

Qualifying statement to be added to Nitrous Oxide for EML 2025 onward

Proposed statement to be added:

Piped nitrous oxide (i.e., centrally supplied systems of delivering gas through buildings) is a major source of atmospheric pollution from healthcare facilities and therefore only point-of-care cylinders are recommended.

Nitrous Oxide (N₂O), a gas occasionally used as an adjunct to general anesthesia or as an analgesic for labor/delivery, is a potent greenhouse gas and ozone depleter with significant environmental consequences. In most large healthcare facilities, N₂O is delivered to operating rooms and labor suites from centrally located bulk storage tanks through a series of pressure-regulated pipes. Studies in Scotland, Australia, and the United States have demonstrated that 70-95% of procured N₂O is commonly lost through leaks in central piped systems, never making it to the operating room or delivery suites.¹⁻³ By comparing procurement and utilization records, only a small fraction of a facility's N₂O can typically be accounted for by clinical use, revealing substantial and unnecessary waste that increases the facility's cost burden, reduces supply chain resilience, increases occupational exposure risk, and damages the environment and human health. While minimizing unnecessary clinical use of N₂O is a critical strategy to reduce greenhouse gas emissions, the majority of healthcare-specific N₂O emissions can be mitigated by addressing the inherent inefficiencies within the central piped N₂O supply systems.^{2,3}

Nitrous oxide may be leaked from multiple sites within the central piped system, including connections in and to the manifold, pipe infrastructure, and pendant connections.³ Some of these leaks may be traced to specific, easily replaced components, but it is likely that many leaks remain hidden within the infrastructure, particularly in aging pipe systems,

making it unfeasible to mitigate emissions through pipe infrastructure maintenance and repair.^{2,3} Transitioning to a portable, point-of-care source for N₂O delivery has proven to be a feasible, practical alternative at a number of large healthcare facilities globally, and has been recommended by the Royal College of Anaesthetists in the UK and Ireland, as well as the American Society of Anesthesiologists.^{1,4} Decommissioning central piped N₂O systems, and avoiding new installations, represent a prime opportunity for healthcare facilities to reduce their contribution to climate change and improve health system resilience, and further support patient health.

The healthcare sector contributes 5% of total global greenhouse gases, exacerbating the harmful effects of climate change on human health. As each liter of gaseous N₂O contributes 0.49kgCO₂e, wastage of hundreds of thousands of liters of N₂O has a high environmental price with little to no clinical benefit. N₂O has a global warming potential (GWP₁₀₀) 273 times higher than carbon dioxide and an atmospheric lifetime of over 100 years.^{5,6} N₂O is currently the single greatest contributor to the destruction of the ozone layer. It is highly stable in the troposphere, allowing for vertical transportation into the stratosphere, where it forms nitrogen oxide intermediates under the influence of ultraviolet radiation and has the potential to destroy stratospheric ozone.⁷ Globally, N₂O from healthcare facilities is estimated to comprise approximately 1-3% of global N₂O emissions.^{8,9} In 2017, N₂O accounted for over 75% of all emissions attributable to anesthetic gases of the NHS in the UK.¹⁰ Available evidence suggests that, unless N₂O emissions are substantially decreased over the next decades, limiting peak global surface temperatures as stipulated in the Paris Agreement will be impossible.¹¹

Conclusion

The large contribution of central supply system N₂O leaks/losses to total healthcare-generated N₂O emissions is wasteful and preventable. The use of small, portable N₂O cylinders attached to individual anesthesia machines at the point-of-care eliminates the significant source of N₂O loss that occurs from central piped systems.

Decommissioning/avoiding installation of bulk N₂O piped systems and transitioning to a patient-level source for N₂O delivery will substantially improve supply system efficiency and decrease costs and total healthcare emissions without eliminating or restricting N₂O clinical use.

References

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