

THIS MONTH IN ANESTHESIOLOGY



683 Burnout Rate and Risk Factors among Anesthesiologists in the United States

Burnout syndrome is a condition characterized by the dimensions of emotional exhaustion, depersonalization, and low sense of personal accomplishment. Burnout is more common in physicians than it is in the general population. It is linked to decreased quality of care, professionalism, patient safety, and physician quality of life. The hypothesis that certain workplace and personal demographic factors may be more associated with burnout symptoms in practicing anesthesiologists than others was tested by conducting a survey of 28,677 American Society of Anesthesiologists member attending anesthesiologists in the United States in March 2020. The effective response was 13.6%. On the basis of the Maslach Burnout Inventory Human Services Survey, the

fraction at high risk of burnout among anesthesiologists in the United States was 59.2% (2,307 of 3,898), and 13.8% (539 of 3,898) met criteria for burnout syndrome. Perceived lack of support at work and at home were most strongly associated with burnout syndrome on multivariable logistic regression modeling. Age was the only personal factor that was associated with burnout and burnout syndrome. See the accompanying Editorial on [page 673](#). (Summary: M. J. Avram. Image: A. Johnson, Vivo Visuals.)



697 Perioperative Methadone and Ketamine for Postoperative Pain Control in Spinal Surgical Patients: A Randomized, Double-blind, Placebo-controlled Trial

Patients undergoing spinal fusion surgery are at high risk for moderate-to-severe postoperative pain and associated complications. Intraoperative methadone administration to these patients has been reported to reduce postoperative opioid requirements and decrease postoperative pain scores. The hypothesis that adding ketamine to methadone will result in less hydromorphone use on the first postoperative day after spine surgery compared to methadone alone was tested in a randomized, placebo-controlled trial of 127 patients undergoing elective spinal fusion surgery. The intraoperative methadone dose was 0.2 mg/kg and ketamine

was administered at $0.3 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ intraoperatively and then $0.1 \text{ mg} \cdot \text{kg}^{-1} \cdot \text{h}^{-1}$ for the next 48 h (all doses were based on ideal body weight). Median (interquartile range) intravenous hydromorphone requirements in the methadone/ketamine group on the first postoperative day were 2.0 (1.0 to 3.0) mg, whereas those in the methadone group were 4.6 (3.2 to 6.6) mg, with a median difference (95% CI) of 2.5 (1.8 to 3.3) mg. Pain scores at rest, with coughing, and with movement were lower in the methadone/ketamine group. See the accompanying Editorial on [page 676](#). (Summary: M. J. Avram. Image: J. P. Rathmell.)



748 Changes in Respiratory Muscle Thickness during Mechanical Ventilation: Focus on Expiratory Muscles

Expiratory muscles play an important role in airway clearance, preventing atelectasis, and maintaining alveolar ventilation with high breathing effort. The first of two substudies tested the feasibility and reproducibility of expiratory muscle (*i.e.*, lateral abdominal wall muscles) ultrasound in 30 mechanically ventilated critically ill patients and assessed the effects of delivered tidal volume on expiratory muscle thickness in 10 patients. The second investigated the evolution of expiratory muscle thickness during the first week of mechanical ventilation in 77 critically ill patients. Ultrasound was found to be a highly reliable tool to assess expiratory muscle thickness. The mean \pm SD difference in expiratory muscle thickness measured at high and low lung volumes was $-0.5 \pm$

0.4 mm. Expiratory muscle atrophy developed in 22% of patients due to loss of muscle tissue while expiratory muscle thickness increased in 12% of patients due to increased thickness of the interparietal fasciae. Changes in the thickness of the expiratory muscles were not associated with changes in diaphragm muscle thickness. See the accompanying Editorial on [page 680](#). (Summary: M. J. Avram. Image: Adobe Stock.)



709 Supplemental Intraoperative Oxygen and Long-term Mortality: Subanalysis of a Multiple Crossover Cluster Trial

The theory that supplemental oxygen might reduce the risk of surgical wound infection has been tested for two decades. The second largest trial of supplemental oxygen found that while 80% inspired oxygen did not decrease the incidence of wound infections, it increased the hazard for mortality by 30% over a median of 2.3 postoperative years. The hypothesis that supplemental oxygen (80% vs. 30%) increases the risk of long-term mortality was tested in a *post hoc* analysis of a large, single-center multiple crossover cluster trial in which nearly 5,000 adults having colorectal surgery were allocated to receive either 30% or 80% inspired oxygen (FiO_2) during general anesthesia. The mortality rate of patients with a home address in Ohio after a median of 3 yr was

14% (276 of 1,971) in the 80% oxygen group and 15% (285 of 1,949) in the 30% oxygen group. The hazard ratio for mortality was 0.97 (95% CI, 0.82 to 1.15). (Summary: M. J. Avram. Image: J. P. Rathmell.)



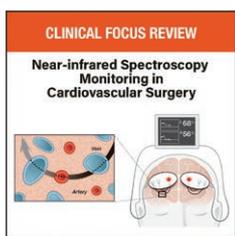
722 Posterior Quadratus Lumborum Block in Total Hip Arthroplasty: A Randomized Controlled Trial

Numerous analgesic techniques have been assessed for their ability to reduce opioid consumption after hip arthroplasty. The ultrasound-guided quadratus lumborum block is an interfascial plane block of the posterior abdominal wall. The three different approaches currently described are lateral, posterior, and anterior, referring to the needle tip position with respect to the quadratus lumborum muscle. The posterior block approach is more superficial with less motor blockade than the anterior approach. The hypothesis that a posterior quadratus lumborum block with ropivacaine in combination with multimodal analgesia will result in less morphine consumption after elective total hip arthroplasty was tested in a randomized, double-blind, placebo-controlled trial of 100 patients. The median (interquartile range) cumulative intravenous morphine consumption during the first 24 h after surgery was 13 (7 to 21) mg in the ropivacaine group and 16 (9 to 21) mg in the saline group and did not differ between the groups. Pain scores during the first 24 h after surgery did not differ between the groups. (Summary: M. J. Avram. Image: J. P. Rathmell.)



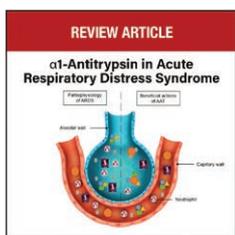
734 Neurons in the Nonhuman Primate Amygdala and Dorsal Anterior Cingulate Cortex Signal Aversive Memory Formation under Sedation

Anesthetics aim to prevent pain, distress, and memory of the unpleasant experience of a wide variety of medical procedures. However, anesthesia may be less effective in preventing implicit memory than it is in preventing explicit and contextual memory. The hypothesis that associations and memory formation may occur, at least partially, under sedation and anesthesia and that neural activity in the amygdala and the medial prefrontal cortex contributes to the acquisition of such memories was tested in two nonhuman primates while sedated or deeply anesthetized with midazolam or ketamine. A tone-odor aversive conditioning paradigm that relies on respiratory responses was used as the unconditioned response and the conditioned response. The retention of conditioned responses after recovery existed in 44% of all sessions under anesthetics, suggesting memory formation at all doses of both types of anesthetics. Changes in neural responses were recorded in the amygdala and dorsal anterior cingulate cortex that varied by the different behavioral outcomes and correlated with aversive stimulus association and successful memory formation. (Summary: M. J. Avram. Image: From original article.)



784 Clinical Applications of Near-infrared Spectroscopy Monitoring in Cardiovascular Surgery (Clinical Focus Review)

Superficial cerebral cortex oxygen saturation can be measured as the derived ratio of oxyhemoglobin concentration to total hemoglobin concentration using near-infrared spectroscopy because tissue, including bone, is transparent to light in the near-infrared spectrum. It is estimated that 85% of cerebral oximetry measurements are derived from the superficial cerebrum while 15% are from extracerebral tissue. Cerebral oximetry does not provide an absolute cerebral oxygen saturation measurement because of dynamic error in the measurements and wide interindividual steady-state variability. It should, therefore, be viewed as a trend monitor. As such, desaturation is often considered to exist when oxygen saturation has decreased more than 20% from baseline or has an absolute value of less than 50%. Proposed applications of cerebral oximetry monitoring of cardiac surgery patients include reducing the risk of neurologic complications. Although corrective interventions based on the information provided by the monitor may affect patient outcomes, there is insufficient evidence from randomized controlled trials to determine whether optimizing cerebral oxygen saturation during cardiac surgery can improve patient outcomes. (Summary: M. J. Avram. Image: From original article.)



792 α 1-Antitrypsin: Key Player or Bystander in Acute Respiratory Distress Syndrome? (Review Article)

Acute respiratory distress syndrome (ARDS) is characterized by hypoxemia, altered alveolar-capillary permeability, and a neutrophil-dominated inflammatory pulmonary edema. Neutrophil-driven inflammation and tissue damage are due in part to release of the protease neutrophil elastase, increased concentrations of which have been linked to the development of ARDS and the need for mechanical ventilation. A number of pharmacotherapies have been investigated for the treatment of ARDS, but none have shown significant efficacy. α 1-Antitrypsin (AAT) is an endogenous protease inhibitor, most notably of neutrophil elastase, and helps conserve the balance between levels of proteases and antiproteases in the lung. It is approved by the Food and Drug Administration as an AAT augmentation and maintenance therapy in patients with AAT deficiency and has been proposed as a novel treatment option for ARDS. In addition to binding and inactivating the tissue degrading enzyme neutrophil elastase *in vivo*, AAT has been reported to reduce inflammation, enhance bacterial clearance, improve epithelial cell disruption, and increase survival in preclinical models of pulmonary and nonpulmonary sepsis. (Summary: M. J. Avram. Image: J. P. Rathmell.)