inevitable exhalation of desflurane in the hours after emergence from anaesthesia.

It is becoming increasingly difficult to understand the rationale for ongoing desflurane use. Although times to emergence are marginally faster than with other agents, cognitive recovery rates are similar and there is no clinically significant reduction in time spent in the PACU compared with sevoflurane. Given the marginal clinical benefits, at best, of desflurane, and the fact that it is the most expensive and environmentally harmful volatile agent in use, many departments of anaesthesia have chosen to become ‘desflurane-free’, by requesting pharmacists to stop purchasing the drug and then removing vapourisers from circulation. TRAaSH (Trainee led Research and Audit in Anaesthesia for Sustainable Healthcare), an Australasian sustainability network that launched Operation Clean Up in 2021, urges all anaesthetic departments to pledge to become desflurane-free by removing desflurane from machines, reducing desflurane procurement, and removing it from their hospital formulary by 2025. Those anaesthetists that have still not heeded such calls to stop using desflurane may soon have no choice. The EU is setting increasingly ambitious targets aimed at reducing greenhouse gas emissions. The aim is climate neutrality by 2050. As fluorinated gases comprise 2.5% of total EU greenhouse gas emissions, the EU has produced draft legislation that includes a proposal to prohibit desflurane use by 2026. If this is passed into law, other countries and jurisdictions will surely pass similar laws. The proposed EU legal text is:

The use of desflurane as inhalation anaesthetic is prohibited as from 1 January 2026, except when such use is strictly required and no other anaesthetic can be used on medical grounds. The user shall provide evidence, upon request, on the medical justification to the competent authority of the Member State and the Commission.

We applaud the research efforts of Hinterberg and colleagues to assess the efficiency of desflurane recapture and efforts to optimise desflurane capture while there are still colleagues using the drug. With our planet rapidly heading towards a climate disaster, it is a more logical and reasonable step to prohibit the use of environmentally harmful drugs such as desflurane. Our question and challenge to those anaesthetists who do still use desflurane is: why wait for it to be banned before stopping using a drug that can safely and easily be replaced by much cheaper and much less harmful alternatives such as sevoflurane or total intravenous anaesthesia, a technique associated with a significantly smaller carbon footprint?

Declaration of interest
ARA is a member of the British Journal of Anaesthesia board.

References