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NEWSLETTER

THE OFFICIAL JOURNAL OF THE ANESTHESIA PATIENT SAFETY FOUNDATION

CITATION: McBride JP, Meyer MJ. Letter to the editor: sustainable health care must be the next patient safety movement. *APSF Newsletter*. 2022;37:75–76.

LETTER TO THE EDITOR:

Sustainable Health Care Must Be the Next Patient Safety Movement

by Jonathon P. McBride, MD, MS, and Matthew J. Meyer, MD

The harm done by health-care-related pollution is equivalent to the medical errors that sparked the patient safety movement.¹ Anesthetic gas are one of the largest and most modifiable sources of health care sector greenhouse gas (GHG) emissions.² Anesthesia professionals have the opportunity to lead the health care sector's response to pollution and climate change.

Last summer, an older woman living in the usually mild climate of British Columbia suffered dyspnea following an extraordinary heatwave—her physician diagnosed her with “climate change.”³ While she is the first known to receive the diagnosis of climate change, she is not the first patient whose health has suffered because of climate change.⁴ She will not be the last.

Climate change is already affecting the health of our patients. Yet, the health care sector is just beginning to understand the impact of environmental health on population health, and to evaluate its large contribution to global emissions and climate-related morbidity.⁴⁻⁶

IMPACT OF ANESTHESIOLOGY ON OUR ENVIRONMENT

The modern health care sector is responsible for an estimated 8.5% of United States GHG emissions; pollution that harms the very people the health care sector cares for (Figure 1).^{6,7} It is essential for the entire health care sector to evaluate and reduce its impact on the environment. Responding to climate change, and its downstream population health impact, is an opportunity for anesthesia professionals to lead on patient safety once again.

Pharmaceutical-related emissions account for approximately 20% of health care sector GHG emissions, more than food service, construction, or transportation.⁶ Volatile anesthetics and nitrous oxide can trap hundreds to thousands of times more energy than carbon dioxide.⁸ One study found anesthetic gasses could be the source of over 50% of the GHG footprint of the entire operating room (OR) suite.²

Desflurane⁹ and nitrous oxide¹⁰ have the highest impact on climate change due to their energy trapping ability and the concentration at which they are used clinically; sevoflurane is the least harmful, but still multiple times worse than the potent GHG methane. In a study comparing the GHG emissions per Minimum Alveolar Con-

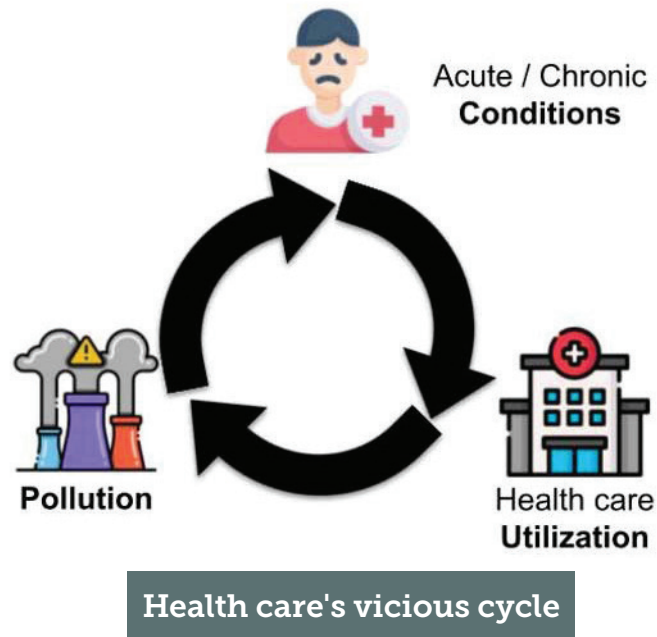


Figure 1: **Health care's vicious cycle.** Pollution causes and exacerbates acute and chronic conditions, which require health care and health care contributes to pollution. Pollution is a patient safety issue.

Opportunities to reduce the impact of anesthesia care on the global environment

- Avoid desflurane⁹ and nitrous oxide¹⁰ unless clinically necessary
- Check for leaks in existing nitrous oxide piping.¹¹ Eliminate nitrous oxide piping from new buildings
- Consider the use of propofol for general anesthesia⁸
- If volatile anesthetics are indicated, use low fresh-gas-flows to reduce the unnecessary consumption of volatile anesthetics¹²
- Advocate for pharmaceutical and medical supply vendors to focus on sustainability, and to design products for the circular economy¹⁸

Figure 2: Opportunities to reduce the impact of anesthesia care on the global environment.

centration (MAC)-hour of anesthesia, propofol is orders of magnitude less impactful on the climate than any volatile anesthetic.⁸

Adding to the harm of nitrous oxide, a recent study found intrahospital delivery of nitrous oxide to be dangerously inefficient with upwards of 70% of procured nitrous oxide being lost via leakage.¹¹ The loss of nitrous oxide from hospital storage to OR utilization is a potential patient and occupational safety issue.

Making modifications to the delivery of anesthesia care (Figure 2) provides an opportunity to reduce our profession's environmental impact and provide higher value patient care. For example, a multidisciplinary OR green team including anesthesia professionals at the University of Wisconsin Health educated the anesthesiology department on anesthetic gas waste, low-flow anesthesia,¹² and differential GHG emissions of volatile anesthetics. Within

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Anesthesia Professionals Can Reduce Environmental Harm and Improve Patient Safety

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three years they reduced their GHG emissions 64% per case while saving \$25,000 per month.¹³ Furthermore, even if a health system institutes sustainable anesthesia practices like low fresh gas flows (<1L per minute), reusable instruments, and the elimination of desflurane and nitrous oxide, there is still an opportunity for the attentive, individual anesthesia professional to make a notable impact.¹⁴

HOW TO GET INVOLVED?

As global priorities shift and patients and organizations demand a more sustainable economy, health care will have to change. The current practice of medicine is unsustainable. In an unprecedented call to action, over 200 medical journals, including the *New England Journal of Medicine*, and *The Lancet*, published an editorial calling for emergency action to reduce greenhouse gas emissions and limit future harm.^{4,15}

Climate change and environmental pollution are global, existential problems that require coordinated and collective action that can provoke anxiety and concern.¹⁶ There are many great organizations leading health care's response to the climate crisis: Healthcare without Harm, Practice Green Health, and The Medical Society Consortium on Climate and Health. These three organizations lead the sustainable health movement in the United States. In addition, Medical Students for a Sustainable Future is a student-led organization for climate and health advocacy.

To be leaders in sustainable health care, anesthesia professionals must reduce the harm of their own practice and begin to advocate for more sustainable health systems. Health care institutions have both great responsibility and great ability. The health care sector is responsi-

ble for one-sixth of the entire US GDP; creating sustainable health care systems¹⁷ can catalyze change throughout the entire economy. Anesthesia professionals have the opportunity to reduce the environmental harm of our practice and again take a leading role in this next patient safety movement.

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Matthew J. Meyer, MD, has consulted for Dialectica and received speaking fees from Takeda Pharmaceutical for a science forum on sustainability. Dr. Meyer has intellectual property related to perioperative efficiency and sustainability. Matthew J. Meyer, MD, is on the steering-committee of Virginia Clinicians for Climate Action. Jonathon P. McBride, MD, is a member of White Coats for Planetary Health and Medical Students for a Sustainable Future.

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