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

Mpody C, Kidwell RC, Willer BL, Nafiu OO, Tobias JD. Preoperative neurologic comorbidity and unanticipated early postoperative reintubation: a multicenter cohort study. *Br J Anaes*. 2024;133(5):1085–1092.

The risk of respiratory complications is highest in the first 72 hours postsurgery. Postoperative respiratory events can exacerbate preexisting respiratory compromise and lead to reintubation, particularly in patients with neurologic disorders. This multicenter, propensity-matched study of 420,096 children examined the association between neurologic comorbidities and unanticipated early postoperative reintubation in children. The primary outcome was unanticipated early postoperative reintubation within 72 hours after surgery. The secondary outcome was prolonged postoperative mechanical ventilation, defined as ventilator use over 72 hours. Additionally, 30-day mortality was also followed in patients requiring reintubation. Cerebral palsy was associated with the highest risk of early reintubation (adjusted relative risk [RRadj], 1.97; 95% CI, 1.44–2.69; $P <$ .01), followed by seizure disorders (RRadj, 1.87; 95% CI, 1.50–2.34; $P <$ .01), neuromuscular disorders (RRadj, 1.76; 95% CI, 1.41–2.19; $P <$ .01), and structural central nervous system abnormalities (RRadj, 1.35; 95% CI, 1.13–1.61; $P <$ .01). Unanticipated early postoperative reintubation was associated with an 8-times increased risk of 30-day mortality (adjusted hazard ratio, 8.1; 95% CI, 6.0–11.1; $P <$ .01). Risk of prolonged postoperative mechanical ventilation was also increased with neurologic comorbidities, particularly seizure disorders (RRadj, 1.73; 95% CI, 1.55–1.93; $P <$ .01).

Comment: This large, multicenter retrospective study focuses on the critical first 72 hours following surgery, a time when the risk of respiratory depression and hypoxemia is highest. Although the study population included children undergoing major surgery, the effect of preexisting neurologic comorbidities presents the anesthesia provider with valuable insights for treatment planning. Selected patients with cerebral palsy, neuromuscular disorders, and structural central nervous system abnormalities may be at lower risk when general anesthesia is performed in an environment that can provide sustained postoperative observation and monitoring. (M Saxen)

Sastre J, López T, Julián R, et al. Assessing full stomach prevalence with ultrasound following preoperative fasting in diabetic patients with dysautonomia: a comparative observational study. *Anesth Analg*. 2024;139(6):1300–1308.

Traditionally, diabetics have been considered to have a high risk of aspiration due to delayed gastric emptying. However, the evidence concerning residual gastric volume (GV) in fasting diabetic patients is inconsistent. This study aimed to compare the fasting GV of diabetic patients with or without dysautonomia with control patients scheduled for elective surgery using gastric ultrasound. This bicentric, prospective, single-blinded case-control study examined patients aged over 18 years, classified as American Society of Anesthesiologists (ASA) physical statuses I to III, and having similar fasting statuses. The primary outcome was the prevalence of risk stomach using the Perlas gastric content grading scale evaluated by ultrasound in the 3 groups. Secondary outcomes included the measurement of cross-sectional area (CSA) and GV in the right lateral decubitus (RLD) position as well as the prevalence of solid gastric residue.

A total of 289 patients were recruited for the study, comprising 145 diabetic patients (83 of whom had dysautonomia) and 144 patients in the control group. The percentage of patients classified as Perlas grade 2 was 13.2% in the control group, 16.1% in diabetic patients without dysautonomia, and 22.9% in diabetic patients with dysautonomia ($P =$ .31). Antral CSA was significantly higher in diabetic patients with dysautonomia compared to the control group ($P =$ .04). However, no significant differences were observed between groups in residual GV. Among diabetic patients with dysautonomia, 12% exhibited solid gastric residue, which was twice the percentage observed in diabetic patients without dysautonomia (4.8%) and 3 times higher than that in the control group ($P =$ .03). The presence of dysautonomia was associated with an increased odds ratio of solid gastric residue (OR, 3.37; 95% CI, 1.28–8.87; $P =$ .01) after adjusting for confounding factors.

Comment: Many conditions and medications cause delayed gastric emptying, putting patients at higher risk for perioperative pulmonary aspiration. This is especially important to consider when using a nonintubated technique. Guidelines for preoperative fasting are inconsistent. The European Society of Anesthesiology (ESA) recommends a standard adult fast while the ASA suggests modification for diabetics. In this study, assessment of gastric contents using point-of-care gastric ultrasound (gastric POCUS) was performed in diabetic patients with and without dysautonomia and in a nondiabetic control group. Despite following fasting guidelines, 12% of diabetic patients with dysautonomia had residual solid contents, which is twice that of diabetic patients without dysautonomia and 3 times that of nondiabetic patients. Gastric POCUS provides a quick and reliable method for assessing gastric contents in higher risk patients. With the increase in availability of ultra-portable handheld ultrasounds in recent years, anesthesiologists in ambulatory settings should consider use of gastric POCUS in patient with higher risk for delayed gastric emptying. (C McKenzie)

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Garcheva V, Sanchez Martinez C, Adel J, et al. Increased rate of anoxic brain damage with laryngeal tube compared to endotracheal intubation in patients with shockable out-of-hospital cardiac arrest – experience from the Hannover Cooling Registry (HACORE). *Resuscitation*. 2024;205:10416.

Supraglottic airway devices (SGAs) such as the laryngeal tube (LT) are recommended in current guidelines for simplified airway management in patients during and immediately after out-of-hospital cardiac arrest (OHCA). Trials evaluating LTs included predominantly OHCA patients with nonshockable rhythms and low survival rates. Hence, LTs are widely used, but their impact on preventing hypoxic brain damage during resuscitation remains unclear. This study examines the outcomes of 452 OHCA patients with shockable rhythms from the Hannover Cooling Registry (HACORE) who had return of spontaneous circulation prior to transport. Of those, 405 patients received primary airway management by endotracheal intubation (ETI) and 47 by LT use. Patients were subsequently treated according to the Hannover Cardiac Resuscitation Algorithm (HaCRA) applying a strict postresuscitation management including therapeutic hypothermia and avoiding routine prognostication. While mortality was moderate with both airway strategies (ETI 29% vs LT 34%; $P = .487$), the rate of anoxic brain damage was much higher in the LT compared with the ETI group (38% vs 21%; $P = .011$). Survivors in the ETI group were more likely to have good neurological outcome (cerebral performance category 1 or 2) compared with the LT group (35% vs 17%; $P = .013$). Pneumonia was more common in the LT vs ETI group (81% vs 53%, respectively; $P < .001$).

Comment: An accompanying editorial by Richard A. Field[1] offers several perspectives to consider while evaluating this report. Acknowledging that airway management in cardiac arrest is heavily dependent upon the skillset of the attending provider, Fields notes this is one of the few published studies to report worse outcomes for SGAs as compared with ETI. Prior evidence supporting the use of SGAs was strong enough for the Joint Royal Colleges Ambulance Liaison Committee to recommend abandoning the teaching of ETI to paramedics. Strengths of this study include its focus on shockable rhythms and the design to draw data from an established outcomes registry. Weaknesses include the significantly unequal numbers of individuals in each group (47 ETI vs 405 LT placements), the limited types of SGAs used, and the fact that the emergency service employed prehospital physicians, who would preferentially opt for ETI and would be expected to produce a higher success rate as opposed to paramedics. Field concludes by acknowledging the demonstrated inferiority of LT airways in this study but calls for further studies examining the effectiveness of other types of supraglottic devices, such as the i-gel. (M Saxen)

do Nascimento TS, Pereira ROL, Maia E, et al. The impact of glucagon-like peptide-1 receptor agonists in the patients undergoing anesthesia or sedation: systematic review and meta-analysis. *Perioper Med*. 2024;13:78. https://doi.org/10.1186/s13741-024-00439-y

Glucagon-like peptide-1 receptor agonists (GLP-1RAs), medications used for glycemic control and weight loss, are increasing worldwide. In the perioperative period, the major concerns related to GLP-1RAs are gastric emptying delay and risk of aspiration. This meta-analysis and systematic review compared the risks and benefits of using GLP-1RAs and control in surgical and nonsurgical procedures under general anesthesia or sedation. A systematic search of MEDLINE, Embase, and Cochrane databases for randomized controlled trials and observational studies involving patients over 18 years of age undergoing elective surgeries or procedures. Outcomes of interest were preprocedural gastrointestinal (GI) symptoms, residual gastric content assessed by endoscopy, pulmonary aspiration during general anesthesia/sedation, perioperative glycemic control, postoperative inotropic support, postoperative nausea/vomiting (PONV), atrial fibrillation, and 30-day mortality rate. Fourteen randomized and observational studies with 2143 adult patients undergoing elective surgeries and procedures were included. GLP-1RAs resulted in increased preprocedural GI symptoms (OR, 7.66; 95% CI, 3.42–17.17; $P < .00001$; $I^2 = 0\%$) and elevated residual gastric content (OR, 6.08; 95% CI, 2.86–12.94; $P < .00001$; $I^2 = 0\%$). GLP-1RAs resulted in lower glycemic levels (MD, −0.73; 95% CI, −1.13 to −0.33; $P = .0003$; $I^2 = 90\%$) and lower rates of rescue insulin administration (OR, 0.39; 95% CI, 0.23–.68; $P = .0009$; $I^2 = 35\%$). There were no significant differences in the rates of perioperative hypoglycemia (OR, 0.60; 95% CI, 0.29–1.24; $P = .17$; $I^2 = 0\%$), hyperglycemia (OR, 0.89; 95% CI, 0.59–1.34; $P = .58$; $I^2 = 38\%$), need for postoperative inotropic support (OR, 0.57; 95% CI, 0.33–1.01; $P = .05$; $I^2 = 0\%$), atrial fibrillation (OR, 1.02; 95% CI, 0.52–2.01; $P = .95$; $I^2 = 16\%$), PONV (OR, 1.35; 95% CI, 0.82–2.21; $P = .24$; $I^2 = 0\%$), and 30-day mortality (OR, 0.54; 95% CI, 0.14–2.05; $P = .25$; $I^2 = 0\%$). Compared with control, preprocedural GLP-1RA use increased the rate of GI symptoms and the risk of elevated residual gastric content despite adherence to fasting guidelines. GLP-1RAs improved glycemic control and decreased the rate of rescue insulin administration. There were no significant differences in the rates of perioperative hypo- or hyperglycemia, postoperative inotropic support, PONV, atrial fibrillation, or 30-day mortality.

Comment: GLP-1 and GIP receptor agonists are incretin-mimetic hormones that increase insulin secretion, decrease glucagon release, increase satiety, and slow gastric emptying. They have become increasingly popular for treatment of diabetes and obesity, with additional cardioprotective effects and delay in renal function decline. Up until recently, most literature relevant to delayed gastric emptying and anesthesia

complications for patients taking a GLP-1RA was limited to case reports. The systematic review highlights the increased rate of preprocedural GI symptoms including nausea, vomiting, and abdominal distention that may indicate retained gastric contents and place patients at higher risk for pulmonary aspiration. On the other hand, patients taking these medications in the perioperative period were found to have improved glycemic control, lessening the need for rescue insulin administration in the perioperative period. This article pairs wells with the multi-society guidelines for patients taking a GLP-1RA. Recommendations include balancing the metabolic needs of a patients with individual patient risk when deciding to continue the medication in the perioperative period as well as a 24-hour liquid fast for high-risk patients and modification to the anesthetic technique. (C McKenzie)

Palatinus H, Johnson MA, Wang HE, Hoareau GL, Youngquist ST. Early intramuscular adrenaline administration is associated with improved survival from out-of-hospital cardiac arrest. *Resuscitation*. 2024;201:1–8.

The objective of this study was to determine whether an initial intramuscular (IM) epinephrine dose followed by standard intravenous (IV)/intraosseous (IO) epinephrine is associated with improved survival after out-of-hospital cardiac arrest (OHCA). This observational study compared the outcomes of first responders delivering prehospital care to a cohort of 1405 cardiac arrest victims in Salt Lake City, Utah over a 14-year period. Outcomes were compared before and after a protocol change directed first responders to deliver an initial 5-mg dose of IM epinephrine to the vastus lateralis prior to obtaining vascular access when responding to a cardiac arrest. Following IM administration, standard protocols were followed that included the establishment of IV/IO access. The primary outcome was survival to hospital discharge. Secondary outcomes were time from EMS arrival to the first dose of epinephrine, survival to hospital admission, and favorable neurologic function at discharge. Of the 1405 patients with OHCAs, 420 (29.9%) received IM epinephrine and 985 (70.1%) received usual care. Fifty-two patients received the first dose of epinephrine through the IV or IO route within the postintervention period and were included in the standard care group analysis. Age was younger and bystander CPR was higher in the IM epinephrine group. All other characteristics were similar between IM and standard care cohorts. Time to epinephrine administration was faster for the IM cohort [median 4.3 min (IQR, 3.0–6.0) vs 7.8 min (IQR, 5.8–10.4)]. Compared with standard care, IM epinephrine was associated with improved survival to hospital admission (37.1% vs 31.6%; aOR, 1.37; 95% CI, 1.06–1.77), hospital survival (11.0% vs 7.0%; aOR, 1.73; 95% CI, 1.10–2.71), and favorable neurologic status at hospital discharge (9.8% vs 6.2%; aOR, 1.72; 95% CI, 1.07–2.76).

Comment: This study, which was based upon the real-world experience of paramedics over a 14-year span, has several methodological limitations but still offers relevant, useful information. It is one of the first clinical studies assessing the effectiveness of early IM epinephrine administration during resuscitation of OHCA. Multiple studies have demonstrated that early administration of epinephrine is associated with improved survival after out-of-hospital cardiac arrest.[2,3] However, evidence-based dosing for IM epinephrine in this situation remains ill-defined. The authors arrived at the 5-mg IM dose by determining it was equivalent to 50% of the 1-mg IV dose prescribed for cardiac arrest. This is analogous to other IM dosing regimens for emergency epinephrine administration. Because of its inherent potency, fixed doses of epinephrine are prescribed for the emergency treatment of anaphylaxis. The authors conclude by calling for randomized, controlled trials to fully assess the potential benefit suggested by this study. (M Saxen)

Lee VCL, Ridgway R, West NC, Görges M, Whyte SD. Anesthetic-sparing effect of dexmedetomidine during total intravenous anesthesia for children undergoing dental surgery: a randomized controlled trial. *Pediatr Anesth*. 2024;34:1213–1222.

Dexmedetomidine (DEX) reduces propofol and remifentanil requirements when used as an adjunct to total intravenous anesthesia (TIVA) in adults, but studies in a pediatric population are sparse. This study investigates the magnitude of dose-sparing effects of a postinduction DEX bolus on propofol and remifentanil requirements during pediatric surgery. This randomized, double-blind, controlled trial included 67 children, aged 2 to 10 years, undergoing elective dental surgery. Patients were assigned to 1 of 4 groups: placebo, 0.25 mcg/kg DEX, 0.5 mcg/kg DEX, and 1 mcg/kg DEX. Maintenance with fixed-ratio propofol and remifentanil TIVA followed a bispectral index (BIS)-guided algorithm designed to maintain a stable depth of anesthesia. The primary outcomes were time-averaged maintenance infusion rates of propofol and remifentanil. Secondary outcomes in the postanesthetic care unit included sedation scores, pain scores, and time to discharge.

The median [IQR] propofol infusion rate was lower in the 1 mcg/kg DEX group (180 [164–185] mcg/kg/min) vs placebo (200 [178–220] mcg/kg/min; percent change, −10.0%; 95% CI, −2.4 to −19.8; $P = .013$). The remifentanil infusion rate was also lower in the 1 mcg/kg DEX group (0.089 [0.080–0.095] mcg/kg/min) vs placebo (0.103 [0.095–0.106] mcg/kg/min; percent change, −13.7%; 95% CI, −5.47 to −21.0; $P = .022$. However, neither propofol nor remifentanil infusion

rates were significantly different in the 0.25 or 0.5 mcg/kg DEX groups. In the postanesthesia care unit, there were no differences in pain or sedation scores, and time to discharge was not significantly prolonged in any DEX group. The authors concluded DEX 1 mcg/kg reduced the propofol and remifentanil requirements during maintenance of anesthesia in children when administered as a postinduction bolus.

Comment: TIVA is ideal for mobile practice given the equipment required is more portable compared with anesthesia gas machines. This study describes a common TIVA technique using an infusion of remifentanil and propofol on pediatric patients during dental extractions and restorations. With the addition of 1 mcg/kg bolus of DEX soon after induction, patients required less propofol (−10%; $P = .13$) and remifentanil (−13%; $P = .22$) compared with the control. Of particular interest to anesthesiologists in the ambulatory setting, there was no significant difference in time in recovery between the patients receiving DEX and the control. Of 88 patients, it should be noted that there were 8 medication dosing errors which serves as a reminder that any additional medication provides an opportunity for error and that drug dosages and concentrations should be closely monitored. Bradycardia is also a concern, especially in pediatrics, and should be considered when using DEX. One 3-year-old patient in the 1 mcg/kg group required atropine rescue because of bradycardia. (C McKenzie)

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