

recently arrested for speeding and for possession of nonprescribed Valium, Xanax, Vicodin, Adderall, and Soma, in addition to marijuana (5). We should all be concerned about this new trend as it makes it increasingly difficult for the anesthesiologist to collect accurate information regarding their patients' histories.

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The Ever-Useful Infrared Analyzer

To the Editor:

Peyton et al. (1) evaluate the use of a conventional infrared analyzer and the double head-space equilibration technique to determine the blood/gas partition coefficients of desflurane, isoflurane, and sevoflurane. They suggest that a conventional infrared analyzer may substitute for the usual use of the gas chromatograph for such analyses. We agree, noting that such use was reported close to a half century ago (2).

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Perioperative Complications During Use of an Obstructive Sleep Apnea Protocol Following Surgery and Anesthesia

To the Editor:

As part of a patient safety initiative at our institution, we implemented a perioperative obstructive sleep apnea (OSA) protocol, and retrospectively examined the occurrence of complications (difficult intubation, postoperative hypoxemia, reintubation, transfer to intensive care unit [ICU], cardiac arrest, and death) in our OSA patient population. Although our findings were limited by the lack of a control group, our data are relevant for all practicing anesthesiologists as there are few data documenting clinical outcomes for OSA patients during the perioperative period.

Our protocol stratified patients undergoing surgery into the categories of mild OSA (Apnea Hypopnea Index [AHI] ≥ 5 but ≤ 15) and moderate/severe OSA (AHI > 15). Patients who were previously diagnosed with OSA, but in which the severity was unknown, were treated as if they had moderate/severe OSA. Patients without a formal polysomnogram (PSG) who were suspected of having OSA due to clinical history were also treated as if they had moderate/severe OSA.

During an 18 month period, patients with documented or suspected OSA requiring IV opioids after surgery were admitted overnight to a designated OSA bed on a general ward. Designated OSA beds were equipped with pulse oximetry, which alarmed both inside and outside the room when the SpO₂ reached 88%. Activation of the

alarm required a nursing intervention to assess and correct any problems noted. A data monitoring form was used to document postoperative hemoglobin-oxygen saturations (SpO₂ $< 90\%$) in patients admitted to the general ward. Patients with mild OSA who did not require IV opioids could be discharged home after surgery. Patient records were reviewed for perioperative complications. The study was approved by the IRB. Informed consent was not required.

A total of 22,067 patients had surgery at our main campus and ambulatory surgery center, and 438 (2%) were identified as known or suspected OSA. Of the 438 patients, 356 (82%) were managed on an inpatient basis and 82 (18%) were ambulatory. Most ($n = 313$; 88%) of the inpatients were admitted to a designated OSA bed on a general nursing floor. Forty-two patients were managed in a stepdown/ICU setting. One patient was managed off protocol. Seventy-seven percent of patients were tracheally intubated for their surgical procedures. Difficult tracheal intubation was noted in 15% (50/328).

Fiberoptic intubation was done in 4% (13/328). Four patients required postoperative tracheal intubation for respiratory failure. Unplanned or urgent transfer to the ICU occurred in 2 patients (0.5%). There were two cardiac arrests and no deaths. One cardiac arrest occurred in the sole patient managed off protocol whereas the second occurred in a patient at home while receiving PO opioids (one day after discharge) after having completed overnight OSA monitoring.

Two hundred twenty OSA data monitoring forms were available from the medical records of the 356 inpatients. The distribution of OSA severity from the patients with OSA data monitoring forms mirrored that of the overall total OSA population. Sleep-related hemoglobin-oxygen desaturation to $< 90\%$ was seen in 35 (16%) inpatients, with 27 (12%) to $< 85\%$, and 17 (7%) to $< 80\%$. The

frequency of desaturation was unrelated to baseline OSA severity (odds ratio [OR] mild versus moderate or severe = 1.4, 95% CI: 0–5, $P = \text{NS}$). Most episodes of hemoglobin oxygen desaturation occurred within the first 24 to 48 hours after the surgical procedure (16 times more likely within the first 24 hours compared with 48 hours (OR = 21, 95% CI: 6–74, $P < 0.0001$). The majority of patients had only 1 or 2 episodes of $\text{SpO}_2 < 90\%$. However, 5 patients had 6 or more and 2 patients had 9 documented episodes of hemoglobin oxygen desaturation. An episode of hemoglobin oxygen desaturation was 14 times more likely to occur in patients receiving IV opioids compared with no opioids (OR = 14, 95% CI: 3–65, $P < 0.001$) and 12 times more likely to occur in patients receiving oral opioids compared with no opioids (OR = 12, 95% CI: 3–58, $P < 0.001$). In addition, hemoglobin-oxygen desaturation occurred in 2 patients not receiving opioids during sleep after general anesthesia.

Baseline PSG studies with CPAP titration were available in 20 patients

with episodes of postoperative hypoxemia. On the same optimal pressure setting as determined by their titration PSG, hemoglobin oxygen saturation decreased postoperatively from an average of $\pm \text{SD}$) $93 \pm 2\%$ on their PSG to $80 \pm 8\%$ postoperatively ($P < 0.001$).

Our data suggest that OSA patients experience postoperative episodes of hemoglobin-oxygen desaturation both with IV and PO opioids, particularly in the first 24 hours after surgery, and these are not reliably prevented by use of CPAP. However, OSA protocols which incorporate continuous pulse oximetry monitoring in designated beds on general nursing floors can be implemented and allow OSA patients at risk for postoperative complications to be monitored without intense resource utilization.

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Please contact Dr. Bolden for a copy of the OSA protocol that was developed by a multidisciplinary committee at MetroHealth Medical Center and monitored between November 2004 through April 2006.

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