

Desflurane's Climate Cost: Disproportionate, Indefensible, Done

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To the Editor,

Anaesthesia exerts a disproportionate ecological impact within healthcare, and it is our collective duty to mitigate this burden. A recent study, based on real-world global and national medical sales data for sevoflurane and desflurane, indicates that, on a per capita basis, Belgium ranks as the world's third largest contributor to pollution from volatile anaesthetics, the majority of which originates from desflurane¹. These data reaffirm the significant responsibility of our profession and underscore a clear strategy to reduce Belgium's climate impact from volatile anaesthetic emissions by 73%, requiring minimal effort while yielding substantial cost savings and logistical benefits.

In Belgium, 6,031 kg (17,145 bottles) of desflurane and 37,451 kg (98,537 bottles) of sevoflurane were used in 2023. Although desflurane accounted for only 4.3% of administered volatile anaesthesia procedures—compared to 95.7% for sevoflurane—it was responsible for 74.3% of their total climate impact. If the small cohort of desflurane users were to switch entirely to sevoflurane, greenhouse gas emissions from all anaesthetic gases in Belgium would decrease by 73%. Given that, after 25 years of clinical research, desflurane's limited pharmacokinetic advantages have not been demonstrated to improve morbidity or mortality, its complete replacement with sevoflurane constitutes a straightforward intervention without compromising patient safety². If the small fraction of Belgian hospitals still equipped with desflurane vaporisers were to follow the majority in removing them from operating theatres, this single action would achieve the most significant reduction in our profession's ecological footprint – surpassing any other intervention - while also yielding notable cost savings and simplifying logistics by eliminating vaporisers. A compelling example can be found in the Netherlands, where desflurane use had already dropped to almost zero by 2021 and was completely eliminated by 2023^{1,3}.

While replacing volatile anaesthesia with total intravenous anaesthesia (TIVA) could reduce Belgian maintenance anaesthesia emissions even by over 95%, such a transition is not currently feasible⁴. In contrast, phasing out desflurane is an efficient and immediately actionable measure for every anaesthetist, achieving approximately 70% of the emissions reduction needed for maintenance anaesthesia on the path to net zero (Figure 1).

The study highlights that a small subset of current clinical practice causes a disproportionate share of anaesthesia-related climate impact¹. If we take our ecological responsibilities seriously, as is expected of all sectors, it is important to encourage the few remaining hospitals using desflurane to recognise its disproportionate environmental impact and to consider a timely transition away from its use. Notably, the EU Regulation 2024/573 of the European Parliament, dated 7 February 2024, on fluorinated greenhouse gases stipulates: 'The use of desflurane as an inhalation anaesthetic shall be prohibited from 1 January 2026, except where such use is strictly required, and no other anaesthetic can be used on medical grounds. The healthcare institution shall keep evidence of the medical justification, and provide it, upon request, to the competent authority of the Member State concerned or to the Commission'⁵. Given that such medical grounds are virtually non-existent, this directive alone should justify eliminating desflurane from hospitals.

Potential to decrease CO₂e by eliminating desflurane

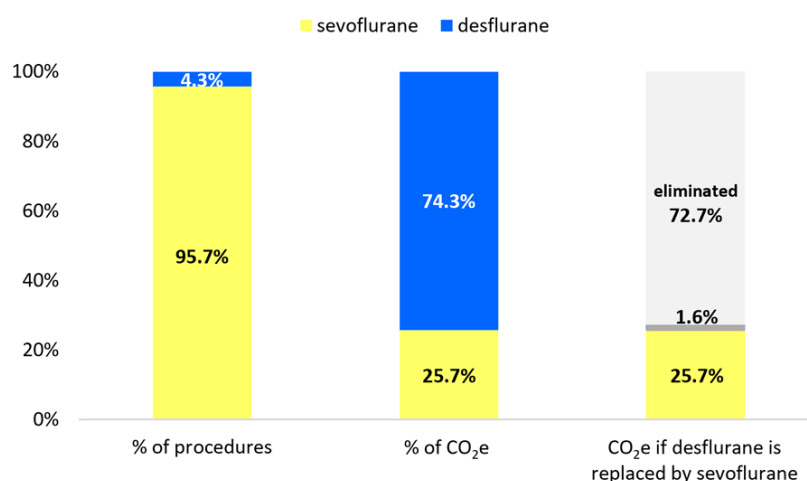


Fig. 1 — In 2023, desflurane accounted for only 4.3% of volatile maintenance anaesthesia time in Belgium but was responsible for 74.3% of the associated CO₂equivalent (CO₂e) emissions. Replacing all desflurane with sevoflurane would reduce emissions from these procedures from 74.3% to just 1.6% of current total emissions, lowering the overall CO₂e from volatile anaesthetics by 72.7%.

Nevertheless, current data underscore a moral and practical imperative to act sooner rather than wait until 2026 to fulfil our ecological responsibilities.

Every second counts: With desflurane anaesthesia generating roughly 45 times the greenhouse gas emissions of sevoflurane, an anaesthetist routinely using desflurane emits more in a single year than a sevoflurane-using colleague does over an entire career—or in one month, more than a TIVA practitioner emits in a lifetime⁶. This stark disparity underscores that eliminating desflurane is by far the most effective way to reduce emissions, surpassing any other conceivable measure.

Conflicts of interest: None.

References

1. Talbot A, Holländer HC, Bentzer P. Greenhouse gas impact from medical emissions of halogenated anaesthetic agents: a sales-based estimate. *Lancet Planet Health*. 2025;9(3):e227-e235. doi: 10.1016/S2542-5196(25)00027-0.
2. Van Speybroeck P, Mulier JP, De Baerdemaeker L. Advantages and Disadvantages of Desflurane Versus Sevoflurane. *Best Pract Res Clin Anaesthesiol*. 2025. Epub ahead of print.
3. Kampman JM, van Bree EM, Gielen L, Sperna Weiland NH. A nationwide approach to reduction in anaesthetic gas use: the Dutch Approach to decarbonising anaesthesia. *Br J Anaesth*. 2025; 134:1146-1152. doi: 10.1016/j.bja.2024.11.049.
4. Kalmar AF, Rex S, Groffen T, Vereecke H, Teunkens A, Dewinter G, Mulier H, Struys MMRF. Environmental impact of propofol: A critical review of ecotoxicity and greenhouse effects. *Best Pract Res Clin Anaesthesiol*. 2025. Epub ahead of print. <https://doi.org/10.1016/j.bpa.2024.12.003>
5. <https://eur-lex.europa.eu/eli/reg/2024/573/oj> [Accessed 31 March 2025].
6. Kalmar AF, Teunkens A, Rex S. Navigating Europe's sustainable anaesthesia pathway. *Eur J Anaesthesiol*. 2024; 41: 465-467. doi: 10.1097/EJA.0000000000001993.

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