A Review of Current Literature of Interest to the Office-Based Anesthesiologist

Chhabada S, Skinner C, et al. Association between age- and sex-specific body mass index percentile and multiple intubation attempts: a retrospective cohort analysis. *Anesth Analg*. 2024;138(4):821–828. doi:10.1213/ANE.0000000000006400

Obesity distorts airways and has been shown to slightly complicate intubation in adults, but whether obesity complicates pediatric intubations remains unclear. The authors tested the primary hypothesis that increasing age- and sex-specific body mass index (BMI) percentile is associated with difficult intubation, defined as more than 1 intubation attempt. A retrospective analysis of pediatric patients between 2 and 18 years of age undergoing noncardiac surgery with oral endotracheal intubation was conducted. The association between BMI percentile and difficult intubation, defined as more than 1 intubation attempt, using a confounder-adjusted multivariable logistic regression model was the primary focus of the study. Secondarily, the authors assessed whether the main association depended on preoperative substantial airway abnormality status or age group. A total of 9,339 patients were included in the analysis. Median (quartiles) age- and sex-specific BMI percentile was 70 (33, 93), and 492 (5.3%) patients had difficult intubation. There was no apparent association between age- and sex-specific BMI percentile and difficult intubation. The estimated odds ratio (OR) for having difficult intubation for a 10-unit increase in BMI percentile was 0.98 (95% CI, 0.95-1.005) and was consistent across the 3 age groups of early childhood, middle childhood, and early adolescence (interaction $P = .53$). Patients with preoperative substantial airway abnormalities had lower odds of difficult intubation per 10-unit increase in BMI percentile with OR (95% CI) of 0.83 (0.70-0.98), $P = .01$. The authors concluded age- and sex-specific BMI percentile was not associated with difficult intubation in children between 2 and 18 years of age. As in adults, obesity in children does not appear to significantly complicate intubation.

Comment: Obesity is associated with an increase in fat deposition in the tongue and pharynx. This results in the visual distortion of anatomic landmarks and possible impaired mobility of the head and pharynx during intubation. The authors point out that intubations are progressively more likely to fail as BMI increases from 18 kg/m^2 to about 30 kg/m^2, but the fraction of successful first-attempt intubations in adults hardly changes as BMI increases from 30 kg/m^2 to 80 kg/m^2. This study showed 1 in 20 of a sample of pediatric patients, age 2 to 18 years, required more than 1 intubation attempt, but increased age- and sex-specific BMI percentile was not associated with increased risk of difficult intubation. Children are thus like adults in that obesity minimally compromises laryngoscopy and intubation.

Schnetz MP, Reon BJ, Ibinson JW, et al. Bispectral index changes following boluses of commonly used intravenous medications during volatile anesthesia identified from retrospective data. *Anesth Analg*. 2024;138(3):635–644. doi:10.1213/ANE.0000000000006633

Although patients are commonly monitored for depth of anesthesia, it is unclear to what extent administration of intravenous anesthetic medications may affect calculated bispectral index (BIS) values under general anesthesia. In a retrospective analysis of electronic anesthesia records from an academic medical center, we examined BIS value changes associated with 14 different intravenous medications as administered in routine practice during volatile-based anesthesia using a novel screening approach. Discrete time windows were identified in which only a single drug bolus was administered, and subsequent changes in BIS values, concentration of volatile anesthetic, and arterial pressure were analyzed. Our primary outcome was change in the BIS value following drug administration. Adjusted 95% CIs were compared with predetermined thresholds for clinical significance. Secondary sensitivity analyses examined the same outcomes with available data separated according to differences in baseline volatile anesthetic concentrations, doses of the administered medications, and length of time window. The study cohort comprised data from 20,170 distinct cases; 54.7% of patients were men, with a median age of 55 years. In the primary analysis, ketamine at a median dose of 20 mg was associated with a median BIS increase of 3.8 (2.5-5.0). Midazolam (median dose 2 mg) was associated with a median BIS decrease of 3.0 (1.5-4.5). Neither of these drug administrations occurred during time periods associated with changes in volatile anesthetic concentration. Analysis for dexmedetomidine was confounded by concomitant decreases in volatile anesthetic concentration. No other medication analyzed, including propofol and common opioids, was associated with a significant change in BIS values. Secondary analyses revealed that similar BIS value changes occurred when midazolam and ketamine were administered at different volatile anesthetic concentrations and different doses, and these changes persisted 11 to 20 minutes after administration. The authors concluded that modest but persistent changes in BIS values occurred following doses of ketamine (BIS increase) and midazolam (BIS decrease) during periods of stable volatile anesthetic administration.

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Comment: The findings in this study are consistent with our understanding of the respective molecular mechanisms of action for ketamine and midazolam. Midazolam, like all benzodiazepines, acts as a positive allosteric modulator on γ-aminobutyric acid (GABA)–A receptors, resulting in hyperpolarization of central nervous system (CNS) neurons. GABA is the major inhibitory neurotransmitter in the CNS. Ketamine blocks the flow of glutamate through N-methyl-D-aspartate receptors in the CNS. Glutamate is a major excitatory neurotransmitter in the CNS. Ketamine and midazolam produce their anesthetic effects through 2 separate and distinct mechanisms, which is reflected in the 2 separate and distinct BIS patterns. The lack of a significant change in BIS values following the administration of other drugs, including propofol and common opioids, remains unclear.

A significant limitation of this study for dental anesthesia providers is the fact that the data were drawn from a population with a mean age of 55 years with each individual drug administered as an adjunct to inhalational anesthesia. Direct application of these results to dental anesthesia, which most often involves intravenous anesthesia administered to pediatric and young adult patients, is difficult.

Laferriere-Langlois P, Morisson L, Jeffries S, et al. Depth of anesthesia and nociception monitoring: current state and vision for 2050. *Anesth Analg*. 2024;138(2):295–307. doi:10.1213/ANE.0000000000006860

This narrative review article examines the current use of the bispectral index, Narcotrend monitor, Patient State Index, entropy-based monitoring, and Neurosense monitor, as well as middle latency evoked auditory potential, and explores how these technologies could evolve in the upcoming years. Whereas theoretical concepts such as minimal alveolar concentration and target-controlled infusions are currently used as surrogates for patient awareness, this review looks at the use of direct neural monitoring such as electroencephalography (EEG) and its derivatives (processed EEG [pEEG]) for monitoring anesthetic depth. Current studies appear to affirm that pEEG monitoring decreases the quantity of anesthetics administered, diminishes the time spent in the postanesthesia care unit, and may reduce the occurrence of postoperative delirium. Three strategies currently guide the application of these technologies: motor reflex monitoring, central nervous system activity, and autonomic nervous system activity. Generally, nociceptive monitors outperform basic clinical vital sign monitoring in reducing perioperative opioid use.

Comment: The adequacy of clinical anesthesia is typically based on factors such as patient movement, sympathetic nervous system activity, and hypnosis. Recent advances in the monitoring of depth of anesthesia and nociception suggest that these traditional indicators may be comparatively crude and result in the application of excessive levels of anesthesia for many types of surgeries. Combined with recent advances in anesthetic pharmacology and the diminished invasiveness of many types of surgery, it appears likely that depth of anesthesia monitoring and nociceptive monitoring will become an increasingly important part of non–operating room anesthesia practice in the near future.

Sawicki CM, Janal MN, Wade SD. Preoperative multisensory room use in pediatric patients with autism: a randomized clinical trial. *Pediatr Dent*. 2024;46(2):91–98.

This study evaluated the impact of multisensory room (MSR) use on preoperative anxiety and postoperative outcomes in children with autism spectrum disorder (ASD) undergoing dental treatment with general anesthesia. Forty children, ages 6 to 17 years, with ASD requiring general anesthesia for dental treatment participated in this study. The sample was predominantly male (62.5%) and identified as either white or black (53%) and non-Hispanic (60%). Participants were randomized to either the control group (standard preoperative waiting room) or intervention group (MSR) for 20 minutes prior to general anesthesia induction. Preintervention and postintervention preoperative anxiety were measured. Following surgery, postoperative emergence delirium was assessed. Short- and long-term postoperative pain and adverse behavioral effects were evaluated at 6 hours, 24 hours, 1 week, and 1 month postsurgery. Data analysis employed repeated measures analysis of variance with 2 groups and either 2 or 4 time periods. Preoperative behavioral anxiety levels increased postintervention in the control group ($P < .05$) and decreased in the MSR group ($P < .001$). Following surgery, pain intensity was greater in the control group compared with the MSR group at 6 hours ($P < .05$) and 24 hours ($P < .01$) and similar at 1 and 4 weeks. Preintervention and postintervention measures of preoperative heart rate, postoperative emergence delirium, and behavioral effects were similar between groups and over time. These findings suggested a novel, nonpharmacologic technique that can be utilized by various health care specialties to reduce preoperative anxiety and improve postoperative outcomes in children with ASD.

Comment: One of the dominant features of ASD is heightened sensitivity to environmental stimulation. This heightened sensitivity affects the way in which autistic individuals interpret and respond to their environment. Engineers, architects, and others have developed environments that reduce an autistic person's aversion to sensory overload, enhance meaningful sensory processing, and foster communication. Acoustic, auditory, tactile, and olfactory stimulation are the most critical design elements of these environments. An MSR is an example of this kind of engineered environment.

This study offers promise for the management of a population of patients frequently seen in the practice of dental anesthesiology. A limitation of the study included the ages of the participants, which ranged from 6 to 17 years. Future studies that examine the efficacy of this intervention in children 2 to 6 years of age would be particularly informative to dentist anesthesiologists.

Summaries and comments provided by

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