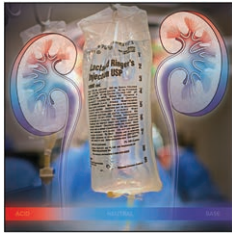


THIS MONTH IN ANESTHESIOLOGY



614 Saline *versus* Lactated Ringer's Solution: The Saline or Lactated Ringer's (SOLAR) Trial

Infusion of large volumes of saline solution can cause hyperchloremic metabolic acidosis. Lactated Ringer's solution contains less chloride, reducing the risk of hyperchloremic metabolic acidosis. The hypothesis that a composite of in-hospital mortality and major postoperative complications would be lower in patients administered lactated Ringer's solution than in those administered saline solution was tested in patients having colorectal or orthopedic surgery. In an alternating cohort controlled trial, 4,187 (49%) patients were assigned to receive lactated Ringer's solution and 4,429 (51%) were assigned to receive normal saline solution. Patients were given a median of nearly 2 l of lactated Ringer's or saline solution in less than 4 h. The primary

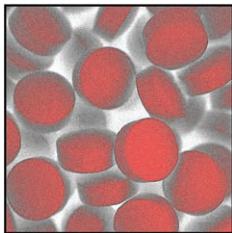
composite of in-hospital mortality and major complications (moderate or severe acute kidney injury, infections, respiratory complications, and hemorrhage) was observed in 5.8% of lactated Ringer's and 6.1% of normal saline patients (absolute difference -0.3% ; 95% CI, -1.3% to 0.7%). Using an intent-to-treat approach, the estimated average relative risk of lactated Ringer's *versus* saline solution across the individual components was 1.16 (95% CI, 0.89 to 1.52). See the accompanying Editorial on [page 609](#). (Summary: M. J. Avram. Image: S. M. Jarret, M.F.A., C.M.I./J. P. Rathmell.)



625 Cannabis Use Disorder and Perioperative Outcomes in Major Elective Surgeries: A Retrospective Cohort Analysis

Surgical patients with an active cannabis use disorder may be at an increased risk of adverse outcomes given the potential for psychoactive and hemodynamic effects within the perioperative setting. A retrospective cohort study was conducted to test the hypothesis that nonambulatory surgery patients with an active cannabis use disorder have a higher risk of postoperative complications using data obtained from the Nationwide Inpatient Sample from 2006 to 2015. The primary composite outcome consisted of clinically relevant postoperative complications, including myocardial infarction, stroke, sepsis, deep vein thrombosis/pulmonary embolus, acute kidney injury requiring dialysis, respiratory failure, and in-hospital mortality. A propensity score matched-pairs

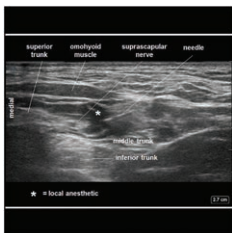
analysis of the cohort was used to evaluate the adjusted association between active cannabis use disorders and the outcome of interest; the matched-pairs cohort consisted of 13,603 patients in each group. There was no statistically significant difference in the composite perioperative outcome between patients with (400 of 13,603; 2.9%) and without (415 of 13,603; 3.1%) a reported active cannabis use disorder (adjusted odds ratio 0.97; 95% CI, 0.84 to 1.11). See the accompanying Editorial on [page 612](#). (Summary: M. J. Avram. Image: Adobe Stock.)



692 One-year Results of a Factorial Randomized Trial of Aspirin *versus* Placebo and Clonidine *versus* Placebo in Patients Having Noncardiac Surgery

The Perioperative Ischemic Evaluation-2 (POISE-2) trial was an international, randomized, controlled trial with a two-by-two factorial design that assessed the individual effectiveness and safety of both clonidine and aspirin among 10,010 patients with either established vascular disease or multiple risk factors undergoing noncardiac surgery. Patients were randomized in a 1:1:1:1 ratio to receive clonidine/aspirin, clonidine/aspirin placebo, clonidine placebo/aspirin, or clonidine placebo/aspirin placebo. This long-term follow-up determined the effect of aspirin *versus* placebo and clonidine *versus* placebo on the 1-yr risk of a composite outcome of death or nonfatal myocardial infarction. Neither aspirin nor clonidine had any effect on the composite outcome at 1 yr; hazard

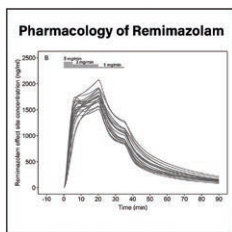
ratios (95% CIs) were 1.00 (0.89 to 1.12) and 1.07 (0.96 to 1.20), respectively. The reported reduction in the 30-day risk of the composite outcome in the subgroup of patients who previously had percutaneous coronary intervention persisted at 1 yr; the hazard ratio (95% CI) was 0.58 (0.35 to 0.95). Reduced risk in this subgroup was mainly due to a reduction in nonfatal myocardial infarction. (Summary: M. J. Avram. Image: J. P. Rathmell.)



839 Subomohyoid Anterior Suprascapular Block *versus* Interscalene Block for Arthroscopic Shoulder Surgery: A Multicenter Randomized Trial

The interscalene brachial plexus block is the pain relief standard for shoulder surgery but has undesirable respiratory side effects related to phrenic nerve block. The anterior suprascapular block is an indirect approach to block the superior trunk that is relatively far from the neck and phrenic nerve. The hypothesis that single injection anterior suprascapular block is noninferior to interscalene block for improving pain control after shoulder surgery was tested in 136 patients in a multicenter, randomized, blinded, placebo-controlled noninferiority clinical trial. All blocks were performed using 15 ml of 0.5% ropivacaine with epinephrine 1:200,000. The primary outcome was the area under the curve of the postoperative pain severity scores, measured at 0, 6,

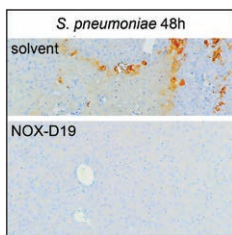
12, 18, and 24 h postoperatively. The areas under the curve for rest pain scores measured for 24 h postoperatively were 13.2 and 12.8 units over 24 h for the interscalene and suprascapular block groups, respectively. The mean difference (90% CI) of -0.3 (-0.8 to 0.2) was well above the noninferiority margin of -4.4 units, providing strong evidence of noninferiority. (Summary: M. J. Avram. Image: From original article.)



652 Pharmacokinetics and Pharmacodynamics of Remimazolam (CNS 7056) after Continuous Infusion in Healthy Male Volunteers: Part II. Pharmacodynamics of Electroencephalogram Effects

Remimazolam, an intravenously administered benzodiazepine, can produce deep sedation quickly from which the patient recovers rapidly due, in part, to its relatively high clearance by tissue esterases. Electroencephalogram measures with a significant correlation to sedation scales provide a continuous noninvasive method for quantifying central nervous system drug effects without the need to stimulate the patient. Twenty adult male volunteers received remimazolam as continuous intravenous infusion at 5 mg/min for 5 min, then 3 mg/min for 15 min, and 1 mg/min for 15 min. Electroencephalogram changes during remimazolam infusion

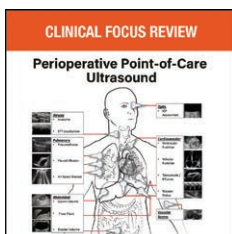
were characterized by an initial increase in the beta frequency band and a late increase in the delta frequency band. Beta ratio had a monotonic relationship to Modified Observer's Assessment of Alertness and Sedation (MOAA/S) scores and could be modeled using a standard sigmoid E_{\max} pharmacodynamic model. The standard sigmoid E_{\max} model failed to describe the time course of the Narcotrend Index appropriately; it was necessary to extend the model by adding a second sigmoid term with a second effect site concentration. (Summary: M. J. Avram. Image: From original article.)



795 Neutralizing Complement C5a Protects Mice with Pneumococcal Pulmonary Sepsis

Vascular hyperpermeability is the hallmark of acute respiratory failure in pneumonia. C5, a component of the complement system, is cleaved into C5a and C5b; C5a may be a driver of inflammation-related tissue injury and immunoparalysis in sepsis. The hypotheses that C5a concentrations are increased in pneumonia and that C5a neutralization by NOX-D19, an anti-C5a specific L-RNA-aptamer, promotes barrier stabilization in the lung and is protective in pneumococcal pulmonary sepsis were tested in a human clinical study and two mouse models, respectively. Hospitalized patients (N = 395) with pneumonia had higher serum C5a concentrations than controls (N = 24; difference [95% CI]: 1.4 [0.1 to 2.9] nmol/l).

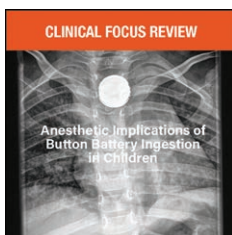
In mice with severe pneumococcal pneumonia and concomitant sepsis, pulmonary hyperpermeability was lower after treatment with NOX-D19 48 h after infection (difference [95% CI]: 1.90 [0.15 to 3.66]). Hyperpermeability was also lower in mechanically ventilated mice after NOX-D19 administration 23 h after infection (difference [95% CI]: 4.76 [1.22 to 8.30]). Mice treated with NOX-D19 had fewer clinical symptoms of severe disease. (Summary: M. J. Avram. Image: From original article.)



908 Perioperative Point-of-Care Ultrasound: From Concept to Application (Clinical Focus Review)

This Clinical Focus Review highlights the recent evidence on perioperative point-of-care ultrasound, with a focus on its application for the general anesthesiologist. Perioperative point-of-care ultrasound is useful for acute assessment of gross cardiovascular function as well as for assessment of causes of hemodynamic instability and shock; it provides several modalities to evaluate both static and dynamic markers of fluid status. It is useful for airway and pulmonary assessment, including identification of difficult airway and detection of the appropriate location of the endotracheal tube within the trachea as well as evaluation of mechanisms of hypoxia and distinguishing states of pulmonary reactivity from pulmonary parenchymal disease states. It can also be used to

evaluate free fluid within the abdomen and pelvis. Incorporation of perioperative point-of-care ultrasound training in anesthesiology residency and strategies for education and certification of the nontrainee are discussed. Finally, the complex subjects of reporting and billing for point-of-care ultrasound examinations are reviewed. (Summary: M. J. Avram. Image: From original article.)



917 Anesthetic Implications of Button Battery Ingestion in Children (Clinical Focus Review)

Despite numerous ongoing efforts to decrease the incidence of button battery ingestion and the associated complications, it remains a significant potential source of morbidity and mortality, especially in young children. Damage from lithium button batteries lodged in the esophagus results from the generation of electrical current, which produces hydroxide ions at the negative pole of the battery, leading to an increase in tissue pH. Damage to the esophageal mucosa from the generation of electrical current can result in long-term scarring and esophageal stricture formation while perforation of the esophagus can lead to pneumothorax, pneumomediastinum, mediastinitis, or tracheoesophageal fistula formation. The definitive management of a patient suspected to

have swallowed a button battery requires prompt recognition and endoscopic removal of battery, which often requires the use of general anesthesia. This Clinical Focus Review considers the potential complications associated with button battery ingestion that are of vital importance to practicing anesthesiologists and recommends solutions for those problems. (Summary: M. J. Avram. Image: From original article.)