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# Table of Contents


16. Muravchick S, et al. Do All Anesthesiologists Have a “Sell By” Date?


Middle Tennessee School of Anesthesia, Nashville, TN. Email: jbaxter@mtsa.edu.

Abstracted by J Joyce, who has nothing to disclose.

**Objective:**

Recall three characteristics of cocaine metabolites, such as benzoylecgonine.

Cocaine is a commonly abused drug that may produce hypertension, myocardial infarction, cardiac ischemia, dysrhythmias, cardiac arrest, ischemic stroke, or hemorrhagic stroke. Typically, elective surgery for patients who test positive for cocaine is postponed because of the potential for hemodynamic instability and the associated complications. Recent evidence indicates that as many as 0.7% of the adult population in the United States abuse cocaine on a regular basis, yet standardization of care for patients who test positive for cocaine upon presentation for elective surgery does not exist.

This retrospective study investigated the risk for the occurrence of a hemodynamic event during elective surgical procedures in patients who tested positive for cocaine. The study cohort comprised 300 consecutive cases admitted to a Tennessee hospital between January, 2006 and March, 2010. The sample consisted of 150 cocaine-positive and 150 cocaine-negative patients; 44.7% of the cocaine-positive patients were female while 58.7% of the cocaine-negative patients were female.

The results of this study demonstrated that a positive test for cocaine was not predictive for a significantly greater incidence of intraoperative hemodynamic events compared to that for patients testing negative for cocaine. Additionally, the patients positive for cocaine were more likely to be administered vasopressors, even though this group of patients had fewer hypotensive episodes of clinical importance compared to the cocaine-negative patients. However, the explanation for this observation was not evident from this retrospective analysis; the authors speculate that anesthesia provider knowledge of the cocaine test results may have introduced a bias toward a lower threshold for vasopressor administration. The cocaine-positive patient was also significantly more likely to receive an intravenous (IV) antihypertensive agent than the negative patient—a not unexpected occurrence due to the potential vascular effects cocaine can produce: increased catecholamine release from presynaptic terminals, profound vasoconstriction and hypertension as the result of the catecholamine reuptake inhibition and reduced nitric oxide production. None of the study cohort experienced anesthesia complications or dysrhythmias.

**Important Points:**

The half-life for cocaine is between 60 to 90 minutes, it is rapidly metabolized and redistributed, and benzoylecgonine is the chief marker for detection via urinalysis. The metabolites of cocaine are inactive and do not cause hemodynamic instability, but those metabolites, specifically benzoylecgonine, can be detected in the urine for 14 days or more. Therefore, this prolonged period of detection may not be indicative of acute cocaine intoxication. Previous studies have suggested that disease(s) and/or mortality associated with cocaine may be more related to the development of pathophysiology from long-term use rather than overdose—suggestions that this study’s results support. The authors also suggest that the risk of an anesthesia-related complication or mortality has a low probability of changing based entirely on the results of a drug screening test.
**Objective:**
Recall the independent variables that are predictive of patients receiving perioperative blood transfusions.

Transfusion of blood and blood products has a long and somewhat checkered history. Modern medical practice has employed transfusions for approximately 100 years, based on the assumption of an empirical improvement of outcome for an anemic patient. While potential benefits from transfusions may be many, the benefits may be offset by the multiple significant transfusion-associated complications including transfusion-associated lung injury (TRALI), transfusion-associated immunomodulation, transfusion-associated circulatory overload (TACO), and cellular hypoxia. The short-term adverse events associated with transfusion, particularly in cardiac surgery patients, are a well-documented lot, but the long-term effects on the survival of this group of patients have not been substantially investigated. Cardiac surgical patients continue to constitute the highest subset of surgical patients receiving transfusions.

This study examined the effects of perioperative transfusion of packed red blood cells (PRBCs) on both short- and long-term survival following cardiac surgery. The data were collected from cardiac surgery and intensive care databases from January, 2002 through December, 2005. The study cohort totaled 5,342 patients: 2,329 patients received no transfusion (73.2% male, 19.8% female, 5.4% mortality) and 3,013 patients received PRBC transfusions (42.5% male, 57.6% female, 9.2% mortality).

**Important Points:**
The data from this study revealed that transfusion produces a significant risk to early, or short-term, postoperative survival as well as affecting long-term survival, even as far removed as affecting the five-year mortality. The patients not receiving transfusions demonstrated a decided survival advantage in the short- and long-term compared to patients who did receive transfusions. Long-term mortality is also affected by other risk factors, including advanced age, peripheral vascular disease, chronic obstructive pulmonary disease, and higher New York Heart Association functional classification.

The results of this study also confirmed the deleterious effects from transfusion following cardiac surgery that have been previously reported, including greater risk for nosocomial pneumonia, sternal wound infection, severe sepsis, and renal dysfunction. The study revealed the following independent variables were predictive of patients receiving perioperative blood transfusions: comorbidities, small body size, emergency surgery, repeat (redo) surgical procedures, complex surgery, preoperative anti-platelet medication, preoperative anti-thrombotic medication, on-pump surgery, advanced age, female gender, and low preoperative hematocrit. In addition, these data revealed a demonstrably higher 30-day and one year mortality in anemic patients who were transfused compared to those not transfused.

These data also raise questions as to the necessity of transfusion in stable patients who have “low” hemoglobin values. Overall, transfusion of blood and blood products following cardiac surgery continues to be used rather indiscriminately even though evidence from this, and multiple previous studies, has delineated detrimental and deleterious effects on long-term survival.
Objective:
State four demonstrated advantages of the ProSeal™ LMA over endotracheal intubation during laparoscopic gastric banding.

Obesity is increasing throughout the developed nations at a rapid rate and as a result, the anesthesia provider will be called upon to provide care for increasing numbers of obese patients for bariatric surgical procedures. Providing anesthesia care for the obese patient is made somewhat more difficult by the alterations in volumes of distribution and lipid-soluble drug dose requirements. The complexity of caring for the obese patient is also increased by the obesity-related comorbidities, including diabetes mellitus, hypertension, pulmonary hypertension, and obstructive sleep apnea. Obese patients’ catecholamines and cortisol levels are frequently elevated, which are significant contributors to associated vascular and metabolic abnormalities. The already increased catecholamine and cortisol levels may be compounded by tracheal intubation with potentially deleterious effects on both coronary circulation and cerebral circulation.

The classic laryngeal mask airway (cLMA) is known to attenuate these stress responses. The ProSeal™ LMA (PLMA) provides an outlet to afford gastric decompression and increasing the degree of protection against aspiration while providing higher sealing pressure in the oropharyngeal area. The cLMA has demonstrated benefits of improved postoperative lung function and pulse oximetry saturation for obese patients following some surgical procedures. The PLMA may afford benefits for obese patients compared to endotracheal intubation. This study was a double-blind, randomized examination comparing the effects of PLMA insertion and ventilation on arterial blood pressure and serum epinephrine as well as the consumption of muscle relaxants compared to endotracheal intubation in obese patients presenting for laparoscopic gastric banding. Reference serum catecholamine and cortisol concentrations were obtained from 15 healthy volunteers. The study cohort consisted of 70 obese patients with body mass index (BMI) ≥ 40 kg/m2 presenting for laparoscopic gastric banding (LGB). These patients were randomly assigned to be tracheally intubated (ETT) or receive the PLMA; these patients were 29% and 17%, respectively, male patients. No previous study has evaluated the effects of airway device on stress response of LGB patients and the development of immediate postoperative complications.

Important Points:
Patients demonstrated less hormonal and hemodynamic changes, as well as fewer hypoxic and postoperative nausea and vomiting episodes following surgery with the use of PLMA for airway management. The PLMA was found to produce less stress activation than ETT during both insertion and removal of the airway device. The reduced stress response during PLMA placement was not influenced by chronic β-blocker administration. Also, during this study, neither depth of anesthesia nor anesthetic drug doses were significantly different between ETT and PLMA groups, which also suggests a lack of involvement of the lesser magnitude stress responses associated with PLMA. The authors suggest the differentiation in stress response stimulation results from features of the individual device: particularly the laryngoscopy process which is exceptionally noxious producing a degree of trauma to the airway—a degree of trauma not introduced by placement of the PLMA. The data from this study demonstrated the greatest stress activation was found following ETT removal, which was not observed upon removal of the PLMA.

The authors found the PLMA to be similarly effective for provision of pressure-controlled ventilation compared to ETT with regard to tidal volumes, lower peak inspiratory pressure (PIP), and leak fraction (LF). PLMA was also found to result in less post-anesthesia respiratory function depression while also needing lower doses of muscle relaxants compared to ETT. The lower doses of muscle relaxants were the result of muscle relaxants being necessary solely for facilitation of the pneumoperitoneum rather than also being needed for maintaining optimal conditions for tracheal intubation and pneumoperitoneum. Finally, employing PLMA was associated with less postoperative coughing, PONV, sympathetic activation, bronchospasm, and desaturation.
Objective:
Recall the observed effect of midazolam premedication and/or propofol induction on the incidence of emergence agitation.

Emergence agitation (EA) is a post-anesthesia complication that is rather common in children, with reported incidences from 2% to 80%. EA may be quite disconcerting for anesthesia providers who do not consistently care for pediatric patients and can be especially anxiety producing for the parents of the child, particularly when they observe the motor agitation that may accompany EA. This paper presents a case report of a three-year old Caucasian child who underwent bilateral myringotomy with tubes under general anesthesia. The authors focused on describing EA, along with associated risk factors, prevention, and treatment, plus attempted to establish relationships between EA and other postoperative behavioral problems that may be observed in children.

Inhalational induction was accomplished in this pediatric patient using sevoflurane, 6%, in O2/N2O: 50%/50%. A peripheral IV was inserted following induction and the child received 1 microgram (mcg) of sufentanil along with 200 mg of paracetamol prior to the beginning of the surgical procedure. The procedure lasted for 10 minutes, with conduct of the general anesthesia via face mask. The child was admitted to the PACU while still sedated. Five minutes after admission, the child awoke in an agitated, inconsolable state, making no contact with the staff providing his care and quickly required physical restraint to prevent physical harm. An additional 1 mcg of sufentanil was administered, whereupon the agitation quickly terminated.

EA seems to be approaching an accepted “normal” consequence of anesthesia in pediatric patients. However, the significant risk for injury, the anxiety produced in parents and care-giving staff, and the potential psychological impact to the child, all indicate the need to better understand and prevent this complication. The true incidence of EA has yet to be determined, with the reported incidence of occurrence spanning a very broad range between 2% to 80%. The incidence of EA has been demonstrated to be more frequent when desflurane or sevoflurane are used; there is no consensus in diagnostic criteria for EA. EA is found most often in children in the preschool age range and is most frequently found following ophthalmologic and ENT surgical procedures.

Important Points:
The etiology of EA remains unknown. Potential etiologies have been proposed, including: 1) late emergence of cognitive function relative to other brain functions, supported by the greater observed incidences since the introduction of sevoflurane and desflurane into clinical practice; 2) rapidity of emergence—an inconsistent observation; 3) specific pharmacologic properties of sevoflurane and desflurane may produce differential recovery of brain functions; 4) prevention of postoperative pain—regionally or systemically—is associated with a lesser incidence of EA; and 5) the immaturity of the nervous system of preschool age children may be a significant contributor to the incidence of EA due to their inability to adapt and cope with perioperative stress and anxiety.

Prevention of EA can be attempted by pharmacologic and non-pharmacologic means. Pharmacological prevention of EA involves administration of sedatives and/or analgesics, either systemically or regionally, and may include: intravenous propofol near the completion of the surgery, intraoperative fentanyl, use of ketamine, clonidine, dexmedetomidine or hydroxyzine-midazolam mixtures. Interestingly, neither premedication with midazolam nor propofol bolus induction reduced the incidence of EA, both speculated to be due to the short elimination half-life of each agent. On the other hand, premedication with clonidine or melatonin are associated with a decrease in the incidence of EA. Non-pharmacological prevention strategies center on reduction of preoperative anxiety. These strategies include: quiet induction with minimal sensory stimuli, music therapy, distraction/hypnosis, clown doctors, acupressure, informational videos, and parental information sessions.
Objective: Review five benefits derived from systemic administration of lidocaine in the ambulatory surgical setting.

Postoperative pain may contribute to delayed patient recovery following surgery and the management of postoperative pain following ambulatory surgery has been historically poorly managed. Multimodal analgesia has been utilized with increasing frequency to improve postoperative pain management while decreasing opioid-induced adverse events/side effects following ambulatory surgery. Postoperative pain has been reduced using systemic lidocaine, which has also produced a reduction in opioid consumption in the PACU. The study in which the reduced opioid consumption in the PACU was reported did not find a beneficial effect with regard to earlier hospital discharge or reduced opioid consumption following discharge. An important question remains as to whether the analgesic properties produced by systemic lidocaine, perioperatively, yields any improvement in the quality of a patient’s recovery following ambulatory surgery.

This study attempted to determine whether perioperative systemic lidocaine produces improved quality of patient recovery following ambulatory surgery, while also evaluating analgesic properties that systemic lidocaine may produce in the ambulatory setting. Sixty-three healthy female patients presenting for outpatient laparoscopic gynecological procedures were included in this prospective, randomized, double-blind, placebo-controlled study. The patients were randomly assigned to the lidocaine group, who received a 1.5 mg/kg bolus dose of lidocaine followed by a continuous infusion at 2 mg/kg/hour until completion of the surgery, or to the control group, who received the equivalent volume of saline as that received by patients in the study group.

Important Points: The data obtained in this study demonstrated a decided improvement in the quality of postoperative recovery for the patients in the lidocaine group: these patients demonstrated an improved global quality of recovery score and higher scores in physical independence, comfort, and pain subcomponents. The patients in the study group demonstrated a 23% improvement in global quality of recovery scores compared to the placebo group. Additionally, patients receiving lidocaine were the beneficiaries of significant opioid-sparing properties and better analgesia that aided their post-discharge recovery to produce the improved quality of recovery. The patients in the lidocaine group also were aided by receiving doses of nonsteroidal anti-inflammatory drugs on a fixed administration schedule.

The patients in the lidocaine group were observed to consume less opioids following discharge from the hospital—it was these patients who reported a better postoperative quality of recovery. As an additional benefit observed, a 26 minute reduction in time to hospital discharge was found in the lidocaine group; this may be of greater importance for patients in an ambulatory setting. Neither neurological nor cardiovascular side effects were found in any patient in the lidocaine group.
Objective:
Relate the potential outcome of aggressive glycemic management in a poorly controlled diabetic patient or a diabetic patient scheduled for a short duration surgical procedure.

Glycemic control perioperatively in diabetic patients is an important yet challenging undertaking. Diabetic patients under general anesthesia may experience hypoglycemia but the signs and symptoms that would normally indicate hypoglycemia are easily masked. Current practice has trended toward avoidance of hypoglycemia in the preoperative fasting period by reduction in the patient’s medication(s), if not omission.

The response to glucagon may be increased while resistance to insulin may be produced by surgical stress. In addition, secretion of endogenous insulin has been shown to be depressed in the presence of isoflurane or sevoflurane and there is a more lengthy disappearance of serum glucose but the mechanism for these effects has yet to be elucidated. Similarly, insulin sensitivity is quite individual in nature, thus the end result for glucose lowering by exogenous insulin is not easily predicted. Hyperglycemia is associated with greater risk of morbidity and mortality. Hypoglycemia is associated with greater hospital costs, increased possibility for the patient to be discharged to a skilled nursing facility, longer hospital stays, as well as greater mortality rates. In severe manifestations, hypoglycemia may contribute to poorer outcomes, increased vulnerability to poor outcomes, and may be a marker for poor outcomes.

This study compared the incidences of hypoglycemia, in the perioperative period, in patients found to have low-normal glucose to those receiving insulin to treat preoperative hyperglycemia. Hypoglycemia was defined as serum glucose <70 mg/dL; low-normal glucose was defined as being in the range of 70-89 mg/dL; hyperglycemia was defined as ≥249 mg/dL for this study.

A total of 587 individuals of whom 308 patients constituted the low-normal group (53.9% male), and 279 patients in the hyperglycemia-treated group (50.9% male).

Important Points:
In this study, patients in the low normal glucose group demonstrated a significantly higher incidence of hypoglycemic episodes perioperatively. For patients who presented with a low normal glucose when tested in the preoperative area, nearly one in six patients (53 of 308) experienced a clinically defined hypoglycemic episode while 10 out of 279 in the hyperglycemia-treated group experienced clinically defined hypoglycemia. Severe hypoglycemia, defined as < 50 g/dL, occurred in only six out of 579 patients in the entire study. Of those six severely hypoglycemic patients, 100% were from the hyperglycemia-treated group. Hypoglycemia in the perioperative period may occur when the exogenous basal insulin dose administered exceeds the basal requirements.

The six cases of severe hypoglycemia occurred in patients who had received rapid-acting or short-acting insulin within six hours of the hypoglycemic event. When serum glucose is rapidly lowered, counter regulatory hormones may be released, which may contribute to wide variability in glycemic control. Such glycemic variability has been linked to increased oxidative stress and mortality among critically ill patients. Thus, it may be hazardous to aggressively manage poorly controlled diabetic patients and/or any diabetic patient slated to undergo surgical procedures that are of short duration because the ensuing hypoglycemia may prove more detrimental than perioperative hyperglycemia.
Objective:
Describe the surprising observed effect gleaned from the low-dose vasopressin infusion following cardiopulmonary bypass.

Patients undergoing cardiac surgery who have ventricular dysfunction and/or pulmonary hypertension may have a greater incidence of morbidity and mortality. Poor left ventricular function may result in persistent hypotension, a life-threatening entity that may be resistant to management by fluids, inotropic agents, or vasopressor catecholamines. Intraoperative catecholamine administration may complicate cardiovascular stability by production of dysrhythmias. Vasopressin has demonstrated greater effectiveness than catecholamines in certain instances, particularly where minimal responsiveness to catecholamines has occurred. Frequently, however, vasopressin is employed as a last resort. Vasopressin can increase mean arterial pressure (MAP) while reducing the amount of norepinephrine needed to maintain nominal blood pressure.

This study investigated the effects of low-dose vasopressin administered to patients with pre-existing mild to moderate systolic dysfunction who were having CABG, to determine if vasopressin administration resulted in a sustained cardiac function improvement. Twenty patients were enrolled in the study from January, 2007 through December, 2007. The patients were randomly assigned to receive low-dose vasopressin, 0.03 IU/minute, or placebo for 60 minutes following CABG; the vasopressin group was 50% male while the placebo group was 60% male. The study tracked heart rate (HR), central venous pressure (CVP), mean arterial pressure (MAP), and pulmonary artery systolic pressure (PASP), along with employing transesophageal echocardiography TEE to determine cardiac output (CO), cardiac index (CI), stroke volume index (SVI), and systemic vascular resistance index (SVRI). Past studies have indicated the effectiveness of vasopressin administration in the restoration of vascular tone for patients taken off cardiopulmonary bypass (CPB), particularly those patients refractory to the actions of norepinephrine. Previous investigations have also disclosed the importance of vasopressin to the maintenance of vascular tone following CPB, demonstrating vasopressin deficiency to be contributory to vasodilatory shock. Administration of a low-dose vasopressin was shown to yield significant improvement in hemodynamics for instances of vasodilatory shock.

Important Points:
The data obtained in this investigation demonstrated an increase in CI that was determined to result from changes in preload, afterload, and increased myocardial contractility. In the vasopressin group, myocardial performance was improved as the result of increased intramyocardial calcium concentrations, which yielded coronary artery vasodilation, along with an increase in the myocardial blood flow produced by the elevation in systemic perfusion pressure.

A significant advantage for the use of vasopressin was the increased vascular tone produced that was achieved without production of potentially detrimental vasoconstriction in either coronary or cerebral circulations. Additionally, the vasopressin infusion produced protective effects on the kidneys while yielding higher blood flow to vital organs and greater cerebral oxygen delivery than would be found with the administration of epinephrine. A rather surprising finding was the increased urine output in the vasopressin group that came from the improved glomerular filtration rate that resulted from the increased MAP. The ejection fraction (EF) was significantly improved by the vasopressin infusion as were CO, CI, fractional area of contraction (FAC), and SVRI.
Objective: Recall the reported bias by academic anesthesiology chairpersons in case assignments for older anesthesiologists.

A physician is deemed “an older physician” at the age of 55 years by both the American Medical Association (AMA) and the American Society of Anesthesiologists (ASA). Since 1998, the ratio of physicians ≥55 years of age to those ≤54 years has steadily risen. As of 2010, almost 50% of all physicians in practice were 55 years of age or greater. Likewise, the proportion of older anesthesiologists has steadily grown: in 1994, 23% were 55 years or older; in 2009 that had increased to 28%; by March, 2011, that percentage stood at 31.5%. Reduced stamina, loss of hearing, slower reaction times, reduced multitasking capability, cognitive impairment, short-term memory impairment, and diminution of fine motor skills are concerns that surround the older anesthesiologist.

This study surveyed academic anesthesia department chairs via an ASA email to determine: 1) the proportion of academic anesthesia departments that have in place policies specific to the older anesthesiologist and what their policies address; 2) investigate whether operations in departments with specific policies differ from those that do not have specific policies; 3) whether there are any screening procedures of older anesthesiologists for any manner of impairment in academic centers; and 4) whether academic departments provide older anesthesiologists roles outside of clinical responsibilities.

This study’s survey was an anonymous, web-based questionnaire conducted in September, 2010. A total of 129 academic chairs received the email invitation, to which 66 (51%) responded. The responses that were received demonstrated no real consistency among academic departments regarding the definition of or policies about older anesthesiologists. Interestingly, the definition of an older anesthesiologist, from a majority of respondents, was set at 60 years or greater. More than 90% of the chairs who responded indicated that their department had neither a mandatory retirement age nor did they place limitations on the number of hours the older anesthesiologist was permitted to work. Anesthesiologists are often compared to airline pilots for which stringent policies are in place regarding performance, and mandatory retirement age. Should similar policies be put in place in anesthesia, a large majority of the academic programs would be significantly impacted. Currently, fewer than half of the respondents in this survey reported a relationship between call policies and anesthesiologist age.

Important Points: An important question or concern involves both the number and complexity of cases in which older anesthesiologists are involved. Of the survey respondents, 53% report assigning older anesthesiologists to less complex procedures. By doing so, these departments may be depicting a belief that the older anesthesiologist may no longer possess the proficiency to appropriately or adequately conduct the anesthesia for more complex and/or demanding cases as well as an unspoken intent not to place the older anesthesiologist in undue physical or emotional stress.

The vast majority of the respondents reported that critical incidents and errors—whether technical or judgment in origin—are tracked and many also track other problem behaviors, but very few departments employ formal assessment tools to monitor ongoing clinical competence. There were no instances where respondents reported specifically tracking problem behaviors in older anesthesiologists. Anesthesiologist age plus the number of years since completing residency were associated with a loss of proficiency.
Objective:
Recall three mechanisms by which a lidocaine infusion may reduce postoperative bowel dysfunction.

Acute postoperative pain and postoperative ileus (POI) occur frequently in patients following abdominal surgery. Acute postoperative pain may be effectively treated with analgesics but there are a multitude of unwanted side effects, including contributing to POI. A long-known medication that can provide analgesia before, during, and after surgery is the amide local anesthetic, lidocaine. Lidocaine works by blocking sodium channels while also producing inhibitory effects on neuropeptide chemical mediators, which may influence pain and its perception and may inhibit systemic inflammatory responses to surgical stress. Blockade of that inflammatory response may contribute to preservation of bowel motility. Suggestions have recently been proposed that lidocaine may aid in preserving gastrointestinal motility.

This study measured the effect of the initiation of a continuous infusion of lidocaine prior to surgical incision with continuation of the infusion until just prior to skin closure on postoperative pain, analgesic requirements, and what effect the infusion may have on the occurrence of POI in patients having laparoscopic gynecological procedures. The sample of this study included 50 women of ASA physical status I or II, 18 years of age or greater, presenting for laparoscopic gynecological surgical procedures under general anesthesia. The study’s data appear to indicate that administration of a continuous infusion of lidocaine may result in improvement in postoperative analgesia, decreased postoperative analgesic/opioid requirements, and contribute to a more rapid return to patients’ first flatus. Intravenous lidocaine is easily administered, economical, and safe. The average duration of the lidocaine infusion in this study was 57 minutes.

Important Points:
The continuous infusion of lidocaine demonstrated the ability to reduce postoperative bowel dysfunction. This study suggests four mechanisms: 1) reduction of postoperative pain, reduces postoperative opioid requirements, and subsequently reduce the adverse effects on colonic motility due to opioids; 2) lidocaine has demonstrated an excitatory effect on gastrointestinal smooth muscle; 3) the inhibitory reflexes found in the walls of the intestines that contribute to the reduction of gastrointestinal motility are blocked by the continuous lidocaine infusion; and finally, 4) intravenously administered lidocaine may possess anti-inflammatory properties that allow it to oppose the inflammatory effects that are produced by histamine, prostaglandins, and kinins, whose actions result in the decrease in gastrointestinal motility.
Objective:
Measure the effectiveness of dexamethasone on postoperative nausea and vomiting and pain following pediatric tonsillectomy.

About 14% of children are readmitted to the hospital after tonsillectomy (TON) due to postoperative nausea and vomiting (PONV) and/or pain. This study evaluated the efficacy of dexamethasone (DEX) 0.15 or 0.5 mg/kg vs. placebo on the incidence of PONV and pain intensity after elective TON.

A total of 648 children underwent TON with or without adenoidectomy from September 2005 to June 2010; 134 were included in the analysis. Demographics were similar between the three groups. Discharge times were not significantly different.

PONV was significantly less in both DEX groups vs. placebo (P<0.01) up to two days postoperatively; significantly fewer DEX patients required rescue antiemetics (P=0.005). No significant difference was seen in the doses of analgesics between groups. Postoperative oral analgesics after discharge from PACU were requested earlier with placebo (P=0.017). Significant pain did not differ between groups during hospitalization but was significantly less on postoperative Day 2 with the DEX groups (no difference between DEX groups).

Important Points:
A single dose of DEX reduced the incidence of early and late PONV and pain severity on postoperative Day 2. A dose of DEX 0.15 mg/kg appeared to be as effective as a dose of 0.5 mg/kg.
Objective: Discuss and evaluate the anesthetic management of a patient with an implanted left ventricular assist device (LVAD) undergoing a laparoscopic gastric bypass.

In addition to prolongation of life and improved quality of life for the patients, LVADs have become an important tool used to allow end-stage heart failure patients a bridge to transplant, allowing patients in acute cardiogenic shock time to recover and offer a potential alternative to heart transplant. A 38-year-old man developed nonischemic cardiomyopathy at the age of 30, progressed to class IV CHF (congestive heart failure) requiring home inotropic support and eventually underwent LVAD implantation. His CHF symptoms decreased but morbid obesity made him ineligible for heart transplant so he was scheduled for laparoscopic Roux-en-Y gastric bypass surgery 1.5 years after LVAD. Comorbidities included hypertension, obstructive sleep apnea requiring nightly continuous positive airway pressure, type –II diabetes mellitus, a history of pulmonary embolism, and a chronic LVAD driveline infection. Three years earlier, because of heart failure, a biventricular pacemaker defibrillator was implanted. The Heartmate II LVAD (small electric rotary pump providing nonpulsatile flow up to 10 L/min) is implanted extraperitoneally in the left upper abdomen, draining blood from the left ventricle and propelling it into the ascending aorta via a polyester tube graft. A “driveline” typically transverses the upper abdomen and exits the skin in the right upper quadrant to provide electrical power to and control of the device. In Heartmate II patients perioperative concerns for abdominal surgery include avoiding surgical trauma to the device/driveline and electromagnetic interference (EMI), which can occur with electrocautery. EMI can possibly affect implantable defibrillators (ICDs) and LVADs possibly leading to initiation of antitachycardia pacing or delivery of a counter shock. It has been reported to affect some pumps’ output and timing circuits so it is essential a member of the care team know the device and be familiar with its programming. Care should be taken with return electrode placement to direct current away from the device generator and bipolar cautery should be used if possible. It is recommended that, if on warfarin for long-term anticoagulation, the warfarin be converted to intravenous heparin before surgery; the heparin be paused during surgery and resumed postoperatively once bleeding concerns are passed. The LVAD cannot adjust output in response to hemodynamic or metabolic changes. Loss of intravascular volume, drug-induced venodilation and reverse Trendelenberg position decrease preload and pump flow. Sympathetic responses to laryngoscopy and surgical stimuli will increase afterload and reduce LVAD output. Anesthetic management must be tailored to address these issues, blunt the sympathetic response to noxious stimuli and maintain intravascular volume by vigilance, anticipation and communication. Drugs with negative inotropic effects such as potent inhalation anesthetics, must be used with caution. Hypoxia, hypercarbia, and acidosis must be avoided. Normocarbia maintenance requires the use of a ventilator with the ability to deliver large minute ventilation at relatively high pressures. Laparoscopic gastric bypass requires steep head-up positioning which significantly improves pulmonary compliance by moving weight of abdominal contents and pannus away from the diaphragm. Hydrodynamic issues were addressed by maintaining anesthesia partially with a remifentanil infusion to blunt sympathetic responses to surgery but allow rapid return of respiratory drive and sufficient arousal to main maintain a patient airway soon after surgery. Intravenous milrinone was used as a prophylaxis against adverse changes in pulmonary vascular resistance and right ventricular dysfunction. Intravenous fluids were used to augment the preload to counter negative effects of systemic venodilation caused by milrinone, general anesthesia, and positioning. An arterial catheter and pulmonary catheter allowed invasive hemodynamic monitoring and rapid response to changes in position, stimulation and cardiac output. Important Points: Despite the many challenges presented to the anesthesia team, the excellent outcome was the result of extensive preoperative preparation, the intraoperative use of appropriate monitoring and pharmacologic agents, a clear understanding of the physiologic changes associated with the LVAD and laparoscopic surgery, dedicated VAD personnel, and continuous communication.


Department of Anesthesiology and Pain Medicine, Seoul National University Bundang Hospital, 166, Gumi-ro, Seongnam-si, Gyeonggi-do, Republic of Korea. E-mail: shdo@snu.as.kr.

Abstracted by T Tilton, who has nothing to disclose.

**Objective:**
Determine the effects of valproic acid and magnesium sulphate on non-depolarizing neuromuscular blocking drug requirements during craniotomy.

Valproic acid (VPA) may induce resistance to non-depolarizing neuromuscular blocking agents (NDMR), while magnesium sulphate (MgSO$_4$) is known to potentiate the effects of NDMR. In a double-blind, randomized, controlled trial, the authors tested the hypothesis that the use of MgSO$_4$ would reduce NDMR dose requirements in patients given VPA.

The study included patients age 18-65 years undergoing elective craniotomy. Excluded were patients with: BMI<18.5 or >24.9 kg m$^{-2}$; neuromuscular, renal, cardiovascular, or hepatic insufficiency; Glasgow Coma Scale (GCS) <15; use of medications that influence NDMR; and/or preoperative epilepsy.

Patients were divided into three groups: Group VM, Group VC, and Group C. Patients in these groups randomly received: VPA premedication (IV 1200 mg nine hours and 600 mg two hours before surgery) and MgSO$_4$ infusion (Group VM); VPA premedication and No MgSO$_4$ (Group VC) or No VPA/No MgSO$_4$ (Group C). Total intravenous anesthesia with propofol and remifentanil was administered and NM monitoring established. Rocuronium (ROC, 0.6 mg/kg) was given and MgSO$_4$ started (50 mg/kg over 10 minutes as a bolus and a continuous infusion at 15 mg/kg/h). Groups VC and C received an infusion of 0.9% saline; ROC 0.15 mg/kg was repeated for a train of four of two.

Total ROC dose (mg/kg/hr) was significantly higher in Group VC vs. Groups VM/C: 0.47 (SD 0.08) vs. 0.31 (0.07)/0.33 (0.12); and more frequently repeated (minute) 24 (4) vs. 36 (13)/39 (13), respectively (both P<0.001). No significant differences were found with respect to extubation times or postoperative mean arterial pressure (MAP), GCS at 6 hour postoperatively; or the incidence of nausea, vomiting, shivering, or use of anti-emetics. Heart rate was significantly lower in the Group VM vs. Group VC (P=0.02).

Significantly more patients with Group C and Group VC required nicardipine use (to maintain MAP at 80-120% of baseline) and at higher doses than Group VM (incidence/dose): 10 (63%)/0.8 (0-6.4) mg, 13 (65%)/1 (0-9.4) mg, and 6 (33%)/0 (0-1.4) mg, respectively. No MgSO$_4$-related side effects were seen in the Group VM.

**Important Points:**
The administration of VPA increased intraoperative ROC requirements during total intravenous anesthesia that was attenuated with an intraoperative infusion of MgSO$_4$.


Service d’Anesthesie et de Reanimation Chirurgicale, Hotel-Dieu Hopital Mere Enfant, Place Alexis Ricordeau, Nantes, F-44000 France. E-mail: Corinne.lejus@chu-nantes.fr.

Abstracted by T Tilton, who has nothing to disclose.

**Objective:**
Identify risk factors for perioperative transfusions in elderly patients undergoing hip fracture surgery and receiving low-molecular-weight heparin.

The incidence of hip fracture surgeries will likely double by 2050 due to an aging population. Six-month mortality is reported as 13-18% possibly due to pulmonary embolism, anemia, age, transfusions, or renal impairment. In a retrospective study, the authors sought to define risk factors of allogeneic erythrocyte transfusion with packed red blood cells (PRBC) in patients >65 years.

This study included patients >65 years admitted with a primary hip fracture. Excluded were patients with multiple trauma, pathological fracture or taking prophylactic anticoagulation regimens other than low-molecular-weight heparin (LMWH). French transfusion criteria were followed: PRBC given intra- and postoperatively for hemoglobin (Hb) <10g/dL. Creatinine clearance (CrCl) was calculated using the Cockcroft-Gault (CG) formula and the Modification of Diet in Renal Disease (MDRD) equation.

During the 12 month study period, 413 of 488 patients were included. The calculated median CrCl was 46 (34-61 mL/minute): 61 patients (14.8%) had severe renal impairment (RI; CrCl <30) and 235 (56.9%) had moderate RI (CrCl 30-59).

A total of 74.8% received preoperative thromboprophylaxis; and 18.2% had analgesic traction. Median time between admission and surgery was 39 (24-62) hrs; 55% had surgery within 48 hrs and 88% within 72 hours. Fractures were cervical (49.2%), intertrochanteric (46%), or with trochanteric extension (4.8%).

All patients received LMWH (4000 units as sodium enoxaparin) within eight hours of surgery.

Procedures performed were osteosynthesis (58.8%), cervicocephalic arthroplasty (39.5%), or total hip (1.7%); cement was used in 25.2%; and surgical drainage was placed in 60.8%. Anesthesia technique was: general alone or combined with femoral block (FB) in 54.7% and 19.9%, respectively; spinal and FB in 24.2%; or spinal alone in 1.2%.

On postoperative Day 3, one-third of the patients were able to stand; 0.97% had a deep vein thrombosis; and 0.73% had a pulmonary embolism. Median hospital stay was 9 (7-11) days. Patients were discharged to a rehabilitation center (67.2%), a nursing home (31.1%), or home (1.7%).

Mean preoperative Hb was 12.6 ± 1.6; 72.1% had Hb >12. Two hundred eighty-six patients (69.3%) received allogeneic erythrocyte transfusion (median PRBC 2, range 2-3). Preoperatively, one patient received fresh frozen plasma, two received platelet concentrates and 22 received vitamin K.

Using the CG formula, multivariate analysis showed independent risk factors for perioperative transfusion were preoperative Hb >12, hip fracture with trochanteric extension, moderate or severe renal impairment (RI). With the MDRD equation, independent risk factors were low body weight, preoperative Hb <12, fracture with trochanteric extension and moderate RI.

**Important Points:**
Both CG and MDRD formulas showed >50% of patients >65 yrs had moderate RI making the use of LMWH potentially problematic. Use of the CG and MDRD formulas to calculate CrCl preoperatively may be useful in identifying patients with moderate RI and therefore at increased risk for transfusion.


Service de reanimation medicale, Centre Hospitalier Universitaire de Bicetre, 78, rue du General Leclerc, 94 270 Le Kremlin-Bicetre, France. E-mail: xavier.monnet@bct.aphp.fr.

Abstracted by T Tilton, who has nothing to disclose.

**Objective:**

Compare fluid responsiveness in critically-ill patients measuring invasive and non-invasive parameters.

Assessing fluid responsiveness (FR) in critically-ill patients can be challenging. The authors compared the ability of arterial pulse pressure variation (PPV) to predict FR with invasive PPV, respiratory variation of pulse contour-derived stroke volume, and changes in cardiac index (CI) induced by passive leg raising (PLR) and end-expiratory occlusion tests (EEO). PPV was measured using non-invasive infrared plethysmography (PPVni).

The study’s inclusion criteria were patients with acute circulatory failure and inadequate tissue perfusion defined as: systolic arterial pressure <90 mmHg (or decrease >50 in hypertensive patients or need for norepinephrine); urine output <0.5 ml/kg for at least two hours; tachycardia >100 bpm; skin mottling; or blood lactate >2 mmol/L and being treated with fluids. Excluded were patients with cardiac arrhythmias, spontaneous ventilator triggering and obvious hydrostatic pulmonary edema.

All patients were monitored with a continuous non-invasive arterial pressure (APni), an internal jugular vein catheter, and a thermistor-tipped femoral artery catheter [to measure invasive arterial pressure (API)]. Baseline measurements of heart rate, API, APni, CI, and global end-diastolic volume (GEDV) were made followed by PLR and EEO tests (description in text). Volume expansion with 500 ml of 0.9% saline over 30 minutes was infused immediately and measurements repeated. Patients with 15% increase in CI were defined as ‘volume responders’ (VR) and others as ‘non-volume responders’ (NVR).

A total of 47 patients began the study, eight (17%) were excluded because the arterial curve was unobtainable for APni due to severe skin hypoperfusion. Mean API is these patients was 45 (SD 10) mmHg and they received a dose of norepinephrine 5.1 g/kg/min (25-75% IQR: 3.1-6.3). Seventeen patients were VR.

A total of 195 pairs of API and APni measurements were made: mean values were significantly correlated (r=0.81, P<0.001); bias was 5 (11) mmHg; and the percentage error 29%. PLR and post-fluid changes in mean APni were significantly correlated (r=0.69, P<0.001) as were PPVni and PPVi (r=0.88, P<0.001) with a bias of -0.6% (2.3) and percentage error 46%.

PPni 11% had a sensitivity of 82% (95% CI, 57-96%) and specificity of 91% (71-99%) which predicted a positive response to FR. PPVi predicted a positive response to FR with 88% (64-98%) and 91% (71-99%) values, respectively. False negatives for PPVni and PPVi was seen with two patients who both had low respiratory compliance. VR had high sensitivity and specificity values with PLR and EEO.

**Important Points:**

PPVni compared accurately with PPVi. The predicted value of PLR and EEO tests were also excellent predictors of VR.


Department of Anaesthesia, Royal Infirmary of Edinburgh, Old Dalkeith Road, Edinburgh DH16 4SA. UK.
E-mail: gary.morrison1@nhs.net.

Abstracted by T Tilton, who has nothing to disclose.

**Objective:**
Describe the use of fibrinogen concentrate as a replacement for fresh frozen plasma in patients undergoing type IV aortic aneurysm repair.

Repair of a type IV thoracoabdominal aortic aneurysm (TAA) often results in large blood loss requiring infusions of replacement blood products. In many European Union countries, the use of fresh frozen plasma (FFP) has stopped due to concerns about variant Creutzfeldt-Jakob disease. In place of FFP, fibrinogen concentrate (FC, purified, virus-inactivated, plasma-derived product) is being administered. FC has a lower risk of infection transmission, does not have to be matched to a patient’s ABO group, and may be stored at room temperature. The authors present three cases of patients undergoing repair of TAA who received continuous infusions of FC.

All patients (70, 71, 70 years), had the same anesthetic (general with epidural) and surgical management. Patients were cooled to a core temperature of 32-33°C and heparin 5000 u given before aortic cross clamping; red blood cell salvage was used. Coagulation was assessed every 30 min using ROTEM, EXTEM, and FIB-TEM MCF (maximum clot firmness) assays; a full blood count, prothrombin time (PT), activated partial thromboplastin (APTT) and FC was measured at surgery’s end and daily in the ICU.

Restoration/maintenance of FIB-TEM MCF within normal range (9-25 mm) was the goal. Starting FC infusion rates (1-10 g/hr) were based on clinical experience and adjusted as needed according to FIB-TEM results and the clinical situation. Severe thrombocytopenia was treated with a platelet infusion.

Intraoperative blood loss (ml) for each patient (1/2/3) was 10,070/11,000/7300; returned salvage blood was 2581/3400/3793; FC given (g) 16/12/12; RBCs given 6/5/6; platelets given (units) 2/2/3; respectively; no FFP or cryoprecipitate was given. Surgeons judged all patients with satisfactory coagulation.

Patient 1 was treated for a lower respiratory infection and discharged on postoperative day (POD) 10; patient 2 sustained an acute kidney injury that improved without replacement renal therapy and was discharged on POD 14, and patient 3 was discharged on POD 14. It is noted that the fibrinogen level was normal in each of the three patients vs. 16 other consecutive patients (in the authors’ care) who received FFP (six had below normal levels).

**Important Points:**
The continuous infusion of FC during Type IV TAA repair was effective in producing satisfactory hemostasis and may be a viable substitute to FFP and cryoprecipitate.
Objective: Discuss the issue of aging among anesthesiologists.

In an editorial, Dr. Muravchick comments on a contribution by Garfield, et al., in the current Journal of Clinical Anesthesia titled “Practice policies for older anesthesiologists (MDA) in academic departments: a national survey of academic department chairpersons”. Dr. Muravchick’s immediate thought was “it’s about time this was addressed” soon followed by “What is the evidence that practice policies specifically related to physician age are either needed or beneficial?” He notes that much of contemporary practice is intuitive and accepted as the standard of care even if not proven.

Research shows that aging, healthy adults experience increased reaction times, decreased fine motor skills and balance, progressive decline in sensory acuity, age-related disease (and concomitant medical treatments), easy fatigability, poor sleep patterns, and subtle cognitive decline. Dr. Muravchick wonders how much is offset by life-long learning, years of pattern recognition and extensive clinical experience.

Not much definitive evidence exists showing any-age MDA provides safe perioperative care. Anesthesia is often compared to the aviation industry with regard to safety issues. It is noted that the strict limits on pilots are not necessarily appropriate to the MDA who function in a supportive, much less isolated environment.

Recently published data from a 10-year period (1993-2002) in Canada showed significantly higher legal claims with higher injury acuity for perioperative injury associated with MDAs 65 years. No conclusion or hypothesis was made.

In Dr. Muravchick opinion many questions need to be addressed before developing policies regarding older MDAs. Examples of questions include:1. “Does increasing age affect competence;2. Do any metrics identify MDAs practicing at marginal levels; 3. Are patient outcomes different between community vs. academic practitioners; and 4. Does prolonged clinical practice pose a health risk to the MDA?”

Other factors to consider include the impact of fewer clinical responsibilities on departmental workload and personal income, legal age discrimination issues, or gender differences of aging. It is noted that less than one-third of the survey respondents had specific policies addressing call and clinical assignments for their aging staff.

Important Points: Many questions must be answered before the development of policies addressing the role and duties of an aging practitioner. Dr. Muravchick suggests more recent data be examined from the ASA Closed Claims Project, the Anesthesia Quality Institute and the National Anesthesia Clinical Outcomes Registry.
Objective: Assess the incidence of QT interval prolongation in patients undergoing noncardiac surgery under general anesthesia.

Prolonged QT interval can be fatal. An interval <440 ms is considered normal. Perioperative factors that can cause prolongation of the QT interval includes drugs (antibiotics, antiemetics, antihistamines, inhalational agents); stress; hypothermia and electrolyte disturbances. The authors investigated the cumulative effects of drugs used for general anesthesia on QTc (heart rate-corrected QT interval) in a cohort of patients undergoing major noncardiac surgery who were already participating in the Vitamins and Nitrous Oxide trial (testing whether patients with a common gene variant in the folate cycle are at higher risk for perioperative myocardial infarction after nitrous oxide).

Patients included in the study did not have atrial fibrillation and had analyzable baseline and follow-up electrocardiograms (ECG). All patients had serial 12-lead ECG’s immediately before surgery, within 30 minutes of PACU arrival, and in the mornings of postoperative days 2 and 3. All perioperative drugs were recorded and electrolytes (potassium, calcium, magnesium) and temperatures on PACU admission were recorded. Change in QTc from baseline was the primary outcome.

A total of 469 patients were included: aged 65 + 10 years; 60% male; and 78.7% white, 20% black, and 0.4% Asian. Mean baseline QTc (Friderica-corrected) was 418 ± 27 ms; 17% had QTc >440 ms; two patients had a QTc >500 ms (indicating a high likelihood of long QT syndrome). Results are available for 429 patients.

On arrival to PACU, 80% of patients had an average increase of QTc of 23±26 ms (mean ± SD; 95% CI 20-25 ms; P<0.001); 2% had no change; 18% had a decrease. About 51% had a QTc >440 ms; 4% >500 ms. The change was >30 ms in 39%, >60 ms in 8%, and >100 ms in 0.5%. No QTc changes were noted on Day 1 or 2 even in the presence of increased heart rate.

The following drugs (table gives values for 59 drugs) produced QTc prolongation >30 ms: angiotensin II receptor blockers for home meds; isoflurane (54%), methadone (53%), ketorolac (58%) for anesthetics; cefoxitin (65%), metoclopramide (43%); unasyn (78%), zosyn (56%) for antibiotics; and epinephrine (80%), ephedrine (49%), calcium (48%) for cardiovascular drugs. A weak negative correlation was found with body temperature.

Postoperatively, 52% had telemetry results: one patient developed torsades de pointes on Day 1 (from 439 to 468 ms); nonsustained monomorphic ventricular tachycardia was seen in 11 (5%); all self-terminated. Premature ventricular contractions occurred in 11%.

Important Points: Postoperative QTc prolongation is common and is associated with commonly used drugs but the exact cause is unknown. QTc is associated with torsades de pointes, so increased vigilance is indicated.
Objective: Identify risks for impaired cerebral autoregulation during cardiopulmonary bypass and the incidence of postoperative stroke.

Patients with impaired cerebral autoregulation (ICA) may experience cerebral hypoperfusion during cardiopulmonary bypass (CPB). This study identified risk factors for ICA during CPB and evaluated the efficacy of near-infrared spectroscopy (NIRS) autoregulation monitoring to identify the problem. NIRS monitors regional cerebral oxygen saturation (rSCO2) and serves as a surrogate of cerebral blood flow. ICA was defined as a mean velocity index Mx ≥0.40 at all mean arterial pressure measurements during CPB. Continuous, moving Pearson’s correlation coefficient was calculated between mean arterial pressure (MAP) and CBF velocity and between MAP and CBF velocity yielding Mx and cerebral oximetry index (COx).

The study included patients undergoing CPB without concomitant carotid artery surgery. All patients received a standardized anesthetic regimen and non-pulsatile CPB. All patients were monitored with bilateral transcranial Doppler and NIRS.

A total of 234 were analyzed, 47 (20%) met the definition of ICA who were more likely to be male (P<0.0001) and less likely to have a history of chronic obstructive pulmonary disease. Age, history of cerebral vascular accident, diabetes, hypertension, and duration of CPB did not differ between groups. Patients with ICA had higher average Mx and COx during CPB and higher CBF velocity and rSCO2. Average CBF velocity correlated with average Mx (r²=0.125, P<0.0001). No correlation was found between average Mx, during CPB and PaCO2, age, or history of stroke.

Factors independently associated with ICA were time-averaged COx during CPB, average CBF velocity, PaCO2, and preoperative aspirin use. Six (12.8%) with ICA had a new stroke postoperatively vs. five (2.7%) without ICA (P=0.011); all appeared to be embolic.

Important Points:
ICA occurred in 20% of patients during CPB. COx may accurately predict ICA.
Objective: Assess the efficacy of amiodarone in decreasing the incidence of atrial fibrillation following lung surgery.

In a randomized, controlled, double-blind trial, the authors compared prophylactic amiodarone (AMI) to placebo (PLA) for reducing the risk of atrial fibrillation (AF; lasting >5 min) in patients undergoing surgery for lung cancer. Inclusion criteria were patients for elective lobectomy or pneumonectomy, age >18 years, and provision of informed consent. Exclusion criteria were previous heart or lung surgery, resting heart rate <40, hypotension or systolic blood pressure <80 mmHg, atrial-ventricular block, sick sinus syndrome, preoperative atrial fibrillation/flutter (of > one month duration), hepatic dysfunction, hyperthyroidism, treatment with monoamine oxidase inhibitors, QTc >440 ms for men, >460 ms for women, or adverse reactions to AMI.

All procedures were performed through an anterior muscle-sparing thoracotomy or by video-assisted thoracoscopy under general anesthesia with a Carlens double-lumen tube. Time to AF was the primary endpoint and time to symptomatic AF was secondary.

Immediately after transfer to ICU, patients received either a bolus of AMI (300 mg) or PLA (5% aqueous dextrose solution) over 20 min and an oral dose of AMI (600 mg) or PLA with the oral doses repeated twice daily for 5 days. Patients were contacted on postoperative day (POD) 30 and queried re occurrence of AF.

A total of 242 patients out of 386 were included and randomized: AMI (n=122) and PLA (120); 5 in each group were removed for cardiac issues or hypotension. Demographics were similar. PLA patients had a 3.5 times (95% CI, 1.9 to 6.5) higher risk of developing AF vs AMI patients. Overall number to treat (NNT) was 4.4 (3.1 to 7.8); and absolute risk reduction was 23% (13 to 33) decreasing from 32% to 9%.

Symptomatic AF with PLA had a relative risk of 3.7 (1.2 to 12). Overall NNT was 15 (8 to 116) and risk reduction was 6.7% (0.9 to 13), decreasing from 9.2% to 2.5%.

AF occurred in 11 AMI patients vs. 38 with PLA (p<0.001). Patients with AF were symptomatic in 27% vs 29%, respectively. All AF converted to sinus rhythm before discharge with additional antiarrhythmic agents or cardioversion. All patients were in sinus rhythm on POD 30. Median time to onset of AF was 68 hours (0.1 to 225 hours) with a median duration of 45 minutes (0.1 to 50 hours).

Adverse events included: one death due to acute myocardial infarction with PLA; and five in each group had possible side effects leading to study discontinuation (QTc length >460 ms in females, >440 ms in males).

Important Points:
High dose prophylactic AMI given postoperatively significantly reduced the incidence of AF and was a safe, efficacious regimen for patients undergoing lung cancer surgery. It is noted in discussion with five reviewers that the dose and route chosen increased fast-track mobilization, decreased ICU stays, and resulted in few adverse events.


Division of Cardiac Anesthesiology, University of Ottawa Heart Institute, 40 Ruskin Street, Ottawa, ON K1Y 4W7, Canada. E-mail: jrobblee@ottawaheart.ca.

Abstracted by L Easley, who has nothing to disclose.

Objective:
Report a case of a Jehovah’s Witness patient who underwent a redo aortic valve replacement complicated by profuse bleeding and a severe hemostatic defect.

Jehovah’s Witness patients present special challenges to medical teams when complex bleeding problems occur because they choose to forego the use of blood and blood products. The authors report a case of a Jehovah’s Witness patient who underwent a redo aortic valve replacement complicated by profuse bleeding and a severe hemostatic defect.

A 56-yr-old Jehovah’s Witness patient was scheduled for an elective redo aortic valve replacement coronary artery bypass graft procedure and a Maze procedure. The informed consent process included a discussion of techniques acceptable to Jehovah’s Witnesses, including the use of cardiopulmonary bypass, continuous red cell salvage, and a review of plasma-derived factors acceptable to the patient. The patient agreed to the use of prothrombin complex and cryoprecipitate and discussed recombinant factor VII and 1-deamino-8-D-arginine vasopressin (DDAVP). The medical team agreed to take the case and to respect the patient’s choices. Following cardiopulmonary bypass and protamine reversal, the patient continued to bleed profusely. To reduce bleeding, DDAVP 16 U, cryoprecipitate 15 U and prothrombin complex were administered.

Due to difficult dissection and prolonged cardiopulmonary bypass, redo procedures and complex procedures add additional risks of bleeding. It is essential to initiate a complete informed consent discussion that includes the risks of bleeding, the consequences of blood loss, and the options for treatment in order to respect the autonomy and dignity of Jehovah’s Witness patients. Due to the nature of the bleeding in this patient following adequate surgical hemostasis and protamine reversal of heparin, the DDAVP was administered to increase platelet adhesion. Cryoprecipitate was administered to increase the fibrinogen level, and Octaplex was given to support the tissue factor pathway of hemostasis. In the Jehovah’s Witnesses’ religious position on blood fractions, whole blood, packed red blood cells, platelets, fresh frozen plasma, and granulocytes are unacceptable transfusion products. Recombinant agents, hydroxyethyl starches, erythropoietin, 1-deamino-8-D-arginine vasopressin, and antifibrinolytics are considered acceptable.

Important Points:
The authors believe, “It is important for informed consent to include a discussion that respects patients’ rights to choose an agent/procedure and to state their position on the agents available to mitigate non-surgical bleeding.”
Objective:
Determine the impact of intraoperative nitrous oxide exposure on an increased risk of perioperative stroke, myocardial infarction, and death.

Small randomized controlled trials (RCTs) and secondary analyses of larger trials have shown an association between nitrous oxide administration and adverse perioperative outcomes. In this analysis of patients who received general anesthesia (GA) in the General Anesthesia versus Local Anesthesia for carotid surgery (GALA) trial, the authors determined the impact of intraoperative nitrous oxide exposure on an increased risk of perioperative stroke, myocardial infarction, and death.

A total of 3,256 patients were randomized to GA or local anesthesia for carotid surgery. This secondary analysis included patients who received GA during the trial, creating a cohort of 1,773 patients undergoing GA. The administration of nitrous oxide was left to the discretion of the anesthetist.

Of the patients receiving GA, 671 received nitrous oxide, 944 did not, and for 158, it was unknown. Patients receiving nitrous oxide were more likely to have had volatile, rather than I.V. anesthesia, neuromuscular block and more likely to have received premedication, and to have had peripheral vascular disease, coronary artery disease, atrial fibrillation, be ASA Category I or II, and were younger. As a result, it is likely that patients receiving nitrous oxide were at higher risk of vascular events after operation than in the no nitrous oxide group. The unadjusted odds ratio for nitrous oxide on the primary outcome was 1.13. After adjustment for the imbalanced variables, the odds ratio was 1.09.

Since there was greater prevalence of vascular risk factors in the nitrous oxide group and a lack of definite effect on the primary outcome or any other measure, the data do not suggest any meaningful adverse effects of nitrous oxide on vascular outcomes. Even though there was no effect on overall incidence of stroke, there was a non-significant increase in the unadjusted risk of fatal stroke.

Important Points:
Due to the greater prevalence of vascular risk factors in the nitrous oxide group and the lack of definite effect on the primary outcome, data from this trial do not support reports that nitrous oxide increases the risk of adverse perioperative vascular events.
Objective:
Review a treatment algorithm based on point-of-care coagulation testing that would decrease allogeneic blood product transfusions during surgical excision of burn wounds and prospectively compare blood product requirements with a control group.

In trauma patients, transfusion requirements can be reduced and survival improved with timely and targeted correction of trauma-induced coagulopathy using coagulation factor concentrates; however, this treatment strategy has not yet been evaluated in burn victims. The authors designed a treatment algorithm based on point-of-care coagulation testing that would decrease allogeneic blood product transfusions during surgical excision of burn wounds.

Thirty consecutive patients undergoing surgical excision of burn wounds were enrolled in this prospective, randomized, controlled, single-center study and randomized into the algorithm group or the control group. In the control group, coagulation management was performed according to the clinician’s discretion and included administration of fresh-frozen plasma (FFP), platelet concentrate, fibrinogen concentrate, prothrombin complex concentrate (PCC), and tranexamic acid. Treatment in the algorithm group was standardized based on the recommendations for bleeding management in trauma-induced coagulopathy using point-of-care rotational thromboelastometry (ROTEM).

Fourteen patients were included in the algorithm group and 16 in the control group. The difference between the groups in the cumulative use of allogeneic blood products was highly significant with 3.1 blood products in the algorithm group compared with 10.2 in the control group. No FFP or platelet concentrate was administered in the algorithm group compared with 5.0 FFP units and four platelet concentrate units in the control group.

This study used a standardized coagulation management algorithm to produce allogeneic blood product requirements in burn victims undergoing surgical burn wound excision and confirms that anemia tolerance and hemostatic coagulation management reduces patient exposure to allogeneic blood products. The use of ROTEM showed no significant effect on overall mortality but significantly reduced blood loss and the proportion of patients requiring transfusion of packed red blood cells (PRBCs) and FFP plus platelets.

Important Points:
The authors believe, “This prospective randomized controlled trial showed a significant reduction in allogeneic blood product requirements in burn victims allocated to a ROTEM-guided treatment algorithm during surgical burn wound excision.”

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Dept of Anesthesiology, University of Wisconsin School of Medicine and Public Health, 600 Highland Avenue, B6/319 CSC Madison, WI 53792. E-mail: kmscro1@wisc.edu.

Abstracted by L Easley, who has nothing to disclose.

**Objective:**
Examine the effect of BIOPATCH placement on the rate of bacterial colonization at the femoral nerve catheter tip following total knee arthroplasty.

Femoral nerve catheter (FNC) insertion is common for postoperative analgesia following total knee arthroplasty. The BIOPATCH is a chlorhexidine-impregnated patch that is designed to inhibit bacterial and fungal growth for several days. This study examines the effect of BIOPATCH placement on the rate of bacterial colonization at the femoral nerve catheter tip following total knee arthroplasty.

One hundred adult patients scheduled for total knee arthroplasty were included in the study. Femoral nerve catheters were placed under sterile conditions using ultrasound guidance. After the femoral nerve catheter was placed, participants were randomized to have the BIOPATCH applied or not. The BIOPATCH group had a BIOPATCH applied at the catheter exit site prior to application of a Tegaderm film dressing. In the non-BIOPATCH group, a Tegaderm film was applied as the only dressing. All patients received a preoperative dose and two postoperative doses of appropriate prophylactic antibiotic therapy. Following therapy, the femoral nerve catheter was removed and cultured for bacterial growth.

BIOPATCH patients had a slightly higher risk of catheter colonization, which was observed in three of 48 vs. two of 47 control patients. Skin culture without the BIOPATCH grew coagulase-negative *Staphylococcus* in 39% of positive cultures and Gram-positive rods/bacillus in 61% of positive cultures. Skin culture with the BIOPATCH grew coagulase-negative *Staphylococcus* in 50% of positive cultures and Gram-positive rods/bacillus in 42% of positive cultures.

Neither statistically nor clinically significant reductions in bacterial colonization of the femoral nerve catheter or the catheter exit site were shown with a BIOPATCH application when the catheter is tunneled and used for only 48 hours. The baseline rate of catheter and exit site colonization was less than what has been reported in the literature. The recent increase in the number of peripheral nerve catheters inserted has caused concern in the regional anesthesia literature regarding bacterial contamination.

**Important Points:**
No benefit was shown in using the BIOPATCH in this patient population.
Objective:

The authors evaluated the effect of a triple low of mean arterial pressure (MAP), Bispectral Index (BIS), and minimum alveolar concentration (MAC) on duration of hospital stay and 30-day all-cause mortality.

Long-term outcomes may be influenced by intraoperative anesthetic management. The authors evaluated the effect of a triple low of mean arterial pressure (MAP), bispectral index (BIS), and minimum alveolar concentration (MAC) on duration of hospital stay and 30-day all-cause mortality.

Patients >16 years post noncardiac surgery between January 6, 2005, and December 31, 2009, who also had BIS monitoring and a single volatile anesthetic identified by nonzero concentrations of only one agent from incision to end of case, were included in the analysis. MAP, BIS, end-tidal volatile anesthetic concentration, propofol use, duration of hospitalization, and 30-day all-cause mortality were extracted from the clinical registry. In the case-based analysis, the averages defining the reference state and low and high values were 87 + 5 mmHg (MAP), 46 + 4 (BIS), and 0.56 + 0.11 (MAC). The triple low combination was associated with the largest risk of significantly prolonged length of stay. Triple high values were not associated with a significant increase in 30-day mortality. All three double low combinations were associated with a two-fold mortality increase.

Isolated low BIS was associated with a reduction in mortality. Isolated low MAC fraction was associated with increased mortality. Case-based double lows taken as a group were associated with a two-fold increase in 30-day postoperative mortality. The results indicate that postoperative mortality is strongly predicted by two double low combinations and a triple low of MAP, BIS, and MAC.

Important Points:

The authors believe, “The combination of low MAC and low MAP was a strong and highly statistically significant predictor for mortality. When combined with low BIS, relative risk adjusted mortality was even greater. Thus, the combination of low MAC, low MAP, and low BIS, a triple low, is an ominous predictor of excessive hospital length of stay and postoperative mortality.”
Objective:
Assess the prevalence and risk factors for intraoperative hypotension (IH) in adult patients undergoing emergent craniotomy for isolated traumatic brain injury (TBI), considering the effects of anesthetic agents.

Intraoperative hypotension (IH) after traumatic brain injury (TBI) may have significantly high incidence of death, persistent vegetative state, or disability. This study assesses the prevalence and risk factors for IH in adult patients undergoing emergent craniotomy for isolated TBI, considering the effects of anesthetic agents.

This retrospective cohort study included patients 18 years and above who underwent emergent craniotomy for TBI. Transfusion of blood products and treatment of IH was at the discretion of the attending anesthesiologist. Electronic anesthesia records were used to abstract intraoperative data including heart rate, blood pressure, fluid balance, mannitol administration, blood transfusion, vasopressor use, and anesthetic agents and displayed the hemodynamic parameters once every 5 minutes. Every displayed reading of SBP <90 mmHg was counted as an “episode” of IH.

A total of 113 patients with isolated TBI who underwent craniotomy were included in the final analysis. Most patients were male and most had severe TBI. The majority had a midline shift >5mm on admission head computed tomographic (CT) scan, and the median maximum thickness of the CT lesion was 18 mm. Seventy-three patients had at least 1 episode of IH; 40 did not have any IH. The median number of episodes of IH was 5. IH was treated with fluid replacement, blood product transfusion, and vasopressors, with phenylephrine being the most common vasopressor used to treat IH. Independent risk factors for IH were multiple CT lesions, subdural hematoma (SDH), maximum CT lesion thickness, and anesthesia duration.

The authors found that the burden of hypotension is high in the intraoperative period and multiple lesions on preoperative CT scan, SDH, maximum thickness of the lesion on CT scan, and duration of general anesthesia were independent risk factors for IH in anesthetized adult TBI patients. The study did not show an association of IH with mortality. The authors did find that a longer anesthesia time increases the risk of IH.

Important Points:
According to the authors, “IH can be expected in a significant proportion of patients undergoing emergent/urgent craniotomy for TBI despite the absence of preoperative hypotension, and one should anticipate the need to treat IH in patients with multiple CT lesions or SDH requiring longer duration of anesthesia.”
Objective:
Examine the current handover practice between the anesthesiologists and the postanesthesia care unit (PACU) staff to identify information omissions and consider which information items the clinicians and nurses believe to be a necessary part of the verbal transfer process.

The immediate postoperative period is important as the patient recovers from the acute derangements resulting from anesthesia and surgery. Incomplete or incorrect transfer of information from the anesthesiologist to the responsible anesthesia nurse can lead to clinical errors. This study examines the current handover practice between the anesthesiologists and the PACU staff to identify information omissions and consider which information items the clinicians and nurses believe to be a necessary part of the verbal transfer process.

The authors developed a checklist to identify the communication of specific data items during the handover between anesthesiologists and PACU nursing staff. The patient’s preoperative physical status and demographic data, the intraoperative details and anesthesia management, significant intraoperative events and postoperative directives were included in the checklist. During a two month period, observations of handovers were made. At the end of the process, the data checklist was sent to the participating anesthesiologists and nursing staff for their feedback.

A total of 526 handovers were included in the study. Items not communicated to the PACU staff during handover in the majority of cases included information such as positioning during surgery, the American Society of Anesthesiologists’ (ASA) physical status, estimated blood loss, desaturation events, and volume of intraoperative fluid administered. The only items communicated in over 90% of handovers were the type of surgery and the analgesia given intraoperatively.

Healthcare providers have different opinions as to which items need to be included in the verbal handover. As a result, incomplete or poor-quality handovers have been a source of adverse events and near misses in hospitalized patients. Studies have shown that mortality rates and complications have declined to almost half since the introduction of the checklist.

Important Points:
This study demonstrates that the handover of surgical patients from the operating room to PACU is inconsistent and that, in many cases, information is not communicated by the anesthesiologists to the PACU nurses, and the information that is perceived as important for the handover process by the healthcare workers is not communicated consistently in most cases.
Objective:
Assess the association between blood component transfusion and postoperative infectious complications in patients undergoing esophageal resection surgery.

Esophageal resection surgery has potential for substantial morbidity and mortality. Patients having esophageal surgery commonly need blood product administration. This study assesses the association between blood component transfusion and postoperative infectious complications in patients undergoing esophageal resection surgery.

This single center, retrospective observational cohort study included adult patients undergoing esophageal resection surgery from 2005 through 2009. The primary outcome was the development of a major postoperative infectious complication, defined as pneumonia, bloodstream infection (BSI), and/or surgical site infection (SSI). The date, time, and type of transfusion were recorded for patients who underwent transfusion.

A total of 465 patients were identified for inclusion in the study. Major postoperative infectious complications were identified in 87 patients. The median time to the first major infectious complication was seven days. A total of 138 patients received a blood transfusion before the onset of a major postoperative infectious complication or during a similar exposure interval in patients who did not develop a major postoperative infectious complication. Transfused patients had lower preoperative hemoglobin levels, platelet counts, and albumin concentrations, higher international normalized ratio (INR), greater intraoperative blood loss, and longer operative times. Non-transfused patients were noted to have a higher body mass index. Univariate analysis showed a strong association between blood transfusion and the development of major postoperative infectious complications.

This is the first study to evaluate the role of individual blood components on the risk of postoperative infectious complications after esophageal resection surgery. The mechanisms causing transfusion-related immune modulation are unclear.

Important Points:
The study showed a significant association between fresh frozen plasma (FFP) and high plasma volume blood component transfusions and major postoperative infections and that there was no association between red blood cell (RBC) transfusion and postoperative infections.
Objective: Evaluate the association among pre- and postoperative B-Type Natriuretic Peptide levels, postoperative patient complications, and hospital length of stay (LOS).

A lab test measuring B-Type Natriuretic Peptide (BNP) plasma levels is used as a diagnostic and prognostic indicator. This study evaluates pre- and postoperative BNP levels in patients undergoing surgical infrarenal AAA repair and analyzes their power as a predictor of in-hospital cardiac events. It also evaluates the association among pre- and postoperative BNP levels, postoperative patient complications, and hospital LOS.

Forty-five patients with sinus rhythm and a left ventricular ejection fraction >40% and undergoing elective major vascular surgery were enrolled prospectively from June 2008 through April 2009. The duration of aortic cross-clamping was recorded. BNP plasma was assessed on the day of surgery and on postoperative Day 1. Cardiac troponin I (cTnI) was measured on arrival at the intensive care unit (ICU) and then 12, 48, and 71 hours later.

Postoperative cardiac complications occurred in eight of the 45 patients treated. The median of preoperative BNP concentrations in patients who developed an acute myocardial infarction was 209 pg/mL compared with 74 pg/mL in those who did not. The difference between groups was significant. The median preoperative BNP concentration in patients who developed postoperative atrial fibrillation was 148 pg/mL compared with 67 pg/mL in patients who did not. The BNP value for patients with all postoperative complications was 84 pg/mL vs. 63 pg/mL for patients with no complications.

This study showed that postoperative levels of BNP predicted postoperative cTnI increases and in-hospital cardiac events and confirmed the relation between pre- and postoperative BNP levels. Preoperative BNP only correlated with cTnI values at 12 hours after ICU admission. Patients taking β-blockers for cardiovascular disease had higher preoperative BNP values than patients without any known cardiac disease.

Important Points: The authors believe, “The present results confirmed the high negative predictive value (NPV) of preoperative BNP levels, and postoperative BNP levels showed a better correlation with postoperative cTnI levels, blood transfusion, and postoperative cardiac events.
Objective: Determine whether cognitive screening tests administered at hospital discharge predict six-month cognitive sequelae in survivors of critical illness.

A large number of critical illness survivors have cognitive impairments that persist years after hospital discharge. There are little data regarding the ability to predict which patients are likely to have cognitive impairments. The authors determine whether cognitive screening tests administered at hospital discharge predict six-month cognitive sequelae in survivors of critical illness.

Consecutive critically-ill patients with mechanical ventilation 48 hours or more and age 18 to 85 years were recruited for this prospective outcome study. Demographic and medical data included length of stay, ventilator data, and the Acute Physiologic and Chronic Health Evaluation II (APACHE II) score. The Mini-Mental State Examination (MMSE) and Mini-Cog were administered before hospital discharge. Three binary logistic regression analyses were conducted to predict cognitive sequela using the predictor MMSE cutoff scores less than 27, MMSE cutoff scores less than 24, and Mini-Cog cutoff scores.

Seventy patients were enrolled in the study. Fifty-three of 70 patients completed six-month follow-up. At hospital discharge, 45 of 70 patients were impaired on the MMSE, and 32 of 70 patients were impaired on the MINI-Cog. Twenty-seven patients were impaired on both the MMSE and Mini-Cog, but only 20 patients had scores within normal limits on both tests. Survivors pre-ICU functioning was within the normal range of intelligence. The MMSE cutoff score less than 27, MMSE cutoff score less than 24, and Mini-Cog cutoff score did not predict cognitive sequela at six-month follow-up.

Neither the MMSE nor the Mini-Cog cutoff scores predicted cognitive sequelae at six months, indicating these cognitive screening tests cannot be used to predict which critically ill patients will have cognitive sequelae at 6 months. Impaired memory was the most frequent cognitive deficit, followed by impaired executive function, upper extremity motor speed, language, attention, and slow mental processing speed.

Important Points:
In this study, the authors found, “The MMSE and Mini-Cog identified a large number of patients with cognitive impairments at hospital discharge but cannot be used as surrogate endpoints for long-term cognitive impairment….critically-ill survivors exhibit significant long-term cognitive impairments.
Objective:
Determine whether patients with thoracic epidural analgesia (TEA) are able to recover the micturition process.

A high post-void residual (PVR) can lead to the insertion of an indwelling catheter with risk of urinary tract infection (UTI) and hospital discharge delay. This study determines whether patients with TEA are able to recover the micturition process.

Two hundred and five patients scheduled for elective major abdominal and thoracic surgery were tested for lower urinary tract flow obstruction. All patients received TEA before the induction of general anesthesia. The bladder catheter was removed either on the morning after surgery in an early removal group (ERG) or at the same time as the interruption of the epidural infusion in the standard group (SG). When patients started voiding spontaneously, the PVR was measured using an ultrasound scanner. Ultrasound assessment of the bladder was done after each micturition in a supine position and recorded.

Patient characteristics were comparable between the two groups except for age, intraoperative fluid administration and duration of surgery. The bladder catheter was kept an average of 17 ± 3 h and 94 ± 57 h in the ERG and in the SG, respectively. All patients who started to void spontaneously in the ERG and in the SG reached a PVR <200 ml and did not require bladder catheterization. After the first micturition, PVR was significantly higher in the ERG compared with the SG. Time to reach PVR <200 ml after bladder catheter removal was significantly greater in the ERG vs. the SG, and the time length between the removal of the transurethral catheter and the first micturition was significantly greater in the ERG. Intraoperative fluid administration and visual analog scale (VAS) on coughing were significant parameters for patients with PVR > 200 ml in the ERG.

In this study, subjects at no risk of developing post-operative urinary retention (POUR) and receiving TEA, and who started to void spontaneously, were able to recover their micturition; however, the bladder function recovery process was longer in the ERG compared with the SG. PVR after the first micturition was significantly higher in the ERG.

Important Points:
According to the authors, “Continuous TEA with bupivacaine 0.1% and fentanyl 3 mcg/ml seems to hinder transitorily the recovery process of micturition. However, it is possible to claim that patients at no risk of POUR and who started voiding spontaneously do not develop POUR even when the PVR is ≥ 200 ml.”
Assessment

1. According to Baxter, et al., which of the following is an accurate statement regarding cocaine drug screening prior to elective surgery?
   a. The primary urinary marker for cocaine, benzoylecgonine, is the primary cause of anesthesia-related hypertension during elective surgery.
   b. Benzoylecgonine may be detected in the urine for as long as 14 or more days following cocaine ingestion and may not be indicative of acute intoxication.
   c. Benzoylecgonine is an active metabolite of cocaine that is instrumental in the production of hemodynamic instability.
   d. All of the above

2. According to Bahskar, et al., patient related variables for which perioperative blood transfusions are given may include:
   a. Small body size
   b. Complex surgical procedure
   c. Female gender
   d. All of the above

3. According to Carron, et al., advantages of using the ProSealTM LMA over endotracheal intubation during laparoscopic gastric banding include all of the following EXCEPT?
   a. Less postoperative cough
   b. Greater muscle relaxant requirements
   c. Less postanesthesia respiratory function depression
   d. Similarly effective pressure-controlled ventilation

4. According to Dahmani, et al., which of the following has demonstrated a lack of efficacy in reducing the incidence of emergence agitation?
   a. Intravenous propofol at the end of a surgical procedure
   b. Intraoperative fentanyl administration
   c. Preoperative administration of midazolam.
   d. Intraoperative administration of dexmedetomidine

5. According to de Oliveira, et al., which of the following was observed from systemic administration of lidocaine in the ambulatory surgical setting?
   a. Improved global quality of recovery
   b. A 26 minute reduction in the time to hospital discharge
   c. Greater scores in physical independence
   d. All of the above

6. According to Drews III, et al., which statement is most correct regarding aggressive glycemic management of a poorly controlled diabetic patient or diabetic patient slated for a short duration surgical procedure?
   a. The ensuing hypoglycemia episode following aggressive glycemic management may be more hazardous than the perioperative hyperglycemia.
   b. Perioperative hyperglycemia carries significantly greater risks than an episode of hypoglycemia.
   c. Both perioperative hypoglycemia and hyperglycemia carry identical morbidity and mortality risks for the surgical patient.
   d. All of the above

7. According to Elgebaly, et al., which of the following was unexpectedly observed from the low-dose infusion of vasopressin following cardiopulmonary bypass?
   a. Significant decrease in cardiac output
   b. Depression of systemic vascular resistance index
   c. Decreased ejection fraction
   d. Increased urine output due to improved glomerular filtration rate
8. According to Garfield, et al., which of the following may influence case assignments for older anesthesiologists?
   a. Lack of proficiency to handle complex cases
   b. Desire to avoid placing undue physical or emotional stress on the older anesthesiologist
   c. Lack of stamina
   d. All of the above

9. According to Grady, et al., a continuous infusion of lidocaine may contribute to reducing postoperative bowel dysfunction by which of the following mechanisms?
   a. Blocking inhibitory reflexes within the gastrointestinal wall
   b. Opposing the inflammatory effects of substances such as kinins, histamine, and prostaglandins.
   c. Reduction of postoperative pain and the postoperative opioid requirement.
   d. All of the above

10. Hermans, et al., found what dose of dexamethasone was effective at reducing postoperative nausea and vomiting after pediatric tonsillectomy?
    a. 0.15 mg/kg
    b. 0.25 mg/kg
    c. 0.75 mg/kg
    d. 1.0 mg/kg

11. According to Hoefnagel, et al., which of the following statements concerning the anesthetic management for laparoscopic gastric bypass in a LVAD patient is incorrect?
    a. The Heartmate II LVAD is a small electric rotary pump providing nonpulsatile flow up to 10 L/min and is implanted extra-peritoneally in the left upper abdomen, draining blood from the left ventricle and propelling it into the ascending aorta via a polyester tube graft.
    b. Drugs with negative inotropic effects such as potent inhalation anesthetics, can be used with these patients without concern.
    c. Laparoscopic gastric bypass requires steep head-up positioning which significantly improves pulmonary compliance by moving weight of abdominal contents and pannus away from the diaphragm.
    d. In Heartmate II patients perioperative concerns for abdominal surgery include avoiding surgical trauma to the device/drive-line and electromagnetic interference (EMI), which can occur with electrocautery.

12. Kim, et al., found that intraoperative MgSO4 after VPA premedication:
    a. Increased postoperative mechanical ventilation time
    b. Increased the dose of rocuronium required
    c. Decreased the dose of rocuronium required
    d. Had no effect on rocuronium dose

13. Lejus, et al., found independent risk factors for perioperative transfusion to include:
    a. Preoperative hemoglobin <12
    b. Fracture with trochanteric extension
    c. Moderate renal impairment
    d. All of the above

14. According to Monnet, et al., non-invasive measurement of arterial pulse pressure variation:
    a. Was less accurate than invasive measures
    b. Was more accurate than invasive measures
    c. Compared accurately to invasive measures
    d. None of the above

15. Morrison, et al., found that fibrinogen concentrate was:
    a. Not a viable substitute for fresh frozen plasma
    b. Associated with acute renal injury
    c. Able to produce satisfactory hemostasis
    d. Associated with increased hemorrhage
16. Dr. Muravchick believes issues regarding aging among anesthesiologists:
   a. Must be addressed in every anesthesia department
   b. Requires more analysis of current data bases
   c. Is critical to patient outcomes
   d. Should mirror the aviation industry

17. Nagele, et al., found which perioperatively administered drugs increased the Qtc interval?
   a. Isoflurane
   b. Ketorolac
   c. Epinephrine
   d. All of the above

18. Ono, et al., identified factors associated with impaired cerebral autoregulation that included:
   a. History of stroke
   b. Preoperative aspirin use
   c. Intraoperative hypotension
   d. Female gender

19. Riber, et al., found that patients receiving placebo vs amiodarone had what higher risk of developing atrial fibrillation?
   a. 1.5 times
   b. 2.0 times
   c. 3.0 times
   d. 3.5 times

20. Which of the following did Roblee, et al., find to be an acceptable transfusion product?
   a. Platelets
   b. Fresh frozen plasma
   c. 1-deamino-8-D-arginine vasopressin
   d. Packed red blood cells

21. What did Sanders, et al., find when analyzing the General Anesthesia compared with Local Anesthesia for carotid surgery (GALA) trial?
   a. Nitrous oxide increased the risk of secondary outcomes.
   b. There was a decrease in the unadjusted risk of fatal stroke.
   c. The data do not support reports that nitrous oxide increases the risk of adverse perioperative vascular events.
   d. There was a greater prevalence of vascular risk factors in the group which did not receive nitrous oxide.

22. What did Schaden, et al., find that was not significantly affected by ROTEM?
   a. Overall mortality
   b. Reduced blood loss
   c. Proportion of patients requiring transfusion of PRBCs
   d. Proportion of patients requiring transfusion of FFP plus platelets

23. What did Schroeder, et al., observe when studying the effect of BIOPATCH placement on the rate of bacterial colonization at the femoral nerve catheter tip following total knee arthroplasty?
   a. Clinically significant reductions in bacterial colonization of the catheter exit site.
   b. No benefit was shown in BIOPATCH use.
   c. Baseline rate of catheter and exit site colonization was more than what has been reported.
   d. Lower risk of catheter colonization in BIOPATCH patients.
24. According to Sessler, et al., what is the effect of a triple low of MAP, BIS, and MAC on duration of hospital stay and 30 day all-cause mortality?
   a. Isolated low BIS was associated with a reduction in mortality.
   b. Isolated low MAC fraction was associated with decreased mortality.
   c. Case based double lows as a group were associated with a decrease in 30-day postoperative mortality.
   d. Low MAC, BIS, and MAP, a triple low, is a predictor of short hospital length of stay.

25. What did Sharma, et al., find increases the risk of IH during craniotomy for TBI?
   a. Single lesions on CT scan
   b. Minimum thickness of the lesion on CT scan
   c. Choice of specific anesthetic agent
   d. Longer anesthesia time

26. In the handover of surgical patients from the operating room to PACU, what did Siddiqui, et al., find to be the only items which were communicated in over 90% of handovers?
   a. Positioning during surgery
   b. Type of surgery and analgesia given intraoperatively
   c. ASA physical status and estimated blood loss
   d. Desaturation events

27. According to Subramanian, et al., what is a baseline characteristic of transfused patients following esophageal resection surgery?
   a. Higher preoperative hemoglobin levels, platelet counts, and albumin concentrations
   b. Lower INRs
   c. Greater intraoperative blood loss
   d. Shorter operative times

28. Vetrugno, et al., found that preoperative BNP only correlated with cTnI values at what length of time after ICU admission?
   a. 12 hours
   b. 48 hours
   c. 60 hours
   d. 71 hours

29. What did Woon, et al., find to be the most frequent cognitive deficit in survivors of critical illness?
   a. Upper extremity motor speed
   b. Language
   c. Slow mental processing speed
   d. Impaired memory

30. What did Zaouter, et al., discover after the first micturition after early removal of urinary catheter?
   a. PVR was significantly higher in the ERG
   b. Time to reach PVR <200 ml was lower in the ERG
   c. PVR was significantly higher in the SG
   d. Time to first micturition was lower in the ERG
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