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Reducing the Carbon Footprint of the Anesthesia Provider

Levi Scott McGowan, DNP, CRNA

KEYWORDS: Carbon Footprint, Anesthesia, Greenhouse Gases, Global Warming

Abstract

Modern anesthesia contributes to environmental pollution with some anesthetics creating a larger carbon footprint. Certified Registered Nurse Anesthetists (CRNA) provided over 45 million anesthetics in 2018, and practice changes could dramatically reduce the carbon footprint. The purpose of this quality improvement project was to provide education to a convenience sample of 10 CRNAs about concrete measures which reduce the carbon footprint of anesthesia care and provide multiple secondary benefits. Results showed that when given additional education about environmentally cleaner anesthetics, the clinicians became more aware of safer and greener alternatives for anesthetic use. The reduced carbon footprint anesthetic is not only better environmentally but is also safer and leads to improved patient satisfaction by reducing postoperative nausea and vomiting.

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PURPOSE

- To provide awareness in the form of continuing education regarding anesthesia practices that are more environmentally friendly and reduce the carbon footprint utilizing a convenience sample of 12 Certified Registered Nurse Anesthetists (CRNAs).



BACKGROUND & RESEARCH

- Data shows world surface temperatures have increased by 0.8°C (1.4°F) since 1900. Humans have accelerated the release of large amounts of greenhouse gases into the atmosphere since the industrial revolution. The atmospheric concentrations of CO₂ has increased by 40% with most accumulation of greenhouse gases occurring after 1970.¹
- The United States (US) healthcare industry accounts for over 8% of total carbon dioxide emissions.³
- Anesthesia contributes to about 5% percent of the total carbon emissions in healthcare. It has been estimated that the annual effect of all inhalation agents is the equivalent to one coal fired power plant.²
- According to the CDC in 2010, 48.3 million hospital-based surgical and nonsurgical procedures performed in the US contributed to global warming.⁵
- A Yale Study conducted in 2017 concluded there are gaps in knowledge related to the environmental impact of anesthetic practice.⁴

METHODS

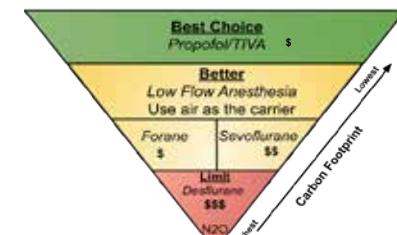
- Design:** Quality improvement project using an educational session to increase awareness on methods to reduce the carbon footprint of anesthesia
- Setting:** Community hospital in southeast region of the US
- Sample population:** Convenience sample of 12 practicing CRNAs with an average of xx years of experience
- Data collection:** Post education survey data collected in June 2019
- Measurements:** Likert and multiple-choice survey assessed educational sessions' effectiveness and post-session knowledge
- Quantitative analysis of survey was performed.

RESULTS

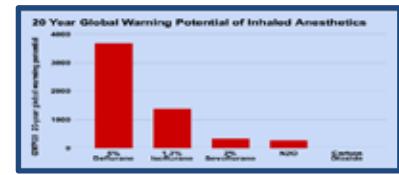
- 40% (N=10) of participants reported no prior knowledge of anesthesia-related carbon footprint reduction education.
- Attendees gained knowledge and selected the correct answers at a statistically significant rate with p values < 0.05 for single correct answer questions.
- Climate change opinions of the participants did not statistically change the post educational survey Likert questions on carbon footprint reduction based of the Mann Whitney U test of less than two for statistical noteworthiness.
- According to the post educational survey, 100% of participants agreed Carbon Footprint and Anesthesia selection should be incorporated into future SRNA curriculum



Anesthesia Agent & Carbon Footprint Impact



- Modern-day anesthesia has a variable impact on the environment based off the selected anesthetic.



CONCLUSIONS

- Curriculum development is needed to educate current and future anesthesia providers about the benefits of greener anesthesia techniques.
- Limiting desflurane use can reduce pharmacy costs and lower the environmental impact.
- Generic propofol has one of the lowest costs and lowest carbon footprints.
- Propofol has secondary benefits such as a 25% reduction in PONV which can reduce patient-related stress and overall healthcare costs.⁷
- A lower carbon footprint anesthetic can lower pharmacy costs, improve patient satisfaction and reduce anesthetic-related PONV.

References

- National Academy of Sciences (U.S.), Royal Society (Great Britain). *Climate Change : Evidence & Causes*. Washington D.C.: National Research Council; 2014. Accessed June 1, 2020. <https://www.ncbi.nlm.nih.gov/books/NBK2020/>; id:18720.
- Campbell M, Pierce JMT. Atmospheric science, anaesthesia, and the environment. *RJA Education*. 2015;15(4):173-179. doi:10.1938/rjacecup.mkt013.
- Sherman J, Le C, Lavers V, Eckelman M. Life cycle greenhouse gas emissions of anesthetic drugs. *Anesthesia and Analgesia*. 2012;115(3):696-700. doi:10.1213/ANE.0b013e31824040.
- Yanina L, Jocelyn L, Sallie B, et al. Survey of knowledge on environmental impact of anesthetic gases using an original mobile application. Lecture presented at: Anesthesiology; June 2017 Session; Boston, MA.
- Hall MJ. National Center for Health Statistics (U.S.). *Inhalative surgery data from hospital and ambulatory surgery centers*. United States; 2010. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.
- Zuegge L. Ecological and economical practice for anesthesiologists. *Advances in Anesthesia*. 2013;31(1): 21-29.
- Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. *Anesth Analg*. 2014;118(1):85-113.