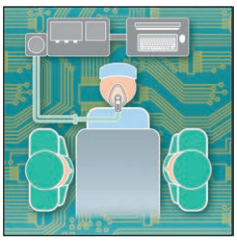
THIS MONTH IN
ANESTHESIOLOGY



253 Anesthetic Management Using Multiple Closed-loop Systems and Delayed Neurocognitive Recovery: A Randomized Controlled Trial

Many different intraoperative anesthetic factors, including inappropriate anesthetic depth, too much or too little intravascular volume replacement, and over-ventilation, may influence various postoperative patient outcomes. This randomized trial tested the hypothesis that closed-loop management of anesthetic depth, cardiac blood flow, and lung ventilation using three independent controllers would result in a smaller change of the cognition score (the 30-item Montreal Cognitive Assessment) from the preoperative period to the first week postsurgery than standard, manually adjusted anesthesia. The 87 nonfrail patients studied were at least 60 yr old and were undergoing moderate- and high-risk noncardiac surgery under total intravenous anesthesia. There was a significant difference in the decrease in the cognition score compared to baseline between the control group and the closed-loop group at 1 week postsurgery (median change [interquartile range]: –1 [–2 to 0] *vs.* 0 [–1 to 1]; median difference: 1 [95% CI, 0 to 3]). This effect persisted at 3 months postsurgery (median difference: 1 [95% CI, 0 to 2]). *See the accompanying Editorial on* **page 219.** *(Summary: M. J. Avram. Image: S. M. Jarret, M.F.A., C.M.I.)*

267 Timing of β-Blocker Reintroduction and the Occurrence of Postoperative Atrial Fibrillation after Cardiac Surgery: A Prospective Cohort Study

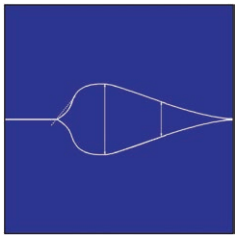
It is recommended that β-blockers be reintroduced as soon as possible after cardiac and noncardiac surgeries to attenuate deleterious effects of excessive postoperative sympathetic nervous system activation. The hypothesis that the effectiveness of β-blocker reintroduction in preventing transient postoperative atrial fibrillation may depend on the temporal relationship between β-blocker reintroduction and postoperative atrial fibrillation occurrence in the first 192 h after cardiac surgery was tested in a prospective cohort study of 663 patients. β-blockers were reintroduced to 532 (80.2%) patients during the first 192 postoperative hours. For the 551 (83.1%) patients who had β-blockers reintroduced during follow-up (day 30), the median duration before reintroduction was 49.5 h. The median time to occurrence of first postoperative atrial fibrillation or death (290 [44%] patients) was 60 h. Reintroduction of β-blockers was associated with a decreased risk of occurrence of postoperative atrial fibrillation at the 72-h landmark time (adjusted odds ratio [95% CI] = 0.58 [0.38 to 0.89]) but not at the 96-h landmark time. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*

291 Associations of Intraoperative Radial Arterial Systolic, Diastolic, Mean, and Pulse Pressures with Myocardial and Acute Kidney Injury after Noncardiac Surgery: A Retrospective Cohort Analysis

Systolic, diastolic, and mean arterial pressures as well as pulse pressure reflect distinct hemodynamic variables. This *post hoc* reanalysis of a large single-center retrospective cohort evaluated the strength of associations of intraoperative systolic, mean, diastolic, and pulse pressures with myocardial and kidney injury after noncardiac surgery in patients who had blood pressure recorded from a radial artery catheter. The incidences of myocardial and kidney injury in the 23,140 patients that met inclusion criteria were 6.1% and 8.2%, respectively. There were clinically meaningful associations between the lowest pressure sustained for 5 min and myocardial and kidney injury for each blood pressure component, with absolute population risk thresholds being roughly 90 mmHg for systolic, 65 mmHg for mean, 50 mmHg for diastolic, and 35 mmHg for pulse pressures. However, none of the blood pressure components added much to a multivariable model that included baseline risk factors. Therefore, baseline risk was a far better predictor of myocardial and renal injury than intraoperative blood pressure. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*

330 Postoperative Pain and Analgesic Requirements in the First Year after Intraoperative Methadone for Complex Spine and Cardiac Surgery

Preventive analgesia is any antinociceptive intervention used to block development of sustained pain throughout the perioperative period and inhibit central neuronal sensitization. The hypothesis that patients administered methadone would have fewer episodes of pain per week during the first postoperative year was tested in a follow-up study of patients who had participated in two clinical trials comparing pain scores and analgesic requirements in subjects randomized to receive either a single intravenous dose of methadone at induction of anesthesia or standard intraoperative opioids (hydromorphone in complex spine surgery patients and fentanyl in cardiac surgical patients). Respondents who underwent spine surgery and received intraoperative methadone reported fewer episodes of pain per week (median score less than once per week) 3 months after surgery than those given hydromorphone (median score daily). In subjects undergoing cardiac surgery, the frequency of episodes of pain per week at 1 month was less in patients given intraoperative methadone (median score less than once per week) than in those administered fentanyl (median score twice per week). *(Summary: M. J. Avram. Image: J. P. Rathmell.)*



280 Correlation of Thromboelastography with Apparent Rivaroxaban Concentration: Has Point-of-Care Testing Improved?

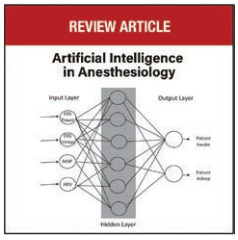
Rivaroxaban, a factor Xa inhibitor, is an alternative to vitamin K antagonists for the treatment of atrial fibrillation and thromboembolism. Reliable point-of-care testing would provide data to guide administration of agents to reverse the anticoagulant effects of rivaroxaban in high-acuity settings such as trauma. Thromboelastography is a point-of-care viscoelastic assay measuring all phases of clot formation that has been used as an alternative to standard coagulation assays for guiding postinjury resuscitation. The hypothesis that thromboelastography reaction time, the time from blood sample placement in the analyzer until the beginning of clot formation, would correlate with the degree of functional factor Xa impairment (apparent rivaroxaban concentration) was tested in 80 trauma patients with rivaroxaban use within 48 h of presentation to the emergency department. Patients taking rivaroxaban before sustaining an injury had elevated median reaction time on admission compared to controls, suggesting slower clot formation, although reaction time remained within the normal reference range for both cases and controls. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*

307 Static and Dynamic Transpulmonary Driving Pressures Affect Lung and Diaphragm Injury during Pressure-controlled *versus* Pressure-support Ventilation in Experimental Mild Lung Injury in Rats

Pressure-support ventilation has been recommended for use in mild acute respiratory distress syndrome. To mitigate ventilator-induced lung injury during pressure-support ventilation, tidal volume and transpulmonary driving pressure must be tightly controlled. The hypothesis that pressure-support and pressure-controlled ventilation at the same tidal volume and dynamic transpulmonary driving pressure would yield comparable lung damage was tested in male rats with mild lung injury induced by endotoxin instillation. At the same protective tidal volume, pressure-support ventilation resulted in higher dynamic transpulmonary driving pressure, similar static transpulmonary driving pressure, and lower airspace heterogeneity than pressure-controlled ventilation, with no significant differences in lung and diaphragm injury. However, when the same dynamic transpulmonary driving pressure achieved with pressure-support ventilation was used for pressure-controlled ventilation, with and without adjusted inspiratory time, it resulted in higher tidal volume and static transpulmonary driving pressure with greater lung and diaphragm injury compared to pressure-support ventilation. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*

225 Practice Advisory for the Perioperative Management of Patients with Cardiac Implantable Electronic Devices: Pacemakers and Implantable Cardioverter-Defibrillators 2020: An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Cardiac Implantable Electronic Devices (Practice Parameters)

This Practice Advisory updates the "Practice Advisory for the Perioperative Management of Patients with Cardiac Implantable Electronic Devices: Pacemakers and Implantable Cardioverter-Defibrillators. An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Management of Patients with Cardiac Implantable Electronic Devices," adopted by the American Society of Anesthesiologists in 2010 and published in 2011. The purposes of this advisory update are to facilitate safe and effective perioperative management of the patient with a cardiac implantable electronic device and reduce the incidence of adverse clinical outcomes. Advisory statements are provided on preoperative evaluation, preoperative preparation, intraoperative monitoring, and managing potential sources of electromagnetic interference. Statements are also provided on emergency external defibrillation or cardioversion and postoperative management. *(Summary: M. J. Avram. Image: J. P. Rathmell.)*



379 Artificial Intelligence in Anesthesiology: Current Techniques, Clinical Applications, and Limitations (Review Article)

The ability of artificial intelligence to sift through large amounts of data quickly and accurately and uncover correlations and patterns that are imperceptible to human cognition makes it a valuable tool for clinicians when it is deployed in the right situation to answer an appropriate question or solve an applicable problem. It has already been applied to various aspects of medicine, ranging from largely diagnostic applications to more therapeutic and interventional applications. This scoping review of the literature begins with an overview of machine learning and the types of learning algorithms as well as artificial intelligence techniques including neural networks and deep learning. It proceeds to review applications of artificial intelligence in anesthesiology, including depth of anesthesia monitoring, control of anesthesia delivery, event prediction, ultrasound guidance, pain management, and operating room logistics. The implications of artificial intelligence for practicing anesthesiologists are that it could provide them with clinical and procedural decision support that would enable them to provide the best possible evidence-based care to their patients. *(Summary: M. J. Avram. Image: From original article.)*

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