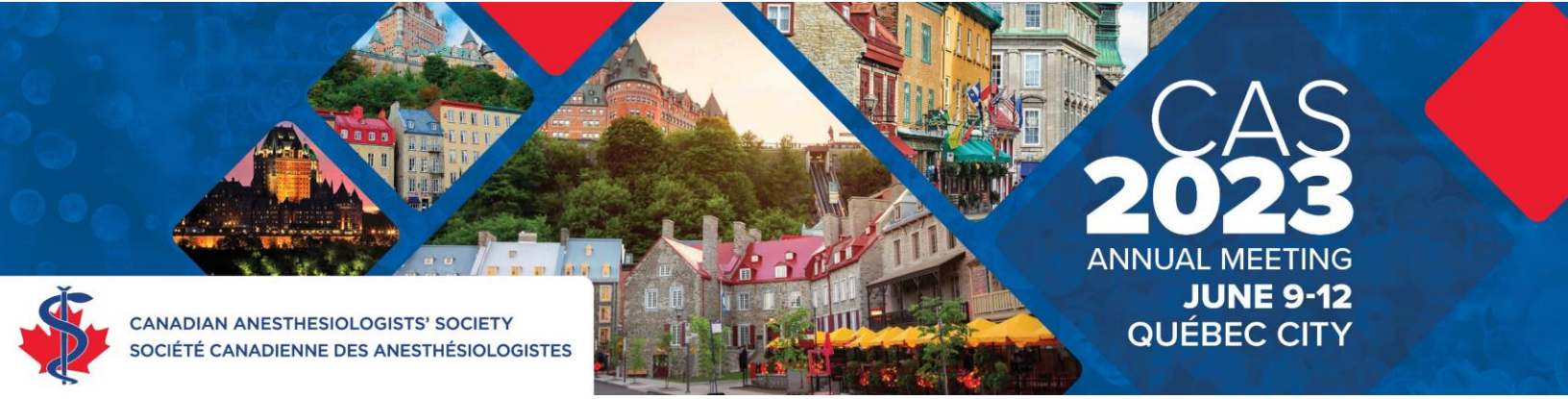

CAS 2023 Annual Meeting

Occupational Health & Risk Education Abstracts

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Perioperative Staff Exposure to Waste Anesthetic Gas in the Operating Room (OR) and Post-Anesthetic Care Unit (PACU) of a Local Centre

AUTHORS

Schmidt, R.[1]; Patterson, C.[1]; Walker, M.E.[1]; Goncin, U.[1]; Hedlin, P.[1]

[1] Department of Anesthesia, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

INTRODUCTION

Healthcare providers in the OR and PACU are at risk of chronic exposure to low concentrations of waste anesthetic gases (WAG) - sevoflurane, desflurane, and nitrous oxide. Chronic exposure to WAG causes oxidative stress, DNA damage, and potentially carcinogenesis1-3. The National Institute for Occupational Safety and Health (NIOSH) suggested limits of 25 parts per million per hour (ppm/h) of nitrous oxide when used alone, 2ppm/h of halogenated agents, or 0.5ppm/h of halogenated agents when used with nitrous oxide4. These recommended exposure limits have not changed since 1977. Further recommendations exist for air exchanges in the OR and PACU. Our local health region recommends 15 exchanges/hour, but the actual number of air exchanges is variable between sites. Here, we aim to investigate perioperative staff exposure to WAG at three local healthcare facilities to identify any safety implications or opportunities for quality improvement.

METHODS

Ethics approval was obtained through the Behavioural Research Ethics Board. In this descriptive pilot study, we compared median and range of sevoflurane exposure between two healthcare roles (nurses and anesthesiologists) across three healthcare facilities (one university-associated site with only adult patients, a children's hospital, and a community surgical centre with adult and pediatric patients). Passive individual badge dosimeters were purchased from Assay Technology (Livermore, CA). These dosimeters were worn by two PACU nurses and two anesthesiologists each day, at each facility, for a 1-week period to capture variations in OR booking. At the conclusion of the 1-week period, the dosimeters were returned to Assay Technology for analysis. Participants who wore dosimeters completed a questionnaire about the type and length of surgeries, anesthetic agents they were exposed to during the sampling period, and the frequency and degree of symptoms correlated to sevoflurane exposure. Statistical analysis was used to determine if median sevoflurane levels exceeded the recommended exposure limits, and any differences between groups split by profession and hospital. Generalized linear models (GLM) with a gamma distribution were used to determine which treatment and symptoms variables were significant covariates in the relationship between sevoflurane and location.

RESULTS

All sites were below the NIOSH-recommended exposure limit (<2ppm). There were significant differences in the median concentration of sevoflurane exposure levels between the three facilities (0.14, 0.1, and 0.95 ppm, $p<0.001$). The lowest median concentration of sevoflurane exposure levels was at the site with no pediatric patients. Anesthesiologists had an increased exposure to sevoflurane (0.42 ppm) in comparison to nurses (0.12 ppm), however this difference was not statistically significant ($p<0.090$). Positive correlations were identified between concentration of sevoflurane exposure and both duration of anesthetic and whether the patient had an endotracheal tube. We found that each minute of exposure to a patient who had a volatile anesthetic increases the concentration of sevoflurane levels multiplicatively by 1.003, and caring for a patient with an endotracheal tube (ETT) increases the concentration of sevoflurane levels multiplicatively by 1.766.

DISCUSSION

Although all facilities were below NIOSH-recommended exposure limits, the variability between sites may warrant improvement. The two facilities with pediatric patients had higher WAG exposure than the one with only adults, likely secondary to inhalational inductions. The correlation between sevoflurane exposure level and ETT use could indicate more sevoflurane being given to achieve greater depth of anesthesia in intubated patients. There are no prior measurements of WAG exposure in our health region. This study has established a baseline from which to assess whether additional interventions are required to protect healthcare workers at risk of long-term exposure, and to direct future research.

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