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Sustainability in the Operating Room

Reducing Our Impact on the Planet



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KEYWORDS

• Sustainability • Environmental impact • Climate change • Greenhouse gas • Waste

KEY POINTS

- Anesthesia providers have the ability to choose an anesthetic plan that minimizes environmental impact without affecting patient care.
- Volatile anesthetic agents are greenhouse gases with significant environmental impacts that can be reduced by choosing to avoid desflurane and nitrous oxide and to use low fresh gas flows.
- Wasted medications and single-use devices, particularly disposable laryngoscopes, contaminate the environment and are a source of considerable cost.
- Anesthesia sustainability initiatives save money and decrease the carbon footprint of the operating room, which is appealing not only to clinicians' individual sense of responsibility and stewardship but also to the collective duty of physicians to improve global health.

INTRODUCTION

Climate change will be the defining health crisis of the twenty-first century and represents the greatest threat to global health.¹ Although severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has captured attention and will be at the forefront of public health measures for the foreseeable future, the effects of climate change on public health are further reaching, longer lasting, and more difficult to mitigate than even this very contagious virus. The scope of the problems arising from climate change is immense, including a rise in sea levels, increases in extreme weather events, increases in atmospheric carbon dioxide (CO₂) to unprecedented levels, the spread of infectious diseases, the loss of biodiversity, and the declining health status of the population as a whole. Efforts are underway in many countries to curb CO₂ emissions and thus slow and, it is hoped, eventually reverse the current trends. Ironically, in striving to improve population and individual health, the health care system contributes significantly to climate change, which ultimately negatively affects human

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Anesthesiology Clin 38 (2020) 679–692
<https://doi.org/10.1016/j.anclin.2020.06.006>

anesthesiology.theclinics.com

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well-being. Many analyses have verified the contribution of developed countries' national health care systems to their countries' greenhouse gas (GHG) emissions to be between 3% and 10%. The UK National Health Service was estimated to contribute 4.6% of national GHGs in 2015,^{2,3} whereas an analysis of 36 generally first-world countries as well as India and China found that the health care sector was responsible for an average of 5.5% of each nation's overall emissions in 2014.⁴ The United States is the second-largest emitter of GHGs globally⁵ and the US health care sector is responsible for 10% of US GHG emissions.⁶ If the US health care sector were a country, it would rank 13th in the world for GHG emissions, ahead of the entire United Kingdom (**Box 1**).⁶ Thus, a decrease in US health care GHG emissions would result in a significant decrease in overall US GHG emissions.

In 2012, the Institute of Medicine suggested that the health sector should lead by example by greening itself and reducing its ecological footprint to improve global health and the health of the planet. Anesthesia providers have considerable freedom in making the care plans for patients and it is important to make choices that minimize the environmental impact of anesthetics without affecting the quality of patient care.

The environmental impact of volatile anesthetics, nitrous oxide (N₂O), intravenous medication waste, single-use devices, and the energy consumption of the heating, ventilation, and air conditioning (HVAC) systems are discussed here, along with practical suggestions to reduce environmental impact.

VOLATILE ANESTHETIC AGENTS

In response to the growing hole in the ozone layer above Antarctica that formed as a result of atmospheric GHGs, the Montreal protocol of 1987 aimed to phase out global chlorofluorocarbon use, with hydrofluorocarbons subsequently targeted through the 2016 Kigali amendment.⁷ Anesthetic gases are chlorofluorocarbons (isoflurane) and hydrofluorocarbons (desflurane, sevoflurane), but volatile anesthetic use was not restricted by either protocol because of medical necessity. In 2014, the release of hydrofluorocarbon and chlorofluorocarbon anesthetic gases was equivalent to 3 million tons of CO₂, with 80% of the emissions from desflurane alone. GHGs differ in their abilities to trap heat. The effect of this heat trapping over a 100-year period is described using a scale called the global warming potential over 100 years (GWP₁₀₀), as shown in **Table 1**. Although other GHGs, such as methane, are emitted in much larger quantities, the environmental impact of volatile anesthetics is significant because volatile anesthetics have much higher GWP₁₀₀ values. For example, despite small quantities, anesthetic gases represented 2% of the United Kingdom's acute National Health Service organizations' carbon footprint in 2012.⁸ Desflurane has far higher GWP₁₀₀ values than the other commonly used agents sevoflurane and isoflurane. The use of desflurane results in nearly 20 times the global warming impact of using sevoflurane. Thus, the choice of volatile agent has the most impact in determining the carbon footprint of an anesthetic (**Box 2**). To put it in more practical terms, the environmental impact of volatile anesthetics can be expressed in equivalent miles driven in a car per MAC-hour of anesthesia, as shown in **Table 2**.

Box 1

If the US health care sector alone were a country, it would rank 13th in the world for GHG emissions.

Table 1
Atmospheric lifetime and global warming potential of volatile anesthetics compared with other known greenhouse gases

	Atmospheric Lifetime (y)	GWP ₁₀₀
CO ₂	5–200 ^a	1
Methane (CH ₄)	10	30
Sevoflurane	1.1	130
Isoflurane	3.2	510
Desflurane	14	2540

^a No single lifetime can be defined for CO₂ because of the different rates of uptake by different removal processes.⁴⁰

Data from U.S. Environmental Protection Agency,³⁹ Sulbaek Andersen MP et al,¹⁶ Intergovernmental Panel on Climate Change (IPCC).⁴⁰

Low Flow

After the choice of volatile anesthetic agent, the fresh gas flow (FGF) rate is the next most important determinant of the carbon footprint of a typical anesthetic (**Box 3**). Any FGF that exceeds the patient's needs and the system requirements will be delivered directly out the roof of the hospital via the anesthesia machine's scavenging system. Thus, the importance of low (<2 L/min) flow cannot be overemphasized. Low flow is most easily accomplished during the maintenance phase of anesthesia. There are several considerations when using low-flow delivery that should be addressed, including the production of compound A and carbon monoxide (CO) and ensuring adequate inspired fraction of oxygen.

Compound A is formed by the degradation of sevoflurane by CO₂ absorbents, most notably those containing the strong bases sodium hydroxide and potassium hydroxide (NaOH and KOH) in desiccated conditions.⁹ Early studies with sevoflurane found a theoretical risk of nephrotoxicity in humans from compound A. However, the literature does not support the evidence of renal injury caused by compound A in humans undergoing anesthesia. Nevertheless, the US Food and Drug Administration (FDA) has included a warning in the package insert for sevoflurane that states: "sevoflurane exposure should not exceed 2 MAC·hours at flow rates of 1 to <2 L/min. Fresh gas flow rates of <1 L/min are not recommended."¹⁰ Although KOH-based CO₂ absorbents are no longer available, NaOH-based CO₂ absorbents are still in use. More modern CO₂ absorbents are calcium hydroxide [Ca(OH)₂]-based or lithium hydroxide (LiOH)-based, which interact minimally with sevoflurane but can still produce compound A when desiccated.¹¹ Overall, the ability to use CO₂ absorbents that do not interact with sevoflurane and the absence of compelling human data that compound A is injurious seem to allow for reasonable doubt regarding FGF limitations with

Box 2

The GHG emissions generated by a 2-hour anesthetic with desflurane (1 L/min fresh gas flow [FGF]) are equivalent to driving a car 608 km (378 miles), roughly the distance from New York City to Akron, Ohio, or from Los Angeles, California, to Phoenix, Arizona. The same anesthetic with sevoflurane (2 L/min FGF) is equivalent to driving 26 km (16 miles).

Table 2	
Equivalent miles driven per minimum alveolar concentration hour of each volatile anesthetic	
	Equivalent Miles Driven per MAC-Hour
Sevoflurane	8 (FGF 2 L/min)
Isoflurane	7 (FGF 1 L/min)
Desflurane	189 (FGF 1 L/min)

Abbreviations: FGF, fresh gas flow; MAC, minimum alveolar concentration.

Data from Sherman JS, Feldman J, Berry JM. Reducing Inhaled Anesthetic Waste and Pollution. *Anesthesiology News* April 13, 2017. Available at <https://www.anesthesiologynews.com/Commentary/Article/04-17/Reducing-Inhaled-Anesthetic-Waste-and-Pollution/40910> Accessed 2/1/2020.

sevoflurane. However, the FDA recommendation mentioned earlier currently still stands and warrants compliance.¹²

CO can be formed by the degradation of any of the volatile agents by desiccated CO₂ absorbents that contain the strong bases NaOH and KOH in large quantities, such as Baralyme and soda lime.⁹ Low FGF maintains moisture in the circuit and in the CO₂ absorbent, thus decreasing the risk of CO production with these absorbents. More modern absorbents [Ca(OH)₂ based or LiOH based] do not produce CO when they interact with volatile agents.¹¹

Fraction of inspired oxygen (FiO₂) is often set lower in pediatric anesthesia, especially in infants, because of concerns for oxygen toxicity and retinopathy of prematurity. When FGF is also set low, the FiO₂ may need to be set higher in order to compensate for oxygen extraction. Diligence to the inspired oxygen concentration is of utmost importance to avoid delivering a hypoxic mixture. In addition, side stream gas analyzers often remove 200 mL/min FGF from the circuit, which must be accounted for when using very low FGF, because not all systems return that volume to the circuit after analysis. Low-flow techniques result in more rapid exhaustion of CO₂ absorbent. Contrary to how many anesthesiologists practice, the most efficient use of absorbent results from changing it based on consistently increased inspired CO₂ concentration rather than after a predetermined period of time or with the appearance of an indicator.¹³

The carbon footprint of an anesthetic that uses any volatile agent is dramatically higher than an anesthetic that uses only neuraxial, regional, or intravenous agents¹⁴ (Fig. 1). The GHG emissions that result from using desflurane without N₂O (discussed later) are approximately 2600 times the emissions that result from an anesthetic using propofol; roughly 32,000 g of CO₂ equivalents (gCO₂e) versus roughly 12 gCO₂e. Sevoflurane is far less detrimental to the atmosphere than desflurane, but its use still results in approximately 135 times greater emissions as using propofol (roughly 1600 gCO₂e versus roughly 12 gCO₂e). Although the environmental impact of pharmaceuticals is also concerning, it is drastically less than the environmental impact of volatiles, making total intravenous anesthesia the superior choice.

Box 3

Choice of volatile anesthetic agent and the rate of FGF are the most important determinants of the carbon footprint of a gas-based anesthetic.

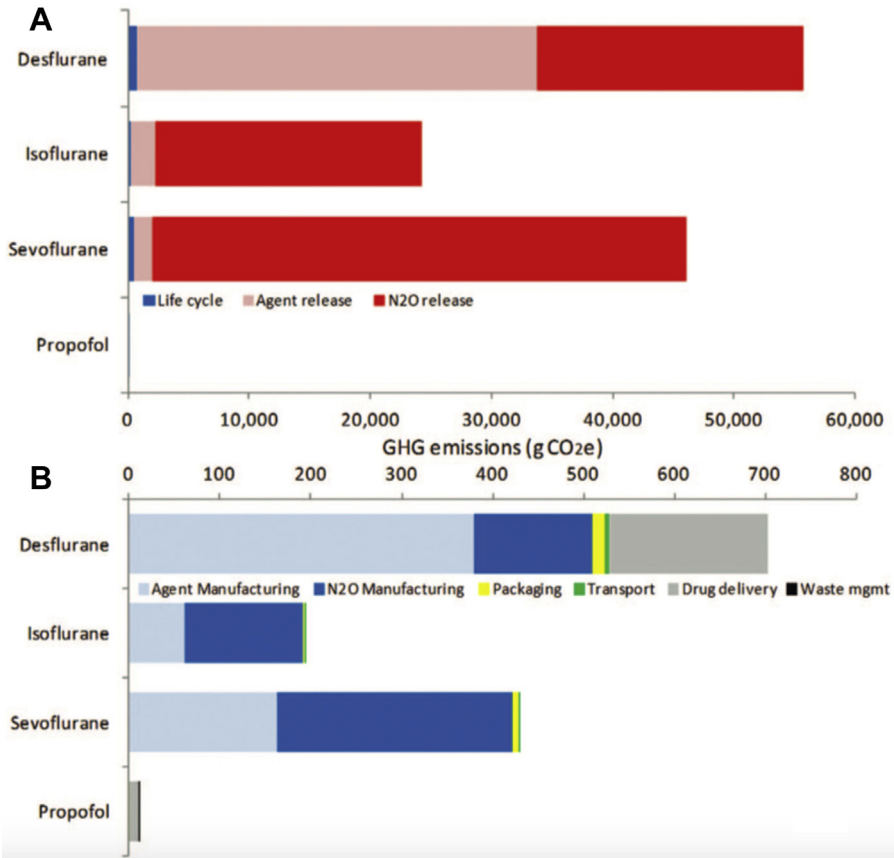


Fig. 1. Life cycle GHG emissions of anesthetics, (A) including waste anesthetic gas emissions of volatile agents and N₂O, and (B) excluding waste anesthetic gas emissions to show the lesser impact of manufacturing, transport, packaging, and drug delivery. Note the differing scales. gCO₂e, grams of CO₂ equivalents; mgmt, management. (From: Sherman J et al. Life Cycle Greenhouse Gas Emissions of Anesthetic Drugs. *Anesth Analg* 2012;114:1086–90; Used with permission from Wolters Kluwer Health, Inc.)

Mask Induction of Anesthesia

Mask induction of anesthesia is unique to pediatrics and presents an additional challenge to minimizing the venting of volatile anesthetic to the atmosphere. In addition, N₂O is often used during mask induction; this is discussed later. High flows are generally used to facilitate rapid changes in inspired sevoflurane during mask induction, and the resulting wasted anesthesia gas is considerable. Flows need not be higher than 5 to 8 L/min initially during mask induction and should be decreased when uptake by the patient has slowed. This slowed uptake is indicated by the expired agent concentration approaching the inspired concentration until nearly balanced and approximating the desired MAC value. Rebreathing increases when FGF decreases, which may decrease the delivered anesthetic concentration, so vigilance is important during this period.¹² Setting alarm limits for low inspired agent concentration is an easy way to ensure that adequate depth of anesthesia is maintained when FGF is reduced.

Fresh Gas Flow Management During Intubation

When a volatile agent has been initiated before intubation (ie, during induction), it is preferable during intubation to turn off FGF and leave the vaporizer at its set point rather than turn off the vaporizer and leave FGF flowing (**Box 4**).¹² Leaving FGF on with the circuit disconnected allows washout of volatile agent from the internal volume of the circuit into the room and requires the reestablishment of a volatile agent in the circuit once the circuit is reconnected. The preferable result of turning off FGF instead is the avoidance of environmental contamination during intubation and the ability to use a lower FGF to maintain circuit concentration after intubation. Although the circuit can be refilled quickly with high FGF, the technique of turning off FGF should be carefully considered in high-risk intubation scenarios. This practice requires mindfulness in resuming FGF after intubation, and individual practitioners must decide their comfort levels with this practice.

Waste Anesthesia Gas Recapture

As mentioned earlier, scavenged waste anesthesia gas (WAG) is typically vented directly out the roof of the hospital. However, several technologies are being developed to capture WAG before its emission to the environment, with the end goals of destruction, warehousing, or purification and reuse.¹⁵ These techniques use adsorption of the volatile WAG onto either activated charcoal or a selective adsorbent, or condensation of the volatile agent to a liquid. A reversible adsorbent process is used by BlueZone Delta (Toronto) to collect WAG and allow for either destruction or reprocessing. Although no pharmaceutical originating from reprocessed or recycled product has yet to be approved by the FDA, halogenated anesthetics are good candidates for recycling in that they are recovered in their original forms, without additives, and are easily purified.¹³

Clinics care points/suggestions to decrease environmental impact:

- Eliminate desflurane
- Use low flow (<2 L/min) during maintenance
- Turn off FGF during intubation while leaving the vaporizer set to preserve volatile agent concentration in the circuit and avoid washout of volatile agent into the room
- Use total intravenous anesthesia to eliminate volatile anesthetic emissions whenever possible

NITROUS OXIDE

N₂O is not only a GHG like the volatile anesthetics but it also depletes ozone and persists in the atmosphere for more than 100 years. As a GHG, it has a global warming potential 298 times that of CO₂.¹⁶ N₂O has a long tradition of use in pediatric anesthesia both to facilitate mask induction and as a maintenance anesthetic carrier gas. However, mask induction without N₂O is not only possible but also advantageous for multiple reasons. Most importantly, use of N₂O during induction decreases inspired oxygen concentration, eliminating preoxygenation, which decreases the time from

Box 4

Turn off FGF during intubation, leaving the vaporizer at its set point, to avoid washout of volatile agent from the circuit and contamination of the operating room (OR) environment.

apnea to desaturation, especially in young children.¹⁷ Because young children are more prone to laryngospasm during induction, and by definition of receiving mask induction usually do not have intravenous access in place, preoxygenation is of utmost importance for safety.

As pediatric anesthesiologists can readily attest, placement of a mask on a child's face (even before a volatile agent is in the circuit) is often distressing to the child, and N₂O offers no benefit for at least 30 seconds after placement of the mask. However, distraction techniques are often effective to help children tolerate both mask placement and delivery of a gradually increasing concentration of sevoflurane. The second gas effect has been mostly studied in adults and with halothane, making application of the principle questionable for pediatric patients who have a larger ratio of alveolar ventilation compared with functional residual capacity and a larger fraction of their cardiac output delivered to the vessel-rich group, both of which serve to speed induction independent of a second gas effect compared with adults.¹⁷ In clinical practice, mask induction with sevoflurane is not faster with N₂O than with 100% oxygen in children.

As an alternative to using N₂O during induction, consider using distraction to help the child tolerate mask placement and initiation of volatile anesthetic in the circuit. Screen technology is a powerful distraction tool for children, but storytelling, jokes, or casual conversation are also effective for different age groups. The advantages and disadvantages of N₂O during induction are summarized in [Table 3](#).

N₂O is frequently used during maintenance of anesthesia. Although this allows for a decreased concentration of volatile agent, the overall carbon footprint of the anesthetic is increased when N₂O is used for maintenance compared with using volatile anesthetic in air and oxygen.¹⁴

Clinics care points/suggestions to decrease environmental impact:

- Avoid N₂O

MEDICATION WASTE

Medication waste is an unavoidable consequence of administering medications during anesthesia care. In anesthesia practice, propofol is the most wasted medication by volume, whereas emergency medications (succinylcholine, atropine, epinephrine, ephedrine, phenylephrine) have the highest waste fractions (percentage of opened medication that is not used and must be wasted).¹⁸ Virtually all medications drawn up from vials end up in the environment in some form, and thus limiting preparation

Table 3

Nitrous oxide for mask induction: pros and cons

Advantages	Disadvantages
Euphoria and ambivalence to presence of volatile anesthetic	Prohibits preoxygenation, predisposing to rapid desaturation in the event of laryngospasm, bronchospasm, or apnea
Stable hemodynamics overall (but potential risk of increased pulmonary pressure)	Significant delay to onset of clinical effect of euphoria
	Dysphoria common with high inspiratory fraction
	Does not speed mask induction
	Increases risk of postoperative nausea and vomiting
	Increases carbon footprint of the anesthetic

Box 5

Virtually all medications drawn up from vials end up in the environment in some form.

to only medications that are planned to be used is the best way to decrease medication waste (**Box 5**).

Disposal of unused medications varies according to hospital policies as well as state and federal regulations. Controlled substances (all narcotics, benzodiazepines, barbiturates, ketamine, and in some states propofol) are considered hazardous waste pharmaceuticals; their disposal is regulated primarily by the Drug Enforcement Administration (DEA) and the Environmental Protection Agency (EPA) (**Boxes 6 and 7**). DEA regulations state that controlled substances must be “irretrievable and unusable after disposal.”¹⁹ The EPA dictates the manner in which controlled substances may be disposed and, in January 2020, banned the sewer system as an acceptable method of hazardous waste pharmaceutical disposal for all but personal and residential purposes.²⁰ Thus, controlled substances must be disposed of in appropriate containers, in full compliance with both DEA and EPA regulations, which generally requires incineration.

Uncontrolled medications are also preferably disposed of by incineration, thus preventing the eventual release into groundwater that occurs when medications leak through landfills. Neither landfills nor wastewater treatment facilities are designed to prevent pharmaceuticals from entering the environment. This finding is shown by well-documented pharmaceutical contamination of groundwater and surface water.²¹ Because the environmental burden of a pharmaceutical generally correlates with the amount that is dispensed, the most commonly used medications (oral contraceptives, antihypertensives, antibiotics, antiepileptics, mood stabilizers, and over-the-counter analgesics) are those most frequently found in the environment.²² Thus, although anesthesia-related medications are a small fraction of overall medication waste, the ubiquitous presence of pharmaceuticals in groundwater is cause for significant concern and serves as an entreaty to avoid unnecessary medication wastage.

Strategies to decrease medication waste include use of prefilled syringes, splitting of vials (especially in pediatric anesthesia) to accommodate smaller dose volumes, and avoiding drawing up medications that may not be used. Third-party vendors’ prefilled syringes of emergency medications decrease waste because, unlike medication drawn up from a vial, an unused prefilled syringe can be returned to stock and has a long shelf life.²³ In addition, prefilled syringes are usually cost neutral or cost saving and their use has been found to decrease medication errors.²⁴ Another type of prefilled syringe is one created by splitting larger vials of medication under a pharmacy’s sterile hood.²⁵ These syringes have a much shorter shelf life than commercially available ones but, for frequently used expensive medications (sugammadex, dexmedetomidine), they are preferable to wasting large fractions of a medication vial’s contents. Proper disposal of pharmaceutical waste is expensive, and it is far less expensive to avoid generating pharmaceutical waste than to pay to dispose of it.

Clinics care points/suggestions to decrease environmental impact:

- Use prefilled syringes for emergency medications
- Request that pharmacy split vials under a sterile hood to decrease waste, which is also beneficial during drug shortages
- Maintain medications readily available but not opened when possible
- Use smaller vials for pediatrics (eg, propofol 10 mL vs 20 mL)
- Follow the controlled substances waste stream to ensure that these medications are not being disposed of by sewer, because this practice is prohibited by law

Box 6

DEA regulations require controlled substances to be irretrievable and unusable after disposal.

SINGLE-USE DEVICES

Health care in the United States uses a mind-boggling number of single-use devices. Anesthesia is no exception, and, with the recent trend of switching to single-use laryngoscopes, there are only a handful of reusable devices used in many practices currently. The switch to single-use devices has resulted from preference for convenience and concern for cross-contamination. However, the environmental impacts have been disastrous. United States hospitals generate approximately 6 million tons of waste annually (**Box 8**).²⁶ Plastic is the mainstay of single-use devices and containers, and, as a result, microplastics have become ubiquitous in the environment.²⁷ Infection control concerns must be addressed in any proposal to decrease use of single-use devices, and the Centers for Disease Control and Prevention (CDC) risk classification and guidelines for disinfection are useful to reference.²⁸

Life-cycle analysis (LCA) is a scientific method used to quantify the environmental emissions of a process or product, including natural resource extraction, manufacturing, packaging, transportation, use/reuse, and waste management strategies.²⁹ A robust LCA represents the gold standard of a given product's environmental impact. Although only recently applied to health care, several LCAs are available for anesthesia equipment, including disposable and reusable laryngoscopes,³⁰ laryngeal mask airways,³¹ and central line kits.³² As more LCAs are published and demands mount on device manufacturers to disclose the environmental impacts of their products, it will become much easier to compare the environmental impacts of reusable and single-use devices.

Many hospitals utilize single-use device reprocessing through third-party vendors. Reprocessing refers to the process of sterilizing, tracking, and repackaging items originally manufactured for single use. The quality standards for this industry are the same as those applied to the original device manufacturers³³ and additionally require tracking of the number of reprocessing cycles for each individual device to ensure its removal before quality is compromised.

Clinics care points/suggestions to decrease environmental impact:

- Use supply chain data to determine costs of single-use devices used in a practice and the cost savings associated with switching to reusable devices
- Implement a reprocessing program to decrease waste, decrease carbon footprint of the operating room (OR), and reduce costs for OR equipment

HEATING, VENTILATION, AND AIR CONDITIONING

Hospitals use an immense amount of energy. The United States Energy Information Administration last quantified hospital energy use in 2007 and found that large

Box 7

EPA regulations specifically prohibit disposing of controlled substances into the sewer system (eg, wasting medications into the sink or toilet is illegal).

Box 8

Six million tons is equivalent to 25 of the world's largest cruise ships. US hospitals generate that much waste annually.

hospitals account for less than 1% of all commercial buildings but consume 5.5% of the total delivered energy used by the commercial sector.³⁴ In a detailed study, the HVAC system accounted for 65% of hospital energy use.³⁵ The OR uses 3 to 6 times more energy per square meter than any other area in the hospital,³⁶ and much of that impact is caused by strict requirements for the provision of suitably clean air during surgical procedures. These requirements are set by ANSI/ASHE/ASRAE standard 170-2017³⁷ and include requirements for air changes per hour (ACH). ORs are required to maintain 20 ACH (although this rate is also governed by state regulations) during surgical procedures, but only 6 ACH when the OR is not being used, provided that a positive-pressure relationship is maintained between the OR and its adjoining spaces. By setting back the ACH in an OR during off hours, many hospitals have significantly decreased their energy use, carbon footprint, and costs (**Box 9**).

HVAC controls are outside the realm of expertise of most anesthesiologists, and therefore adjustments of OR HVAC controls are a multidisciplinary undertaking. The building infrastructure must allow for computer-controlled adjustments to the HVAC system and real-time monitoring of the pressure relationships of the ORs. Synchronizing the OR setback schedule with the real-time surgery schedule is helpful, and a manual override must be in place to ensure OR ACH are appropriate in unforeseen circumstances. These strict protocols and planning may seem to make OR setbacks too cumbersome a project to initiate, but the cost savings realized by institutions that have successfully implemented setbacks speak to the incentive. Data from Practice Greenhealth (the largest networking organization for sustainable health care in the United States) indicate that member hospitals report a median saving of \$2585 per OR per year, and median hospital savings of \$33,600 per year attributable to OR setbacks.³⁸

Clinics care points/suggestions to decrease environmental impact:

- Inquire about the HVAC system controls for your OR. If your hospital has a sustainability initiative in place, use that infrastructure to mobilize the relevant stakeholders needed for OR setbacks

SUMMARY

The challenges to human health are many. As of this writing, Sars-CoV-19 has established itself in the forefront of everyone's mind but climate change, although more insidious and more debated, remains the larger threat. There is high-level buy-in from the global community to minimize the spread of the novel coronavirus, protect those most vulnerable to infection, and to find treatments and vaccines. Humanity has faced the threat of infectious disease before, and, although the end of this

Box 9

Decreasing the ACH in the OR during unoccupied times results in a significant decrease in carbon footprint and energy costs for the hospital.

pandemic may be years away, the way forward is fairly clear. Climate change presents a much more difficult problem in that it has been created over several decades by humanity's choices, and, as a result, it will be impossible to effectively mitigate without global cooperation. Ultimately, climate change will affect every person on Earth. A problem of this magnitude must be addressed on every level and from every sector if any headway is to be made on turning the tide before irreversible changes occur. Everyone must each do their part, in both their personal and professional lives, to bring about global change. A desirable side effect of many sustainability efforts is significant cost savings, and this provides the leverage needed to convince departments and larger organizations to pursue sustainability projects.

Sustainability work in hospitals, specifically in ORs, has more impact than the same efforts in other settings because of the hospitals' and ORs' significant uses of energy, medications, and supplies. Anesthesia providers can decrease the environmental impact of their clinical care. They can choose to avoid desflurane and N₂O because of their high GWP₁₀₀ status. They can minimize medication waste by only drawing up medications that are needed and by using prefilled syringes. They can use LCA studies to advocate for supplies with lower environmental impact and lower cost instead of submitting to the lure of convenience at the expense of the environment. They can collaborate with other experts in their hospitals to tackle larger projects, such as reducing unnecessary energy use, especially in ORs. As everyone makes changes in their own practices, they positively influence those around them to do the same and, slowly, the collective planetary benefit increases. It took considerable time to get the planet into the dangerous situation it is in, and it is going to take time to "right the ship." By learning about the carbon footprint of daily choices in anesthesia and adjusting clinical practice to minimize impact, clinicians are playing a part in healing the damage already done to the planet and setting the example for the future of anesthesia care.

DISCLOSURE

The author has nothing to disclose.

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