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The environmental responsibility of modern anesthesiology and perioperative care

La responsabilidad ambiental de la anestesiología moderna y el cuidado perioperatorio

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Climate change is widely recognized as a major threat to global health in the 21st Century. Compared to the pre-industrial era, the average temperature of our planet is 1.10C higher [\(1-3\)](#) and the impact would be unsustainable in the not too distant future if such increase continues unabated. During the last weeks of January 2024, Colombia faced exceptionally high temperatures, setting new historical records in the country. [\(4\)](#)

Health care plays a substantial role in global climate change, accounting for approximately 5.2% of the total CO₂ emissions and ranking the health care sector as the fifth largest carbon emitter. [\(5\)](#) Moreover, carbon emissions are only one of the concerns linked to healthcare systems, which also encompasses pollution generated mainly during perioperative care. [\(6\)](#)

In the face of these global challenges, international organizations such as the Intergovernmental Panel on Climate Change are urging for the adoption of profound and transformative changes, both at a personal and professional level, starting with "individual awareness" of the problem. During the United Nations Climate Change Conference (COP26) held in Glasgow, UK, in 2021, 50 countries committed to establishing low-carbon and sustainable healthcare systems, and 14 agreed to achieve net-zero emissions in the healthcare sector by 2050. [\(7\)](#)

Achieving these objectives certainly implies a major change in the way we live and interact in society with the environment. Some of the crucial considerations include: 1) establishing health and care systems that are sustainable and resilient; 2) reducing demand and migrating to energy sources with low greenhouse gas emissions (wind, solar, nuclear and biofuels); 3) promoting nature-based solutions, such as conserving forests, woodlands, urban green spaces and wetlands; 4) implementing carbon capture and storage

technologies; 5) energy-efficient building design and retrofitting; and 6) encouraging active human travel, such as walking, wheelchairs and bicycles, as well as promoting electric vehicles and sustainable public transportation. Finally, in the agricultural sector, changes are sought in agricultural practices, land use and diets, all with the aim of reducing carbon emissions and promoting more sustainable food systems.

Similar to other highly technical and resource-intensive disciplines, anesthesiology and perioperative care account for a significant portion of the environmental impact of medical care. In the context of increasing calls to address the significant contributions of anesthesia to climate change, volatile anesthetics have gained increasing attention, primarily due to their potent greenhouse gas characteristics. Volatile anesthetics have minimal metabolism in vivo and are released into the troposphere (approximately 95%) with minimal chemical alteration: sevoflurane and desflurane persist in the troposphere for ~1.1 and 14 years, respectively. Beyond volatile anesthetics, operating rooms account for 30 % of the daily generation of medical waste, with anesthesia contributing about 25 %, 40 % of which is considered potentially recyclable. [\(2\)](#)

The World Federation of Societies of Anesthesiologists (WFSA), after organizing a committee of recognized experts and regional leaders in sustainability, has released three basic principles of responsible and environmentally sustainable anesthesiology practice: 1) patient safety should not be compromised by the introduction of sustainable anesthesiology practice; 2) high, middle and low income countries should support each other appropriately in the process towards providing sustainable medical care (including anesthesiology), and 3) it should be mandatory for healthcare systems to reduce their impact on global warming. These

Table 1. Consensus principles of environmentally sustainable anesthesia and recommendations adopted.

Source: Excerpted and modified from White et al. (1).

principles are framed in the consensus of environmentally sustainable practice of anesthesia (Table 1).

The working group suggests that these seven consensus principles form the basis of sustainable anesthesia practice. It is the opinion of this group that such measures can be achievable on a global basis, with minimal material resources and financial investment. The group also clarifies that while these guidelines address the needs of

most patients and health care professionals in most circumstances, anesthesia providers always need to balance environmental and patient benefits with local or regional environmental and logistical factors at their sites.

Several of these recommendations are feasible to implement. However, individual awareness of climate change and its potential impact on our work as anesthesiologists is fundamental to

achieving environmental sustainability. This is a concern that leads us to reflect on how to systematically promote and apply "environmental sustainability" in routine work and daily life, especially in the aftermath of a critical period of stress such as the COVID-19 pandemic (8). There is a lack of understanding of how anesthesiologists and other professionals in perioperative settings perceive the environmental impact of their practice.

However, the first step toward potential change begins by acknowledging this need. (9)

A recent qualitative study explored environmental sustainability from the perspective of anesthesia providers at a facility in Zurich, Switzerland, that implements environmentally sustainable practice guidelines. Eighty-nine percent of participants stated that environmental sustainability is essential to their work as anesthesiologists, and 95 percent reported that they implement measures to make their practice more environmentally friendly. Conscious choice of anesthetics was identified as the most common step respondents take to reduce the environmental impact of anesthesia. Waste production and improper waste management was the most frequently mentioned associated threat to the environment. Last but not least, lack of knowledge on environmental sustainability issues was recognized as a barrier to achieving better environmental goals. (10)

In contrast, Gonzalez-Pizarro et al. presented a large survey of 1,237 anesthesiologists including practitioners from 75 countries. Forty-five percent of the respondents failed to identify which of the halogenated gases had the largest carbon footprint during anesthetic practice, 55% did not use low flows during practice, and they documented an association between country per capita income and implementation of environmentally sustainable practices. (11)

Climate change is the major threat to planetary and human health today and is a process that is occurring here and now (12). It will have adverse effects on human health by changing the nature, severity, and frequency of disease presentation. The practice of environmentally sustainable and responsible anesthesiology is not only crucial to address the global threat

of climate change, but also requires a collective effort and leadership at every level of health care. From choosing greener anesthetics to proper waste management, every step toward environmental sustainability in anesthesiology is essential to mitigating the effects of climate change on human and planetary health. Moreover, this sustainable approach requires the active collaboration of all stakeholders, including healthcare providers, hospital administrators, medical equipment manufacturers, and governmental and nongovernmental organizations. Only through collective effort and committed leadership can we move toward a more sustainable future in the practice of anesthesiology.

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