Abstract

❖ This quality improvement (QI) project aimed to increase anesthesia providers' awareness of the environmental effects of inhaled anesthetics. The goal is to lower greenhouse gas emissions from anesthesia services and promote eco-friendly practices among providers.

Purpose

❖ This quality improvement project evaluates the impact of an educational intervention on anesthesia providers' knowledge and intent to adopt greener anesthesia practices.

Background/Significance

❖ The U.S. healthcare sector contributes nearly 8% of total CO_2E emissions, with operating rooms responsible for 25% of hospital waste, nearly a quarter of which is anesthesia-related [22,25]

❖ Inhaled anesthetics including desflurane, sevoflurane, isoflurane, and nitrous oxide are potent greenhouse gases that undergo minimal metabolism in the body, leading to their near-complete release into the atmosphere [13,15]

❖ Despite expert guidelines advocating for sustainable anesthetic practices, including the avoidance of desflurane and nitrous oxide, widespread knowledge gaps and institutional barriers hinder adoption [13,22]

❖ Research highlights a lack of awareness among anesthesia providers regarding their environmental impact, with studies showing that up to 62.6% feel they lack adequate training in sustainable anesthesia, and 76.8% have received no formal education on the topic [25,26,33]

❖ Reducing fresh gas flow (FGF) rates while increasing volatile anesthetic concentrations can significantly lower overall agent consumption, achieve optimal anesthetic depth faster, and reduce emissions during the critical wash-in phase of inhalational anesthesia [27]

❖ Low-flow anesthesia (LFA) is a safe and effective method for reducing anesthetic waste gas and greenhouse gas emissions, yet high fresh gas flow (FGF) rates remain a common practice in operating rooms [13,27]

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Reference

Methods

❖ ***QI Project Design & Intervention:*** The QI project employed a retrospective post-pre methodology via YouTube to evaluate the impact of an educational video on sustainable anesthetic practices.

❖ ***Assessment Tool:*** The project measurement tool incorporated Bloom's Taxonomy of Cognitive Knowledge and the CPD-Reaction questionnaire to evaluate knowledge acquisition and behavioral intention shifts. The CPD-reaction questionnaire is a 12 item assessment tool designed to measure changes in behavioral intentions following continuing professional development activities. Grounded in socio-cognitive behavioral change theory and incorporates the Theory of planned behavior, This measurement tool suggests that an individual's intention to perform a behavior is the strongest predictor of actual behavior change.

❖ ***Participant Involvement:*** During implementation, 8 anesthesia providers participated in the project, including 1 Anesthesiologist, 6 CRNAs, and 1 Nurse Anesthesiology resident. One participant's incomplete survey was excluded from the final data set.

Table 1: *Properties of Inhalational Anesthetic Agents*

Agent	Global Warming Potential over 100 years	Atmospheric Lifetime (years)	Pharmacokinetic Properties MAC, Blood: Gas, Oil: Gas
Sevoflurane	130	1.1	2%, 0.6, 50
Isoflurane	510	3.2	1.1%, 1.4, 90
Desflurane	2540	14	6%, 0.42, 18.7
Nitrous Oxide	298	114	104%, 0.47, 1.4

Adapted from "sustainability in the Operating Room; Reducing Our Impact on the Planet," (Gordon, 2020)

Results

❖ Key constructs evaluated in behavioral change include 1.) Intention: The individuals commitment to changing their practice 2.) beliefs about capabilities: Confidence in their ability to implement changes 3.) social influence: perceived social pressures or encouragement too change 4.) beliefs about consequences: expected outcomes of adopting the behavior 5.) moral norms: ethical or moral motivation driving behavior change

Comparison Mean Construct Scores (Pre and Post)
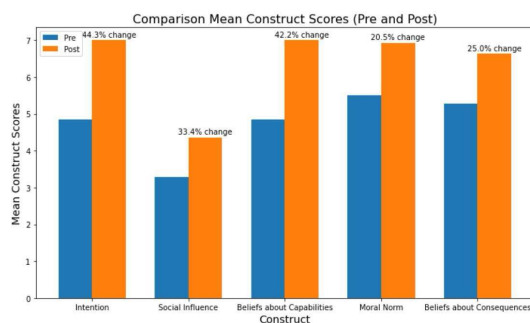
❖ Post-education scores showed substantial improvements, particularly in intention (44.3%), beliefs about capabilities (42.2%), and social influence (33.4%). Beliefs about consequences (25%) and moral norms (20.5%) also improved, but to a lesser extent, indicating the need for ongoing support to strengthen these areas

Results Cont.

❖ Participants' baseline knowledge of sustainable anesthetic practices had an average score of 3.00, which increased to 5.71, reflecting a 90% improvement. Their ability to select sustainable anesthetic agents saw a 141% increase, with an average score rising from 2.43 to 5.86. Knowledge of using low fresh gas flows (LFGF) to reduce anesthetic emissions also showed a substantial improvement, with the average score increasing from 2.57 to 5.71, marking a 122% rise.

Participants Level of Cognitive Knowledge (Pre/Post)
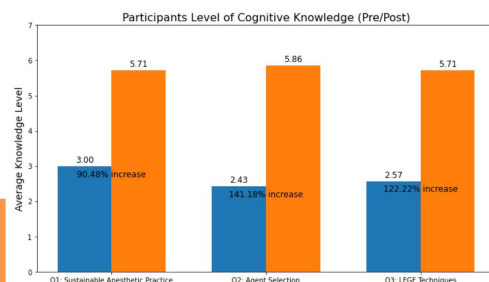
Discussion

❖ Pre- and post-scores showed substantial improvements in anesthesia providers' cognitive knowledge of sustainable anesthetic practices, with notable increases in knowledge about sustainable agents and low fresh gas flow techniques

❖ The intervention also- boosted providers' intent to change practices, particularly in intention, beliefs about capabilities, and social influence, highlighting the effectiveness of education in promoting sustainability.

❖ Despite positive outcomes, the lower-than-expected participation rate limited statistical validity, suggesting the need for higher sample size in future studies to allow for statistical analysis.

Conclusion

❖ The educational intervention successfully increased providers' intention to adopt sustainable practices, demonstrating that education and enhanced knowledge can motivate behavior change

❖ Providers' beliefs in their ability to implement sustainable practices improved, indicating that the intervention addressed key barriers such as knowledge gaps and perceived difficulty

❖ Peer engagement and professional norms play a significant role in motivating providers to incorporate sustainable practices into their work.