Cost and Efficiency Analysis of Low Flow Sevoflurane Anesthesia Using Dragersorb Free Absorber

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Background/Introduction: Low flow anesthesia using Desflurane is known to produce cost savings compared to normal flow, but Desflurane is also more expensive than Sevoflurane. To our knowledge, no study has been done for low flow anesthesia using Sevoflurane. One of the limitations has been the commonly recommended 2 L/min fresh gas flow during Sevoflurane anesthesia to minimize Compound A. Because of the new technology in soda lime production from Drager, its Dragersorb Free absorber does not generate Compound A, in contrast to the traditional absorber Dragersorb 800+. Therefore, it is now feasible to study the cost effectiveness of low flow Sevoflurane anesthesia vs. normal flow conditions. We hypothesize that low flow Sevoflurane anesthesia is more cost effective and efficient, even taking into account of the higher cost of the special Dragersorb Free absorber.

Methods: Consecutive general anesthesia cases utilizing Sevoflurane were included in the study using Drager Apollo machine. Low Flow group (n=28 cases) used Dragersorb Free absorber; Normal Flow group (n=30 cases) used Dragersorb 800+ absorber. After IV induction and intubation, oxygen flow was reduced to 4 L/min until patients achieve 0.5 MAC as calculated by age on the anesthesia machine. Then, the Low Flow group had combined O2 and air flow reduced to 1 L/min, the Normal Flow group had combined O2 and air flow reduced to 2 L/min, until all patients reach 1 MAC volatile anesthesia during prep and prior to incision. The 1 MAC volatile anesthesia was maintained while intraoperative care continued by IV balanced technique until emergence and extubation. Data points were collected from the Drager Apollo DataLog, including duration of general anesthesia, O2 and air consumption, Sevoflurane consumption and uptake. The time from surgery end to extubation was also collected. All cases were conducted by a single anesthesiologist using consistent techniques without variation. Data were entered and analyzed in Excel spreadsheet. Statistical analysis was performed for the two data groups using unpaired Student's t-Test in Excel; statistical significance is defined as $p<0.01$.

Results: The average life span of Dragersorb Free absorber was 929 min for Low Flow, compared to 1530 min for Dragersorb 800+ for Normal Flow, resulting in absorber cost of \$0.022/min (Low Flow) vs. \$0.011/min (Normal Flow). However, the cost of Sevoflurane volatile was \$0.08/min for Low Flow, and \$0.12/min for Normal Flow. Therefore, for every min of anesthesia, combined absorber and volatile cost was \$0.102/min for Low Flow, vs. \$0.131/min for Normal Flow, resulting in cost savings of \$0.03/min ($p<<0.005$). The average case length was 133 min for Low Flow, 102 min for Normal Flow ($p=0.032$), and the average

time to extubation was not significantly different between the two groups (3.7 min for Low Flow vs. 5.5 min for Normal Flow, $p=0.095$). The efficiency of Low Flow resulted in Sevoflurane waste of 38%, compared to 57% for Normal Flow ($p<<0.005$).

Conclusion: Low flow anesthesia for Sevoflurane using the Dragersorb Free absorber results in savings of $0.03 per min of anesthesia time and less volatile anesthetic environmental waste compared to normal flow. Even greater cost savings were observed using low flow Sevoflurane compared to low flow Desflurane (unpublished data, Atchison). Assuming an average of 6 hours anesthesia time per day per operating room, utilizing the Low Flow Sevoflurane anesthesia technique will result in at a minimal $2,808 savings per OR per year, simply by taking advantage of the new soda lime absorber technology. This change in practice could produce huge cost savings in terms of medical economics across the country.