

# 2019 Poster Abstracts



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# Qualitative Research

A1

## **Adaptation and Validation of the Situation Awareness Global Assessment Technique for Student Registered Nurse Anesthetists**

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**Introduction:** Using simulation in student registered nurse anesthetist (SRNA) education necessitates the ability to objectively quantify its impact on SRNAs' clinical decision-making. The situation awareness global assessment technique (SAGAT) is a direct, objective tool used in high-risk industries to assess operator's situation awareness, a key construct of decision-making in dynamic environments. The study's purpose is to validate a modified SAGAT for use with SRNAs during a specific event.

**Literature Review:** Reviewed works link medical error to situation awareness and show a link between integrating simulation emphasizing this construct to better outcomes. Lack of a valid, reliable, direct, objective situation awareness measurement tool is identified. The SAGAT's reliability and validity is shown as is its growing use in other medical specialties.

**Theoretical Framework:** Endsley's "Theory of Situation Awareness in Dynamic Systems," the most widely cited and accepted, describes the impact of situation awareness on decision-making and performance in dynamic settings.

**Methodology:** With UTHealth Science Houston IRB approval, mixed methods using systematic integration of qualitative and quantitative data and analysis gave more complete, synergistic data utilization and validity. Qualitative outweighed quantitative in this study.

**Data Collection and Methods:** An exploratory sequential mixed methods design used purposeful sampling to identify 2 sample sets of CRNA, nurse educator subjects: 7 subjects for the qualitative methods in the first study phase, 49 for the quantitative in the second phase. Goal and task data collection and validation used Delphi methods with the first sample. Content analysis of these results created items for an adapted SAGAT. Then, data collected from the second, larger sample used quantitative methods to determine item and scale content validity indices with ratings of item rankings. Exploratory factor analysis added reliability of underlying theoretical processes.

**Results and Data Analysis:** Content analysis of the 7 experts' output formed 39 SAGAT items. Twenty-one items mean relevancy rankings exceeded relevancy (2.5 or > on a 0 to 3 scale). Item content (I-CVI) and scale (S-CVI/AVE) validity indices exceeded excellent validity minimums: (I-CVI > 0.83 and S-CVI/AVE > .90) for 37 of the 39 items (range of 0.83 to 1.0) and 0.92 for all items measured as 1 scale. Exploratory factor analysis showed 28 items loading on 2 factors.

**Discussion and Conclusions:** Situation awareness is a critical trait of skilled anesthesia providers, more so as automation, technology, and anesthesia in nonoperating room areas increase. It develops with experience and training thus objectively quantifying it can help steer SRNA education. This adapted and validated tool can aid in gauging the impact of simulation curricula and identifying ways to improve decision-making.

**Funding Sources:** This research was funded by the generosity of the AANA Foundation in the form of a \$13,688.45 general research grant.

## A2

### **Airway Management for Deep Sedation/MAC: Current Practices, Associated Outcomes, Limitations, and Needs as Identified by Survey Results**

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**Introduction:** Deep sedation/MAC administration is increasing outside the hospital OR for many benefits. Pharyngeal airways are often needed in these settings to provide a patent airway. An electronic survey examining the use of pharyngeal airways in anesthesia procedures was created to identify potential needs in airway management relative to current practice.

**Literature Review:** Adverse effects associated with oral airways include stimulation of coughing, gagging; cause bleeding, swelling; can damage teeth; can induce a sore throat; can displace tongue causing airway obstruction. Adverse effects with nasal airways include an increase in cardiovascular responses, can cause nasal pressure sores, and provoke epistaxis.

**Theoretical Framework:** A phenomenological research framework approach was used to explore, understand, and identify the void and potential needs in airway management for deep sedation/MAC.

**Methodology:** A national electronic survey of a large, diverse population of anesthesia providers examined current airway practices, subsequent outcomes, and potential needs associated with airway devices.

**Data Collection and Methods:** A survey was developed to capture information and outcomes regarding oral and nasal airways from anesthesia providers and was disseminated via a closed group Facebook site with more than 18,000 Certified Registered Nurse Anesthetist (CRNA) members and student registered nurse anesthetist (SRNA) members. The survey consisted of 19 questions including demographic queries, oral and nasal airway use and outcome events, need for a chin lift /jaw thrust with airway use, and assessment and experience of using a nasal airway in the oral cavity. IRB approval was requested and was granted an exemption based on survey content. Descriptive and inferential statistics, including confidence intervals, were utilized to analyze the survey data.

**Results and Data Analysis:** A total of 293 respondents reported airway-associated negative patient outcomes for oral and nasal airways. Respondents (52.8%) have used a nasal airway orally to mitigate adverse outcomes. Thirty-six percent of these users experienced adverse outcomes using a nasal airway orally including coughing/gagging and airway occlusion and/or severance due to patient biting. Respondents (98.2%) indicated interest in using an alternative airway device for reducing adverse outcomes.

**Discussion and Conclusions:** The majority of surveyed anesthesia providers observed some type of adverse effect with oral and nasal airways, which led to a noteworthy subgroup (52.8%) reporting the use of nasal airways orally. Study outcomes suggest a void in airway management options for deep sedation. Providers have indicated a need for improved airway devices that maintain a patent airway while mitigating adverse effects.

A3

## **Barriers to Physician Supervision Removal of Certified Registered Nurse Anesthetists in South Carolina**

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**Introduction:** CRNAs in South Carolina (SC) are required by statute to be supervised by a physician. This statute suggests to stakeholders that CRNA care must be supervised for safety. This limits access to care and increases the cost of providing anesthesia services. This study identified barriers and provided recommendations to South Carolina Association of Nurse Anesthetists (SCANA) for development of a strategic plan to achieve supervision removal in SC.

**Literature Review:** Literature notes barriers to removing supervision of CRNAs are resistance from the physician community, financial gains from billing for providing supervision, political campaigning and litigation by physician organizations, and state and institutional mandates. Research is needed to identify barriers in SC and to develop strategies to remove supervision language.

**Theoretical Framework:** This project's framework is adapted from Donabedian's quality of care framework. The current structure in SC is that physician supervision is required, the project's process is identifying barriers and strategies for achieving supervision removal, and the outcome is a strategic plan to remove physician supervision of CRNAs.

**Methodology:** By survey, phenomenological methodology was used to identify opinions, insight, attitudes, and knowledge of CRNAs on physician supervision and its removal in SC. This method was used to build, analyze, and identify themes within the dataset.

**Data Collection and Methods:** An 11-question electronic survey was disseminated via email to 1,064 CRNA members of SCANA. The purpose was to gain insight into CRNA knowledge of physician supervision requirements, perceived barriers that currently exist to its removal, and ranking of effective strategies. The survey was open for 17 days with 166 anonymous submissions and a response rate of 15.6%. Questions included select all that apply, dichotomous, multiple choice, rank order, Likert-type scales, and open-ended. Research Electronic Data Capture software was used to analyze the data for themes and patterns. A strategic plan was developed to address barriers and strategies to overcome.

**Results and Data Analysis:** SC CRNAs understand physician supervision, the CMS supervision requirement, and current SC statutes. SC CRNAs reported: lowest level of understanding of the CRNA role: legislators; supervision removal is "important" and "very important"; most significant barrier in removing supervision in SC: political resistance from physician organizations; and most effective strategy in removing supervision in SC: educating legislators on the CRNA scope of practice.

**Discussion and Conclusions:** Through literature review and data analysis, a strategic plan for achieving supervision language was developed. The recommendations in the strategic plan are classified into 4 categories: policy planning, mobilizing grassroots advocacy, forming relationships and educating legislators, and tackling political resistance from physician organizations. The strategic plan was presented to SCANA leadership.

A4

### **Intraoperative Handoffs Among Nurse Anesthetists**

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**Introduction:** Intraoperative handoffs can lead to patient care error. Standardized handoff protocols improve patient care quality and safety during intraoperative handoff patient care verbal communication. PATIENT transfer of care checklist protocol use among nurse anesthetists significantly reduces the rate of omission of essential patient care information as measured by handoff accuracy scoring.

**Literature Review:** Effective healthcare verbal communication during patient care handoffs leading to adverse events is a global and national healthcare problem. The Joint Commission (2017) and World Health Organization (2013) report handoff errors lead to medical error, patient harm, and increased healthcare costs. Standardizing handoff communication is a national priority safety goal.

**Theoretical Framework:** Transactional Model of Communication (Barnlund, 1970) proposes verbal communication is multilayered, information transacting feedback loop system shared between a sender and receiver in a handoff.

**Methodology:** Preinterventional/postinterventional (pre-/post-) survey, CRNA clinical practice quality improvement 8-week project design was implemented in a large metropolitan hospital using the Johns Hopkins Nursing EBP Model guidelines.

**Data Collection and Methods:** Convenience sample of 72 CRNA employees of a large urban metropolitan hospital surgical services anesthesia department are invited, and 52 CRNA volunteers enroll in a pre-/post- intervention mixed method survey 8-week clinical practice quality improvement DNP project (n=40 completed) using direct observation of 182 intraoperative handoffs measuring the omission of 11 items of essential patient care information. PATIENT transfer of care protocol (Wright, 2013) is the clinical practice change. Pre- (n=52)/post- (n=125) intervention handoffs were observed for verbal omission of patient care information using a handoff accuracy scoring tool (Bruno and Guimond, 2016).

**Results and Data Analysis:** PATIENT transfer of care process clinical practice change intervention significantly reduced rate of omission of 11 items of essential patient care information during intraoperative handoffs between nurse anesthetists (pre- = 6.12/post- = 8.19). CRNA survey satisfaction with the PATIENT handoff process was not significant.

**Discussion and Conclusions:** Standardized handoffs were not utilized among CRNAs prior to the clinical practice change intervention. The DNP project improved anesthesia provider understanding of how effective communication processes can improve intraoperative handoffs when using an evidence-based standardized handoff protocol.

A5

## **Methods of Preoperative Fasting Education and the Incidence of Prolonged Fasting in the Outpatient Surgery Population**

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**Introduction:** Preoperative fasting is crucial to avoid aspiration and prevent morbidity/mortality. Prolonged fasting can cause intraoperative complications, increase length of stay, and decrease satisfaction. The aim was to determine current fasting compliance rates for the outpatient surgery population, type and content of fasting education administered, and which method(s) had the highest degree of compliance.

**Literature Review:** Prolonged fasting occurs from a lack of patient understanding. Overfasting is perceived as safer to prevent adverse outcomes. Improved education to encourage hydration before surgery can reduce prolonged fasting. Solutions to standardize education include providing written instructions, personalized phone calls, and SMS/text message reminders.

**Theoretical Framework:** The Iowa Model guides clinical practice and patient outcomes. It describes a multiphase change process with feedback loops and is recognized for its application by multidisciplinary healthcare teams.

**Methodology:** A 16-question survey was administered to 435 patients when they arrived to check in the day of surgery. A 2-tailed t test was used to determine correlations between variables. A p-value of <0.05 was considered statistically significant.

**Data Collection and Methods:** The survey inquired about adherence to institutional fasting guidelines, education received, and patient demographics. Demographic data was categorical and expressed as number and percentage. Survey data was inserted into the RedCap system using a collection tool developed by the research team. This study's primary goal was to assess current fasting compliance rates as well as the content and type(s) of education that patients receive prior to surgery. Secondary aims were to evaluate compliance with each education type, identify how patients would like to receive future education, and assess if a change in the current practice is warranted.

**Results and Data Analysis:** Compliance with clear liquids was 34.7% with a correct perception of patient education at 55.8%. Instruction methods including an information brochure, telephone call, and other education were statistically significant to have the correct perception. Other methods were the patient online portal and the scheduler. There was a statistically significant improvement in education compliance when patients utilized an online resource for NPO education.

**Discussion and Conclusions:** Patients (44.4%) lack correct perception of preoperative NPO education. Most education is provided verbally or by an informational brochure. Forty-three percent of patients reported that they stopped drinking fluids at midnight. Fifty-one percent of patients want to receive education in formats not offered at the institution including email, text messages, and the patient portal. A change in current education is warranted.

## A6

### **Perioperative Use of Emend (aprepitant) for the Prevention of Postoperative Nausea and Vomiting in Children**

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**Introduction:** Emend is used for prevention of postoperative nausea and vomiting (PONV), and was recently added to the anesthesia preoperative orders at Nationwide Children's Hospital. During the perioperative period, there is limited data regarding its use in pediatrics. The purpose of this study is to review its initial perioperative use in a busy tertiary care pediatric operating room setting

**Literature Review:** Emend works through blockade of the neurokinin-1/substance P system, and has been shown to effectively control PONV in adults. During the perioperative period, there is limited data regarding its use in pediatric patients, although it has been used in the prevention of nausea and vomiting in children receiving chemotherapy.

**Theoretical Framework:** Emend has not been used to control PONV in pediatric patients until recently. This study aims to review its introduction and utilization in the perioperative setting at a pediatric hospital.

**Methodology:** Since the introduction of Emend to the OR formulary, pharmacy services has been tracking its use on a monthly basis. A retrospective chart review was conducted using the pharmacy database to analyze all cases of its perioperative use.

**Data Collection and Methods:** We retrospectively reviewed the records of all patients who received Emend perioperatively. The following data were retrieved: age, weight, gender, history of PONV, conditions that may increase the risk of PONV, contraindications to the use of routine antiemetic agents, type of surgery, planned inpatient or outpatient, and length of stay. The formulation of Emend (capsule or liquid) administered was noted. Intraoperative data included the use of opioids, the use of other antiemetic agents, and the type of anesthesia used. Efficacy was also assessed by reviewing the records for PONV or the administration of other antiemetic agents.

**Results and Data Analysis:** The study cohort (N=31) had an average age of 15.7 years. There were 15 males and 16 females. The most common types of surgery included gastrointestinal (10) and otolaryngological (5). The majority of patients (25) had intraoperative opioids. All patients had at least 1 intraoperative antiemetic, with 21 of them receiving both ondansetron and dexamethasone. One patient had PONV in PACU, while 3 others had PONV in the initial 24 hours following surgery.

**Discussion and Conclusions:** The addition of Emend preoperatively to the PONV prophylaxis regimen was effective in preventing PONV in 87% of pediatric surgical patients. The primary indications for giving Emend were a prior history of PONV and/or concerns regarding the emetogenic potential of the procedure. Due to a limited sample size, we were unable to determine whether any of the study variables were associated with PONV.

A7

## **Reducing Implicit Bias in Healthcare Providers: A Quality Improvement Project in an Anesthesia Department**

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**Introduction:** Implicit bias (IB) is a provider factor that leads to a racial disparity in pain management between African American (AA) and non-Hispanic White (NHW) patients. If treated like a habit, bias can be changed through the use of bias assessments and recognition techniques. A multidimensional implicit bias training program was implemented to decrease implicit bias and reduce the impact of this racial disparity.

**Literature Review:** Most healthcare providers (HCPs) explicitly state they do not have bias yet test high for racial implicit bias. This bias causes providers to give less pain medication to AAs compared with NHWs. Studies in other fields have shown that IB can be reduced by training. Multifaceted training techniques can ensure equal treatment for all patients regardless of race

**Theoretical Framework:** A framework for HCP implicit bias training include a safe environment, IB science, its influence on behaviors, IB self-awareness, methods to overcome IB, and awareness of how IB influences others.

**Methodology:** The Johari Window model creates domains of awareness. It can be applied to the situation of HCPs being unaware of the biases that can affect AAs and the management of their pain. Implicit bias training expands the provider awareness domain.

**Data Collection and Methods:** This project employed a single group, within-subjects predesign/postdesign. CRNA demographics, IB, explicit bias, and racial pain disparity knowledge were assessed at intervals. Implicit bias was assessed using the Implicit Association Test (IAT). Explicit biases were assessed using the Racial Attitudes Toward AAs scale and Concerns About Discrimination scale. Knowledge about pain disparities between AAs and NHWs was assessed with the Biological Differences Between Blacks and Whites scale. Assessments were administered using a computerized survey program via email. The sample included CRNAs that completed all preassessments and postassessments and training.

**Results and Data Analysis:** Before the intervention all 67% of CRNA participants were found to have implicit bias against AAs, while their explicit bias results showed that they had no bias. After the implementation of the implicit bias reduction training, 67% of CRNAs showed a reduction in their IB while explicit measures of bias remained the same. The CRNA sample was 58% female, 92% white, with a the majority being middle aged, from suburban neighborhoods.

**Discussion and Conclusions:** HCP implicit bias has been shown to lead to disparities in care, including the management of pain. By providing HCPs with a measurement of their biases and incorporating bias training and education, implicit bias can be reduced, and this could lead to improved patient care. In the future, similar programs might be useful in other anesthesia departments, as well as educational program.



A8

## **The Perception of Radiologic Education in Anesthesia Practice By Certified Registered Nurse Anesthetists**

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**Introduction:** Among the many advanced modalities of care, a CRNA is disciplined in its chest x-ray interpretation. CRNAs use medical images for both planning and evaluation. The author suspects the skill sets among CRNAs in practice could vary based on the doctoral/master's degree-level education language, and suggests investigating the current status of radiologic interpretation and the education it was created from.

**Literature Review:** With the exception of 2 continuing education units from the *AANA Journal*, there was no literature with regard to the quality or methods of education in learning the fundamental knowledge or interpretation of chest radiology by CRNAs. Only the requirements set forth by the National Board of Certification and Recertification for Nurse Anesthetists and the Council on Accreditation of Nurse Anesthesia Educational Programs have listed such education as required.

**Theoretical Framework:** As an exploratory investigation, this will be used to assist in creating a theoretical framework.

**Methodology:** A survey was developed that addressed the following questions: What kind of training in radiologic interpretation have CRNAs received? What opinions do CRNAs have about their confidence to read a chest x-ray for line or ET placement? What opinions do CRNAs have for the need for radiologic education?

**Data Collection and Methods:** Electronic questionnaire survey was accessed by participants by randomly selected practicing CRNAs via the Research Survey Services and Assistance (via the AANA) for a 4-week survey period. Three thousand email invitations were sent.

**Results and Data Analysis:** A total of 221 surveys were returned. With a population size of roughly 53,000 and a confidence interval of 95% and a margin of error of 5%, approximately 382 surveys would have been needed. Descriptive characteristics and cross-tabulation were carried out for all questions. The data failed to meet basic requirements for cross-tabulation but were adjusted for small sample size in order to look for possible relationships.

**Discussion and Conclusions:** Although limited by the sample size, the opinion of the respondents indicated that they felt there should be more radiologic education in both the nurse anesthesia program and as continuing education. Radiologic education of current practicing CRNAs was considered absent by those who responded to the survey.

# Quantitative Research

A9

## Adjuvant Use of Dexmedetomidine Versus Clonidine in Interscalene Blocks to Decrease Postoperative Opioid Consumption in Shoulder Arthroplasty Patients

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**Introduction:** Currently, opioid administration is the standard for treatment of postoperative pain but is accompanied by a variety of significant side effects such as constipation, nausea, vomiting, drowsiness, respiratory depression, death, physical dependence, and misuse. Research evidence has shown a reduction in intraoperative and postoperative opioid consumption when ultrasound-guided peripheral nerve blocks are performed. Medical advances have resulted in the use of adjuvants in regional techniques to prolong blockade and provide additional analgesia efficacy. Two alpha-2 adrenergic receptor agonists, clonidine and dexmedetomidine, have been adopted as adjuvants in regional anesthesia. These medications bind to the alpha-2 adrenoceptors presynaptically and postsynaptically resulting in proration of pain transmission signals and decrease in sympathetic activity. With the use of these medications as adjuvants in peripheral nerve blocks, it can decrease acute pain with an aftereffect of reduction in opioid consumption.

**Theoretical Framework:** The framework around this study is observing opioid use following shoulder arthroplasty when patients are pretreated with either dexmedetomidine or clonidine adjuvants in an interscalene block.

**Literature Review:** An extensive literature review was completed over the following: shoulder arthroplasty, current treatment for pain status post shoulder arthroplasty, the alpha-2 receptor, pharmacokinetics of dexmedetomidine and clonidine and its use in regional blocks, and the opioid crisis.

**Research Design:** Retrospective chart review studying the effect of dexmedetomidine versus clonidine in an interscalene block and postoperative opioid consumption.

**Methods:** Patients undergoing shoulder arthroplasty were treated with an interscalene block with adjuvant medication being clonidine or dexmedetomidine. Four surgeons and 3 anesthesiologists were observed. Patients included were > 50 but < 90, with an ASA score less than or equal to 3. No preoperative opioid administration was given and intraoperative fentanyl was limited to 100 mcg.

**Data Collection:** A retrospective chart review of patients from the dates of 1/2017 through 12/2018 observing TSA with an interscalene block with either dexmedetomidine or clonidine. Opioid consumption was collected calculating 12-hour and 24-hour opioid consumption along with blockade duration.

**Results and Data Analysis:** Statistical analysis using a paired 2-tailed t test was completed over the collected data. Morphine milligram equivalence did not differ between adjuvant medications dexmedetomidine and clonidine during 12-hour MME ( $p = 0.4051$ ) and 24-hour MME ( $p = 0.1610$ ) postperipheral nerve blockade. There also was no statistical significance between the sensory block duration of the 2 groups ( $p = 0.6199$ ).

**Discussions and Conclusions:** Patients who received either alpha-2 agonist, clonidine, or dexmedetomidine in interscalene blocks for shoulder arthroplasty did not consume fewer opioids when compared with its over the counter medication. This study supports there is no added benefit using clonidine over dexmedetomidine or vice versa.

## A10

### **Anesthesia Care Team Type and Hospital Characteristics: Are Decreased Levels of Supervision Associated With Different Acuties and Outcomes?**

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**Introduction:** In recent decades, anecdotal evidence suggests a shift from QX (medical direction) to a QZ team approach, which does not require compliance with restrictive TEFRA regulations on practice and staffing ratios. This new model has not been studied in terms of characteristics or outcomes but has the potential to increase CRNA autonomy with cost savings. We sought to describe and quantify this model.

**Theoretical Framework:** Previous research has shown no difference in outcomes between different providers but needs to be extended to examine the QZ team model, as well as quantifying the similarities in patient population.

**Literature Review:** A large body of evidence has shown no difference in outcomes between anesthesia providers but has not accounted for conflation of independent CRNA practice with QZ team, since there is no distinguishing modifier.

**Research Design:** The study is a retrospective, correlational design using existing databases. We compared 4 models: independent MD, medical direction, QZ team, and independent CRNA.

**Methods:** The sample was created from the 2013 Medicare 5% Limited Data Sets: provider, inpatient, denominator, and hospital characteristics. We excluded patients under 65 and outpatient surgery, otherwise cases with an anesthesia bill were used. To distinguish between independent CRNA and QZ team (same billing code), we used the 2014 Physician Compare database.

**Data Collection:** Charlson Comorbidity Index (CCI) was calculated using 2013 Medicare inpatient, base units from provider, mortality and demographics from denominator databases. Provider entry into the Physician Compare is delayed, so we examined the 2014 file.

**Results and Data Analysis:** QZ team accounted for 16% of all cases compared with 39% that were medical direction. Independent CRNA practice accounted for 3.7%, and was mostly rural. Base units and CCI ranged from 6.2 to 7.8 and 2.17 to 2.51, which was statistically significant between models (ANOVA,  $p < 0.001$ ). However, the clinical relevance is questionable, especially between team practices. Poisson regression for 48-hour mortality showed no difference between independent providers, but team practices, hospital size, and age were all associated with increased rates ( $p < 0.005$ ).

**Discussions and Conclusions:** Lightly supervised (QZ) team anesthetics account for a sizable proportion of all cases, and have a markedly similar profile of comorbidity and surgical complexity compared with medical direction. The large effect of hospital factors on mortality suggests limited importance of model type in determination of provider choice. Future work should further examine this cost-efficient team approach.

## A11

### **Anesthetic Techniques for Total Hip Arthroplasty**

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**Introduction:** Anesthetic technique choices can impact the perioperative course and recovery for patients. The aim of this retrospective chart review was to evaluate the overall effect of different anesthetic techniques on patients undergoing total hip arthroplasty (THA). The outcome measures include intraoperative and postoperative opioid consumption and postoperative visual analog scale pain scores.

**Theoretical Framework:** The Donabedian model was selected to guide this research project. The model consists of 3 distinct parts: structure, process, and outcome with the goal of improving patient outcomes.

**Literature Review:** Research has shown single-shot lumbar plexus blocks with neuraxial anesthesia to be an effective strategy for improving outcomes for patients undergoing total hip arthroplasty. This research builds on prior research that evaluated anesthetic techniques for THA.

**Research Design:** A retrospective chart review of anesthetics were administered between 2015 and 2017 for THA patients. Data was collected for opioid consumption and VAS pain scores for 3 anesthetic techniques: general anesthesia (GA) alone, GA with lumbar plexus block (LPB), and spinal anesthesia with LPB.

**Methods:** Sixty-two patients between 2015 and 2017 at an academic medical center met inclusion criteria. Twenty-five patients received GA with LPB, 25 patients received spinal anesthesia with LPB, and 12 patients received GA alone. Statistical analysis was conducted to evaluate differences between the 3 arms of the study.

**Data Collection:** Data was manually collected using a REDcap database on demographics, opioid consumption, VAS pain scores, and administration of other anesthetic agents. Data were collected for opioid use and pain scores in 12-hour intervals up to 48 hours postoperatively.

**Results and Data Analysis:** Data were analyzed using ANOVA and a linear mixed model approach. Opioid consumption was significantly greater in the GALPB group relative to the NALPB group for all time intervals ( $p = 0.002$ ). There were significant differences in the intraoperative ME received in the NALPB group relative to both the GA and GALPB group with the NALPB group receiving significantly less ME ( $p = <0.003$  and  $p = <0.001$ ). No difference was found between the groups for VAS pain scores.

**Discussions and Conclusions:** The results of this project demonstrate the benefits of neuraxial anesthesia over general anesthesia for opioid consumption. The spinal anesthesia technique decreases opioid consumption over time compared with general anesthesia. This study builds on prior research but has limitations. Further research is needed to determine the impact of lumbar plexus blocks in total hip arthroplasty.

A12

**Assessing Baseline and Postdischarge Risk Factors in Subjects With and Without Sleep Apnea Undergoing Endoscopy With Deep Sedation**

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**Introduction:** Ambulatory surgery poses problems for patients with obstructive sleep apnea (OSA) because narcotics and anesthetics used during surgery can complicate the negative effects of OSA, leading to cardiac events, brain hypoxia, and even death. This study was designed to evaluate the prevalence of cardiopulmonary risk factors among postendoscopic patients with diagnosed and undiagnosed sleep apnea.

**Theoretical Framework:** Reason's SCM holds that errors are not caused by inevitable human mistakes, but by an organization's incomplete layers of error protection that allow errors to pass through unchecked to harm.

**Literature Review:** Based on the literature review, there has not been a study that has quantified both the cardiac and pulmonary risk factors that ambulatory surgical patients undergoing endoscopies may be susceptible to in the immediate postoperative period

**Research Design:** This quantitative study utilized a prospective, descriptive cross-sectional design and incorporated a pretest/posttest data collection approach. This study is objective and quantitative because the data yielded quantifiable answers to closed-ended research questions.

**Methods:** Patients were recruited preprocedure to obtain POX, actigraph and resting baseline ECG. Postsedation-procedure values (actigraph, POX and ECG) for the following 24 hours were retrieved. A p-value less than 0.05 was considered to be statistically significant. A target sample included 50 adult outpatients from a Florida suburban endoscopy center.

**Data Collection:** Expedited IRB approval was obtained from VCU. Subjects were recruited until sample requirements were met. The instruments were STOP-Bang survey, preprocedure 12-lead ECG, POX, and actigraph, followed by 24-hour postprocedure ECG monitor, POX, and actigraph.

**Results and Data Analysis:** Pulse oximetry and Actigraph scores revealed no difference based on OSA. The ANOVA for oxygen desaturation events and sleep quality indices reflected no differences across groups. Sleep quality had no measurable influence on adverse events and was similar across groups; participants diagnosed with OSA slept longer than those in the untreated or no OSA group. Regressions for sleep quality indices reflected no differences among groups.

**Discussions and Conclusions:** There remains a lack of literature on cardiopulmonary and ECG indicators of cardiac risks in patients with OSA in the 24 hours following discharge from ambulatory surgery. This study characterized the ECG, pulse oximetry, and Actigraph at baseline and postdischarge among 50 postendoscopy outpatients with OSA and without OSA. Further research is recommended.

**Funding Sources:** This study was funded by a research grant from the AANA Foundation.

## A13

### **Assessment of Military Personnel, Veterans, and Family Taking Dietary Supplements at Tripler Army Medical Center**

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**Introduction:** Dietary supplements (DS) side effects and interactions with medications can lead to increased surgical morbidity and mortality. There is a void in data related to DS consumption and patient knowledge of DS. The purpose of this project was to study the frequency of use, supplements used, knowledge base among military beneficiaries, and veterans consuming DS during the preoperative period.

**Theoretical Framework:** Based on the IOWA model of EBP, a survey tool was developed to solicit quantifiable data regarding DS use in preoperative patients and their knowledge of potential adverse effects of DS interactions.

**Literature Review:** Surgical patients appear to use DS and herbal supplements (HS) more frequently than the general population. Furthermore, studies have demonstrated a higher prevalence of DS use among military personnel compared with the civilian population.

**Research Design:** This is an experimental quantitative survey study. A convenience sample of at least 400 adult subjects without mental illness was calculated and after IRB exemption data collection occurred preoperatively via SurveyMonkey. Participation was voluntary and data remained unidentifiable.

**Methods:** Data was collected in preoperative anesthesia clinics during preanesthetic evaluations, or in holding areas immediately prior to surgery, using the validated tool “Knowledge Assessment of Military Personnel and Family Taking Herbal Supplements” electronic survey. The convenience sample was 449 subjects from Tripler Army Medical Center in Hawaii.

**Data Collection:** Data were voluntarily, anonymously, and verbally obtained from subjects using SurveyMonkey. Collected data included: sex, age, rank, beneficiary status, race, BMI, tobacco use, marital status, and knowledge of DS side effects and drug interactions.

**Results and Data Analysis:** For demographic data, frequencies and proportions were provided for qualitative variables, and means/standard deviations for quantitative data. Of the 449 subjects interviewed, 27.8% or 125 subjects reported taking at least 1 dietary supplement. The most frequently used supplement were multivitamins at 26.4% followed by fish oil/omega-3 fatty acids at 8.8%. Notably, we found that only 22.4% of patients were aware of any potential side effects and only 8% were aware of potential drug interactions.

**Discussions and Conclusions:** We found a large knowledge gap regarding patient knowledge of DS, which may have negative effects on surgical outcomes. Our results validate the prevalence of DS use among military beneficiary surgical patients is substantial. Thus, this knowledge gap provides opportunities for CRNAs to improve preoperative assessments and education regarding DS use to decrease potential surgical complications.

**Funding Sources:** This study was generously funded by a TriService Nursing Research Program (TSNRP) research grant.

A14

## **Comparison of Ondansetron, Dexamethasone, and its Combination in the Prevention of Postoperative Nausea and Vomiting**

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**Introduction:** Postoperative nausea and vomiting (PONV) is a common and adverse event of general anesthesia. The Apfel score identifies 4 independent risk factors associated with PONV; female gender, nonsmoker, postoperative opioid use, and history of PONV or motion sickness. This project compares the rate of PONV by the prophylactic antiemetics administered with consideration of patient risk factors.

**Theoretical Framework:** This project utilizes the Donabedian model of structure, process, and outcome. This framework evaluates the quality of patient care services and identifies areas for quality improvement.

**Literature Review:** The Society for Ambulatory Anesthesiology (SAMBA) recommends combination interventions for patients at high risk for PONV. Multiple randomized controlled trials support the greater efficacy of combination antiemetic prophylaxis for surgical patients.

**Research Design:** IRB granted exemption for this project. A retrospective chart review compared the rate of PONV for surgical patients who received ondansetron, dexamethasone, or the combination of both prophylactic antiemetics.

**Methods:** The project was conducted at an academic medical center. Inclusionary criteria were adult surgical patients who received general anesthesia in 2018. Emergency, pediatric, and obstetric cases were excluded. PONV outcome was defined by nursing assessment charting or if antiemetics were needed in the recovery period.

**Data Collection:** Data for 12,193 patients were securely extracted and stored in a HIPPA compliant database. Information gathered included patient PONV risk factors, surgery type, and administration of ondansetron or dexamethasone in the perioperative period.

**Results and Data Analysis:** The PONV rate in a 24-hour period was 19% for ondansetron, 22% for dexamethasone, and 23% for the combination of both antiemetics. With zero Apfel risk factors, antiemetics had no effect on PONV outcome. With 1 risk factor, there was a small effect on PONV outcome with ondansetron and its combination treatment but without clinically significant results. When there were at least 2 risk factors, all prophylactic antiemetic choices significantly reduced PONV.

**Discussions and Conclusions:** This project demonstrated that combination therapy of prophylactic ondansetron and dexamethasone had similar reductions in PONV rates as the administration of individual medications. Antiemetics most benefited surgical patients who were at higher risk for PONV. Patients with no PONV risk factors do not require prophylactic antiemetics.

## **Comparisons of Preoperative Blood Pressures in Surgical Patients**

*Brian Stacy, BSN, RN; Kenneth Daratha, PhD*

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**Introduction:** A consensus has not been established on which blood pressure to use as the surgical patient's baseline. Preoperative blood pressures have been shown to vary. Differences in patient care and outcomes may occur depending on the blood pressure considered to be "baseline" by the anesthesia provider. The purpose of this project was to compare blood pressures leading up to surgery in surgical patients.

**Theoretical Framework:** The Donabedian structure, process, and outcome model guided this project. This model connects anesthesia provider decision-making to the ultimate goal of improved patient care.

**Literature Review:** Studies demonstrate significant elevation in the first blood pressure measured in the operating room compared with preoperating room pressures. More dramatic elevation is seen in patients with cardiovascular disease.

**Research Design:** IRB granted exemption. This observational, retrospective, descriptive project sought to measure mean blood pressures in surgical patients in a variety of care settings leading up to surgery. The number of cardiovascular risk factors associated with blood pressure variability was examined.

**Methods:** This project was conducted at a tertiary care center in the Pacific Northwest. Adult, elective surgical patients who received general anesthesia were included. Mean blood pressures from the presurgical ambulatory period, the surgical admit unit, and the first blood pressure in the operating room were calculated.

**Data Collection:** Data from 6,081 adult, elective surgical patients who were intubated between September 30, 2017 and October 1, 2018 were extracted for analysis. Cases where blood pressures from each care setting were not recorded were excluded.

**Results and Data Analysis:** Mean systolic pressure varied significantly between patient care settings, with the first blood pressure in the operating room significantly elevated from the ambulatory period. This variation became more extreme as the number of cardiovascular risk factors increased. Repeated-measures ANOVA and pairwise *t* testing was used to determine the significance of the findings. Differences in systolic blood pressure were statistically and clinically significant; differences in mean arterial pressure were neither statistically nor clinically significant.

**Discussions and Conclusions:** Significant elevation in mean systolic blood pressure from the presurgical ambulatory period to the first blood pressure in the operating room was observed in this project. Changes in mean arterial pressure were clinically and statistically insignificant. The findings suggest that overtreatment for hypotension may occur if the first systolic pressure in the operating room is used as a baseline.



**Continued Professional Certification Beta Research Study**

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National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA)

**Introduction:** The National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA) launched the Continued Professional Certification program (CPC) for Certified Registered Nurse Anesthetists (CRNAs) in 2016. The CPC assessment (CPCA) begins in 2020. The purpose of this study was to compare differences in CPCA performance under different testing modalities and proctoring conditions.

**Theoretical Framework:** Allowing CRNAs to have the ability to take the CPCA remotely and use of resources may help reduce test anxiety and improve performance on the CPCA.

**Literature Review:** A systematic review conducted in 2016 concluded that testing should assess knowledge as 1 component of competence, promote lifelong learning, and allow the examinee access to resources normally available in the provision of patient care.

**Research Design:** A prospective, randomized, quasi-experimental design was used.

**Methods:** A total of 1,500 CRNA volunteers were randomized by gender, age group, and year of certification into 1 of 6 groups based on method of proctoring (in-person or remote) and use of resources (closed book, open book with NBCRNA-provided electronic resources, or open book with use of hard copy resources).

**Data Collection:** Data were collected in 3 phases: a preassessment survey, the CPCA (given at home or testing center), and a postassessment survey. Pre-CPCA and post-CPCA surveys were sent via electronic mail with a link to Survey Monkey prior to and following the CPCA.

**Results and Data Analysis:** Scores were higher in the resource groups, but test times were twice as long. The CPCA was perceived as moderately to highly difficult; those in the closed book in-person group rated it less difficult when compared with the open book remote group. Assessment times were 25 minutes longer in the remote group and a moderate amount of problems occurred. Of those who used resources, 84.2% used it to confirm an answer and 40% indicated problems with electronic resources. Half agreed the CPCA accurately reflected core knowledge all CRNAs should know.

**Discussions and Conclusions:** Use of resources significantly increased test scores; however, no significant difference was found in meeting performance standard across conditions. Subjects experienced a moderate degree of problems with remote proctoring and eBooks, but responses indicated that remote proctoring may reduce test anxiety. Future CPCAs will be delivered as closed book with choice of in-person or remote proctoring.

**Funding Sources:** National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA)

## A17

### CRNA Attitudes and Beliefs Toward Use of the 2017 ACC/AHA Clinical Practice Guidelines for Management of Hypertension in the Perioperative Setting

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Oakland University

**Introduction:** In 2017, the American College of Cardiology (ACC) and the American Heart Association (AHA) initiated guidelines for the prevention, detection, evaluation, and management of high blood pressure in adults. The purpose of this study was to identify (1) the attitudes and beliefs of CRNAs regarding the 2017 guidelines for the management of hypertension in the perioperative setting; (2) self-reported adherence to the guidelines; and (3) barriers to adherence.

**Theoretical Framework:** Donabedian model for assessing health services and evaluating quality of care provided the framework for this study.

**Literature Review:** Hypertensive patients are at risk for intraoperative hemodynamic instability that may lead to stroke or myocardial ischemia. Despite widely disseminated practice guidelines, there is little published evidence regarding the management of perioperative hypertension.

**Research Design:** A descriptive survey design was used to examine the attitudes and beliefs of CRNAs toward use of the 2017 ACC/AHA clinical practice guidelines for management of hypertension in the perioperative setting.

**Methods:** A convenience sample of Michigan CRNAs received an anonymous survey via email. The survey tool included 10 attitudinal statements about practice guidelines in general and 10 parallel statements about the 2017 ACC/AHA guidelines. In addition, an open-ended question asked respondents to identify any barriers they encountered in adhering to the guidelines.

**Data Collection:** An email invitation to participate in the study was sent to 2,400 CRNA members of the Michigan Association of Nurse Anesthetists. The anonymous survey was delivered via Qualtrics over a 3-week period. All data were deidentified and reported in aggregate.

**Results and Data Analysis:** Overall, CRNAs agree that guidelines are important, help to standardize care, and improve patient outcomes. When asked if they were familiar with the 2017 ACC/AHA guidelines, less than half selected a response denoting that they were (41.1 %) while more (45.8%) responded that they were not ( $M = 3.78$ ;  $SD = 1.6$ ). The most prevalent barriers to adherence identified by those providing an open-ended answer were unfamiliarity with the guideline (100%), department policies (30%), and practice restrictions (30%).

**Discussions and Conclusions:** Hypertension is a frequent observation in perioperative practice settings. Studies have shown that the uptake and implementation of practice information does not always occur with the simple dissemination of knowledge. Although CRNAs appreciate and adopt many practice guidelines, awareness of the specific 2017 ACC/AHA guidelines was not evident in the population surveyed. Removal of barriers such as practice restrictions may improve acceptance and adherence.

A18

## Effects of Dexmedetomidine Administration on *Drosophila melanogaster* With Leigh Syndrome

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Webster University

**Introduction:** There is currently a lack of evidence-based research regarding the anesthetic care of patients with a known mitochondrial disease. In order to provide research evidence that explores the anesthetic management of mitochondrial disease, this study tested the effects of dexmedetomidine on *D. melanogaster* with Leigh syndrome (LS), a model commonly used for biological experimental studies.

**Theoretical Framework:** This study utilized a theoretical framework that included implementation of the scientific method applied to quantitative research in a laboratory setting.

**Literature Review:** Dexmedetomidine has been shown to increase mitochondrial neuroprotective effects in model organisms. The neuroprotective property of dexmedetomidine suggests that it may be a choice anesthetic agent for patients with mitochondrial disease.

**Research Design:** The research design for this study was experimental and was completed in a laboratory at Webster University in St. Louis.

**Methods:** Mutant *D. melanogaster* heart rates, in the larval stage of development, were assessed after the administration of dose dependent dexmedetomidine. Experimental groups included *D. melanogaster* with global gene knockdown in both NDB8 and SURF1 genes that were exposed to dexmedetomidine.

**Data Collection:** The pharmacological effects of dexmedetomidine on larval heart rates was assessed by using a microscopic method and then statistically analyzed using a 1-way ANOVA and Tukey test.

**Results and Data Analysis:** There was no significance in WT vs NDB8 or SURF1 (n=124, 74, and 76), respectively, after acute exposure of dexmedetomidine ( $p>0.05$ ). When statistically compared, there was no significance between WT vs NDB8 or SURF1 (n=60 for each group) after chronic exposure to dexmedetomidine. To confirm the amount of expressed gene knockdown, there was significance in the amount of SURF1 RNAi expression when compared with WT RNA ( $p=0.0131$ ). However, there was no significance in the NDB8 expression when normalized to ACT and GAP ( $p>0.05$ ).

**Discussions and Conclusions:** This is a pilot study of the physiological effects of dexmedetomidine on *D. melanogaster* with Leigh syndrome. There was no effect on heart rate in the experimental groups when exposed to the independent variable. This study may be used as a foundation for future research in order to move toward evidence-based practice as it relates to the anesthetic management of patients with mitochondrial disease.

## A19

### **Effects of Humerus Intraosseous Administration of Epinephrine in a Normovolemic and Hypovolemic Porcine Model**

*Joseph O'Sullivan, PhD, CRNA; Don Johnson, PhD, RN; Dawn Blouin, BS*

US Army Graduate Program in Anesthesia Nursing

**Introduction:** The purposes of this study were to compare the maximum concentration (C<sub>max</sub>), time with maximum concentration (T<sub>max</sub>), mean concentration, rate of return of spontaneous circulation (ROSC), time to ROSC, and odds of ROSC when epinephrine was administered by humerus intraosseous (HIO) compared with intravenous (IV) routes in both a hypovolemic and normovolemic cardiac arrest model.

**Theoretical Framework:** Both endogenous and exogenous administered catecholamines may cause vasoconstriction to the bones that may alter the delivery of epinephrine from the bone into the systemic circulation.

**Literature Review:** We speculated that epinephrine administration in a hypovolemic compared with a normovolemic model may change many factors. No studies to date have investigated the effect of hypovolemia on these factors when epinephrine is administered.

**Research Design:** Quantitative, experimental, between groups design was used.

**Methods:** Twenty-eight swine were randomly assigned to 4 groups: HIO normovolemia and hypovolemia; IV normovolemia and hypovolemia. The hypovolemic groups were exsanguinated 31% of their blood volume and placed into arrest. CPR was then initiated, and 1 mg epinephrine was given by IV or HIO routes. Blood samples were collected; then albumin 5% was given. CPR continued until survival or for 30 minutes.

**Data Collection:** We randomly assigned 28 male animals (60-80 kg) to 1 of 4 groups: IV and HIO normovolemic; IV and HIO hypovolemic; IV and HIO normovolemic. The humerus was used as it is very vascular, commonly used for fluids/drugs, and does not interfere with CPR.

**Results and Data Analysis:** We calculated a large effect size of 0.6 based on previous similar research. Using an  $\alpha$  of 0.05, a large effect size of 0.6, and a power of 0.8, we calculated that we needed a sample size of 28 ( $n = 7$  per group). We performed power analysis using multivariate analyses of variance (MANOVA) that indicated no significant differences in pretest data between each group data by group indicating the groups were equivalent. A MANOVA indicated significant differences in C<sub>max</sub> by group.

**Discussions and Conclusions:** The HIO is an effective route in a normovolemic model. However, restoration of sufficient blood volume is essential for ROSC in a hypovolemic scenario.

**Funding Sources:** TriService Nursing Research Program

## A20

### **Effects of Pregabalin on Neurobehavior in an Adult Male Rat Model of PTSD**

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US Army Graduate Program in Anesthesia Nursing

**Introduction:** Effective approaches to prevent and treat PTSD are important areas of basic science research. Pregabalin (PGB), a derivative GABA, possesses the potential to positively affect neurobehavioral changes associated in PTSD. Using a rodent model of PTSD, the aims were to determine the effects of PGB as a possible prevention for the development of PTSD-like symptoms and its use as a possible treatment.

**Theoretical Framework:** In a 3-day restraint tail-shock PTSD rodent model, we evaluated the preventative and treatment effects of preshock and postshock administration of PGB in anxiety, locomotion, memory, and depression.

**Literature Review:** Numerous pharmacological compounds have been tested in an attempt to alleviate the symptoms of PTSD. PGB, a gabapentinoid derivative of  $\gamma$ -aminobutyric acid possesses the potential to positively affect neurobehavioral changes associated with PTSD.

**Research Design:** In an experimental prospective between groups design, 60 male Sprague-Dawley rats were randomly assigned into 6 groups: control vehicle, control PGB, control naïve, PTSD vehicle, PTSD pre-PGB (prophylactic), and PTSD post-PGB (nonprophylactic).

**Methods:** After the 3-day restraint-shock procedure to induce PTSD, dependent on group assignment, PGB was administered for 10 days. The behavioral components were evaluated using the elevated plus-maze (EPM) for anxiety, Morris water maze (MWM) for memory, and forced swim test (FST) for depression. Data were digitalized via AnyMaze software.

**Data Collection:** Data was collected via video and AnyMaze software which digitalized and quantified the data from the EPM and MWM. Data from the FST were measured with a stopwatch by blinded members of the research team.

**Results and Data Analysis:** Data were analyzed using a 1-way ANOVA for each of the outcome variables with a Tukey HSD post hoc test. PGB administered 24 hours before the initial PTSD event increased the water and food intake significantly, suggesting a resiliency to developing PTSD sequelae. However, PGB administered 24 hours before the initial PTSD event or for 10 days following the last PTSD stress event did not statistically improve mean open arm exploration on the EPM, spatial memory, learning in the MWM, or behavioral despair measured by the FST ( $p > 0.05$ ).

**Discussions and Conclusions:** PTSD is a devastating outcome of distressing events. It is essential to investigate other potentially superior treatments to prevent and mitigate sequelae from PTSD and to elucidate alternative treatments. The results of this study suggest that treatment with PGB prior to exposure of a stressful event may increase resilience and possibly decrease the development symptoms related to PTSD.

**Funding Sources:** Funding is provided by a TriService Nursing Research Program (TSNRP) grant and was conducted at the US Army Institute of Surgical Research (USAISR).

## A21

### **Effects of Pregabalin on PTSD-Induced Changes in Rat Brain Gene Expression**

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US Army Graduate Program in Anesthesia Nursing

**Introduction:** Finding effective modalities to prevent and treat PTSD continues to challenge medical researchers globally. Pregabalin (PGB) has the potential to prevent or reduce the gene expression changes associated with PTSD. Using a rodent model of PTSD, the purpose was to determine the effects of PGB as a prophylactic modulator of PTSD-induced changes in gene expression and its use as a potential therapy.

**Theoretical Framework:** To evaluate the preventative and treatment effects of preshock and postshock administration of PGB on PTSD-induced changes in gene expression in a 3-day restraint tail-shock PTSD rodent model.

**Literature Review:** PTSD causes physiologic and structural changes in the hippocampus and amygdala secondary to hyperactivity of several hormones and neurotransmitter systems. PGB decreases the release of several of these chemical messengers.

**Research Design:** In a prospective, experimental, between groups design, 60 male Sprague-Dawley rats were randomly assigned into 6 groups: control vehicle, control PGB, control naïve, PTSD vehicle, PTSD pre-PGB (prophylactic), and PTSD post-PGB (nonprophylactic).

**Methods:** We evaluated PTSD-induced gene expression changes in the amygdala and hippocampus of 60 Sprague-Dawley rats. Rats were exposed to a 3-day restraint-shock procedure along with a PGB administration protocol. Subsequently, amygdalae and hippocampi tissue samples were harvested and sent to Qaigen for gene analysis using the RT2 Profiler PCR Array.

**Data Collection:** Following the restraint-shock and medication protocol, rats were euthanized with isoflurane. Their hippocampi and amygdalae were dissected, snap frozen, and sent to Qaigen lab for gene expression analysis using the RT2 Profiler PCR Array.

**Results and Data Analysis:** Amygdalar and hippocampal samples were analyzed for gene expression changes. One-way ANOVA was used to detect amygdalar and hippocampal differences between groups. Of 94 genes examined, 67 amygdalar and 61 hippocampal genes had large effect sizes greater than 0.138. Several amygdalar and hippocampal genes related to glutamate and GABA were significantly increased in response to PTSD stress, with some having a more than 2-fold change. The upregulation of certain glutamate and GABA related genes was ameliorated by both preshock and postshock PGB.

**Discussions and Conclusions:** PTSD causes tragic personal unrest when untreated. It is vital to search for superior and alternative medical therapies that may reduce the severity of PTSD's consequences. The results of this study highlight gene expression changes after stress exposure, along with the prevention of some neuronal changes after PGB use. Our study adds to the PTSD knowledge base and may lead to innovative therapies.

**Funding Sources:** Funding is provided by a TriService Nursing Research Program (TSNRP) grant and was conducted at the US Army Institute of Surgical Research (USAISR).

**General Anesthetic Induction Sequence High Fidelity Simulation: Determining Efficacy Among Novice Student Registered Nurse Anesthetists**

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Gonzaga University

**Introduction:** A general anesthetic induction sequence is a daunting task. Although the effectiveness of high fidelity simulation training has been widely studied among undergraduate nursing, no studies have published data related to student nurse anesthetist training. The purpose of this study is to determine the effectiveness of high fidelity simulation training among entry-level student nurse anesthetists.

**Theoretical Framework:** Benner's From Novice to Expert and Kolb's Experiential Learning theories guided this research. The combined frameworks are used to enhance clinical nurse training via simulation.

**Literature Review:** High-quality evidence supports the use of simulation training for novice clinicians entering the clinical environment. The use of simulation prior to entering the clinical environment improves provider satisfaction and ultimately patient safety.

**Research Design:** Local IRB approved our quasi-experimental study, consisting of a waitlisted design. We tested the effectiveness of our comprehensive 1-hour high fidelity simulation experience. We developed an assessment tool and study participants were compared in pretest and posttest measurements.

**Methods:** A pilot study determined an effect size for our power analysis. Participants included first-year nurse anesthetist students and 2,022 cohort applicants. All participants received a didactic lecture on an anesthetic induction sequence and tested. Simulation training was provided and participants were tested again. Assessments compared using a paired t test.

**Data Collection:** All data was deidentified at the time of collection. A scoring and analysis tool was developed and tested during our initial pilot study. Primary data collection was objectively performed by the principal researchers.

**Results and Data Analysis:** Analysis of our pilot data provided the effect size required to power the full study at 80%. Our full study detected a 29.0% improvement in induction assessment tool scores after high fidelity simulation ( $p < 0.001$ ). Despite the wide variability in pretest scores, posttest high fidelity simulation scores were relatively consistent independent of the participants clinical background and experience. Induction sequence training using high fidelity simulation was proven to be effective in the novice student anesthetist.

**Discussions and Conclusions:** In alignment with the current research evidence, the use of high fidelity simulation training among student nurse anesthetists may help to improve learning, self-efficacy, and subsequently improve patient safety. Anesthesia programs should consider integration of high fidelity simulation throughout program curriculum, fostering the student nurse anesthetist technical and nontechnical skills.

**Hyperoxia: Current Practice of Oxygen Delivery During General Anesthesia**

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Gonzaga University

**Introduction:** The mortality benefit of conservative oxygen administration is being demonstrated in the literature. Evidence suggests limiting intraoperative fraction of inspired oxygen to below 60%. However, oxygen delivery practices during anesthesia are largely unknown. This begs the questions to what degree are patients being exposed to hyperoxia during general anesthesia and what is guiding practice?

**Theoretical Framework:** Donabedian structure process outcome model was used to guide this project. The model allows practitioners to analyze the structure and processes of healthcare delivery to improve patient outcomes.

**Literature Review:** Evidence supports a mortality benefit to avoiding excess supplemental oxygen among inpatients. Deleterious effects of hyperoxia include absorptive atelectasis and vasoconstriction. More studies are needed on intraoperative oxygen administration.

**Research Design:** IRB exemption was granted. This observational, retrospective, descriptive project sought to determine the median FiO<sub>2</sub> and SpO<sub>2</sub> from intubation to extubation. Factors associated with hyperoxia such as ASA status, BMI, and surgery duration were also examined.

**Methods:** This project was conducted at a tertiary care center in Washington State. All adult patients were intubated for general anesthesia and extubated at the end of the case. Cardiac, thoracic, pulmonary, emergent, and ENT procedures were excluded. Median FiO<sub>2</sub> was measured from intubation to extubation and analyzed by patient and procedural factors.

**Data Collection:** Data from 10,508 adult surgical patients that underwent general anesthesia during the 2018 calendar year were extracted for analysis. Cases for which FiO<sub>2</sub> values were missing or both intubation and extubation were not documented were excluded.

**Results and Data Analysis:** Of the cases reviewed, 39% of the patients were exposed to FiO<sub>2</sub> in excess of 60% during anesthesia. Median FiO<sub>2</sub> from intubation to extubation largely fell between 50% and 70% and SpO<sub>2</sub> averaged 99%. The risk for hyperoxia, defined as FiO<sub>2</sub> greater than or equal to 60%, was higher for patients with a higher ASA status, higher BMI, and with COPD ( $p < 0.05$ ). Positive smoking status was also associated with hyperoxia ( $p = 0.05$ ), whereas cases lasting longer than the median case duration were associated with a lower FiO<sub>2</sub> ( $p < 0.001$ ).

**Discussions and Conclusions:** This project found that exposure to high intraoperative fraction of expired oxygen is common practice. The mortality benefit to less liberal oxygen administration is widely accepted in critical care. Further studies are needed to evaluate the implications of oxygen exposure during general anesthesia and the safety and feasibility of more conservative intraoperative oxygen administration.



A24

## **Implementing an Alternative IV Safety Catheter to Augment Safe Practices Among Anesthesia Providers**

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Mayo Clinic

**Introduction:** The CDC determined anesthesia providers contribute to 27% of needlestick injuries. Utilizing IV safety catheters may reduce injuries by 50%. Multiple barriers have been identified to inhibit anesthesia providers from incorporating IV safety catheters into their daily practice. This study aim is to reduce the rate of nonsafety IV catheter use by implementing an alternative safety catheter.

**Theoretical Framework:** The continued utilization of nonsafety catheters places a serious risk for anesthesia providers to become exposed to bloodborne infections. It is essential to ensure safe IV practices.

**Literature Review:** CDC estimates the United States has 385,000 needlestick injuries annually. Twenty-seven percent of those injuries are due to the resistance of anesthesia providers in using IV safety catheters. The utilization of IV safety catheters may reduce that rate by as much as 50%.

**Research Design:** This is a quasi-experimental study where it determined the impact of an intervention on a population but did not utilize random assignment. Prior to disbursement of a survey, specific survey inclusion criteria required all participants to be a CRNA or an anesthesiologist.

**Methods:** An IV safety catheter was introduced into a 29 operating room surgical area. A total of 103 CRNAs and anesthesiologists were given the opportunity to trial this device over 3 months. The core anesthesia staff was asked to complete a 10-question survey to determine rates of safety catheter use. The data was collected and evaluated via Redcap.

**Data Collection:** Surveys were disbursed via intercampus email and collected via Redcap. Redcap is an online survey consolidation website utilized to collect surveys and place data in spreadsheets for evaluation.

**Results and Data Analysis:** Forty-two of 103 participants responded with a completed survey allowing a 40.7% response rate. A threshold of 51% was determined the minimum rate providers were required to utilize IV safety catheters in order to be determined compliant in their use. Before implementation, 7 providers stated they utilized this device less than or equal to 50%. Postimplementation, providers now utilize a safety catheter a minimum rate of 51% ( $p = 0.035$ ). Overall, 31% of the 42 providers increased the rate of IV safety catheter use.

**Discussions and Conclusions:** Many barriers prevent the successful incorporation of IV safety catheters into an anesthesia provider's practice. This project showed implementing an alternative IV safety catheter reduced the rate of nonsafety IV catheter use, reducing the risk of needlestick injuries. Further research focusing on culture change will be essential to further reduce the rate of nonsafety IV catheter use.

## **Influence of Language on SRNA Perceived Preparedness for and Confidence About Passing the NCE**

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Johns Hopkins University

**Introduction:** The CRNA National Certification Examination (NCE) is offered exclusively in English language. The NCE pass rate in Spanish-speaking Puerto Rico is below the national average thus negatively impacting CRNA workforce and reducing access to quality nurse anesthesia care. This study explores the role language may play in Puerto Rico's low NCE pass rate and student registered nurse anesthetists' (SRNAs') interest in taking the NCE in Spanish.

**Theoretical Framework:** Cummins Model of Language Competence framed this study. The theory summarizes that students with a high degree of English fluency may not have the same level of language proficiency at an academic level.

**Literature Review:** Studies show primarily Spanish-speaking students encounter unique challenges when taking tests in English including translation needs and inherent examination linguistic errors, which create additional challenges to success, without testing knowledge.

**Research Design:** A cross-sectional, correlational, descriptive design was used in this study to explore the role language plays in bilingual (English/Spanish) nurse anesthesia students' perceived preparedness for and confidence about passing the NCE, as well as their interest in taking the NCE in Spanish.

**Methods:** The Nurse Anesthesia Students' Perceived Preparedness Survey was administered to SRNAs in 5 nurse anesthesia programs. The survey assessed SRNAs across 4 domains – English language proficiency, study habit, test taking proficiency, and school-based training, on a Likert scale of 1 to 10 with 1 being “strongly disagree” and 10 being “strongly agree.”

**Data Collection:** Data was collected using Survey Monkey. Overall, survey score described perceived preparedness, and the outcome domain described perceived confidence about passing the NCE and interest in a Spanish NCE. Demographic data were used to describe SRNA language.

**Results and Data Analysis:** Seventy-eight SRNAs completed the survey. Primarily Spanish-speaking SRNAs (PSSS) scored lower than primarily English speaking SRNAs (PESS) ( $t=6.366$ ,  $p<0.001$ ). Primary language predicted perceived need for more exam time. PSSS were more likely to perceive the need for more time on the NCE ( $\beta=3.279$ ,  $p=0.001$ ). Survey score was associated with confidence about passing the NCE ( $\beta=0.034$ ,  $p<0.001$ ), preference to take the NCE in Spanish ( $\beta=-0.044$ ,  $p<0.001$ ), and English ( $\beta=0.046$ ,  $p<0.001$ ), as well as the perceived need for more time on the NCE ( $\beta=-0.023$ ,  $p=0.002$ ).

**Discussions and Conclusions:** Primary language is a predictor of perceived need for more exam time to take the NCE. Regardless of comparable training, preparing for the NCE in English language influences school based training, study, and test taking habits of primarily Spanish-speaking SRNAs, which in turn affects their confidence about passing the NCE and ultimately their NCE pass rate.

## **Intraoperative Hypotension in Noncardiac Surgery Patients at Providence Sacred Heart Medical Center**

*Genna LeDrew, BSN, RN; Kenneth Daratha, PhD*

Gonzaga University

**Introduction:** Intraoperative hypotension (IOH) during noncardiac surgery is a common side effect of anesthesia that is strongly associated with acute kidney injury, myocardial injury, and mortality. The purpose of this study is to report the rate and characterize IOH at multiple absolute mean arterial pressure thresholds in order to identify areas for anesthesia practice improvement.

**Theoretical Framework:** The theoretical framework guiding this study is the “Structure, Process, Outcome” model, which provides a strategy for evaluating the quality of care to identify areas for improvement.

**Literature Review:** There is a strong association between IOH and specific adverse postoperative outcomes, such as acute kidney injury, myocardial injury, and mortality. The risk of these outcomes increase as IOH severity and duration increase.

**Research Design:** This is an observational, retrospective, and descriptive study deemed exempt by the IRB for human subjects research. This study determined the rate of IOH of multiple absolute mean arterial pressure thresholds, and characterized IOH by patient and surgical characteristics and case timepoints.

**Methods:** This study was conducted at a large academic medical center in Washington State. Adult patients undergoing general anesthesia for scheduled noncardiac surgery over a 1-year time period were included. Rates of IOH were calculated by quantifying the duration of mean arterial pressures under specific absolute thresholds during surgery.

**Data Collection:** Anonymized health data from 11,042 cases were extracted from the electronic medical record to a secure database. Cases in which blood pressure was not measured at least every 5 minutes were excluded, yielding a total of 10,475 cases for analysis.

**Results and Data Analysis:** The rate of IOH was as high as 24% for IOH definitions with a moderate risk for end organ damage and as high as 8% for definitions with a high risk. Bivariate analyses revealed the relative risk of IOH to be significantly higher in females (RR 1.57, 95% CI (1.43-1.71),  $p < 0.001$ ), younger patients (RR 1.13, 95% CI (1.04-1.21),  $p < 0.001$ ) and longer cases (RR 1.70, 95% CI (1.57-1.84),  $p < 0.001$ ), and highest in plastics surgery (RR 2.58, 95% CI (2.31-2.89),  $p < 0.001$ ). When hypotension occurred, 42% occurred between anesthesia induction and surgical incision.

**Discussions and Conclusions:** IOH was very common, especially in plastic surgery. The results demonstrated almost half of IOH occurred prior to surgical incision, suggesting anesthesia alone is the causative factor. These results support that anesthesia providers should act promptly to minimize IOH exposure, remain vigilant in high risk populations, and work independently to reduce exposure between induction and incision.

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## **Intraoperative Opioid Administration Among Patients With Cancer**

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Gonzaga University

**Introduction:** Studies suggest intraoperative opioids may be associated with poor outcomes for cancer patients. Reducing opioids may be beneficial. Anesthetists influence postoperative outcomes by anesthetic choices. Rates of opioid administration among surgical patients were examined in this study. Findings suggest anesthetists should reevaluate current levels of opioid administration to cancer patients.

**Theoretical Framework:** Donabedian structure process outcome model guided this project. The model allows practitioners to determine if a change in practice is needed to improve care and patient outcomes.

**Literature Review:** In vivo and in vitro evidence suggest the dangerous effects opioids may have on patients with cancer. Intraoperative opioid administration has been associated with immunosuppression, tumor cell progression, recurrence, and metastasis.

**Research Design:** IRB granted exemption. This observational, retrospective, descriptive project sought to determine the rate of intraoperative opioid administration to patients with and without cancer. Factors (opioid history, service line, and duration) associated with intraoperative opioid use were examined.

**Methods:** This project was conducted at a tertiary care center in the Pacific Northwest. All adult patients undergoing scheduled surgeries were included. Participants received total intravenous or inhalational anesthetic techniques. The rate of opioid administration to patients with a diagnosis of cancer was compared with patients without a cancer diagnosis.

**Data Collection:** Data from 8,168 adult surgical patients that were intubated between October 1, 2017 and September 30, 2018 were extracted for analysis. Cases where intubation and extubation were not documented and cases where the procedure was not performed were excluded.

**Results and Data Analysis:** Most surgical patients in this project (94%) received intraoperative opioids. Patients with a primary diagnosis of cancer had similar rates of intraoperative opioid administration compared with patients without a primary cancer diagnosis (RR=1.0; 95% CI=0.98-1.02; p=0.97). A history of opioid use prior to surgery did not impact the rate of opioid administration (RR=1.03; 95% CI=0.99-1.08; p= 0.18). Case durations lasting longer than the median case time were more likely to receive intraoperative opioids (RR=1.10; 95% CI=1.06-1.14; p<0.001).

**Discussions and Conclusions:** Opioid free anesthesia was rarely observed in this project. Neither primary cancer diagnosis nor a history of opioid use prior to surgery were associated with the use of opioid free anesthesia. Sufficient evidence exists suggesting poor outcomes for patients with cancer when exposed to opioids. Randomized trials to explore risk and benefits and to guide the use of opioid free anesthesia are underway.

**Investigation of L-Theanine and Plasma Biomarkers in a Rodent PTSD Model**

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US Army Graduate Program in Anesthesia Nursing

**Introduction:** Posttraumatic stress disorder (PTSD) is a chronic and debilitating anxiety disorder occurring after a traumatic event. The diagnosis of PTSD still mainly relies on subjective measures, which may lead to unreliable psychological diagnoses and inefficient treatment. The aim of our study was to explore changes in plasma biomarkers to enhance accuracy in the diagnosis and early treatment of the disorder.

**Theoretical Framework:** We evaluated the preventative effects of preshock and postshock administration of L-theanine, a compound in green tea, in neurobehavior and plasma biomarkers in a rodent PTSD restraint tail-shock model.

**Literature Review:** In spite of L-theanine's known anti-inflammatory and neuroprotective health benefits, no research exists for PTSD treatment. Utilization of markers for PTSD has shown improved reproducibility, translation, and outcome predictability.

**Research Design:** In an experimental prospective between groups design, 66 male Sprague-Dawley rats were randomly assigned into 6 groups: control vehicle, control L-theanine, control naïve, PTSD vehicle, PTSD pre-L-theanine (prophylactic), and PTSD post-L-theanine (nonprophylactic).

**Methods:** We evaluated plasma biomarkers in PTSD-induced Sprague-Dawley rats. PTSD-stressed and nonstressed groups received control, prestress L-theanine or poststress L-theanine. Trunk blood samples were sent to RayBiotech for Quantitative Biomarker Quantibody Array with enzyme linked immunosorbent assay (ELISA) kits.

**Data Collection:** Following neurobehavior testing, rats were anesthetized with isoflurane, sacrificed, and trunk blood was collected. Plasma was sent to RayBiotech for evaluation of various biomarkers and data statistically analyzed.

**Results and Data Analysis:** Data were analyzed using t tests. The plasma levels of neuroendocrine biomarkers and proinflammatory cytokines/chemokines did not show a significant difference between groups. However, the plasma biomarkers P-cadherin and Notch-1, which have important roles in neural development, cell-cell adhesion, and synaptic formation, were significantly downregulated in response to PTSD stress. Furthermore, the administration of L-theanine in both models increased P-cadherin and Notch-1 back to control levels after the traumatic event.

**Discussions and Conclusions:** Early identification of plasma biomarkers and the development of PTSD biomarkers can be beneficial for the early and definitive diagnosis of PTSD. Known neuromodulating biomarkers, P-cadherin and Notch-1, were upregulated with the treatment of L-theanine. This study lays the foundation for future studies to investigate quantitative diagnostic criteria and novel pharmaceuticals for PTSD treatment.

**Funding Sources:** Funding was provided by TriService Nursing Research Program grant and was conducted at the US Army Institute of Surgical Research.

## **Knowledge Assessment of Military Personnel, Veterans, and Family Taking Dietary Supplements**

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**Introduction:** Dietary Supplements (DS) side effects and interactions with medications can lead to increased surgical morbidity and mortality. There is a void in data related to DS consumption and patient knowledge of DS. The aim of this study was to investigate the prevalence of use, supplements used, the knowledge base among military beneficiaries, and veterans consuming DS during the preoperative period.

**Theoretical Framework:** Based on the IOWA model of EBP, we developed a survey tool to solicit quantifiable data regarding DS use in preoperative patients and their knowledge of potential adverse effects of DS interactions.

**Literature Review:** The surgical population appears to use DS and herbal supplements (HS) more frequently than the general population. Furthermore, studies have demonstrated a higher prevalence of use among military personnel compared with the civilian population.

**Research Design:** This is an experimental quantitative multicenter survey study. A convenience sample of at least 2,400 adult subjects (400 subjects x 6 medical centers) without mental illness was calculated and anonymous data collection occurred preoperatively via SurveyMonkey. All participation was voluntary.

**Methods:** Data was collected in preoperative anesthesia clinics during preanesthetic evaluations, or in surgery holding areas immediately prior to surgery using the validated tool “Knowledge Assessment of Military Personnel and Family Taking Herbal Supplements” electronic survey. The total convenience sample size was 2,623 subjects from 6 medical centers.

**Data Collection:** Data were voluntarily, anonymously, and verbally obtained from subjects using SurveyMonkey. Collected data included: sex, age, rank, beneficiary status, race, BMI, tobacco use, marital status, and knowledge of DS side effects and drug interactions.

**Results and Data Analysis:** For demographic data, frequencies and proportions were provided for qualitative variables, and means/standard deviations for quantitative data. When examining the relationship of 2 categorical variables, a chi-square ( $\chi^2$ ) test of independence was used. Participants (32.3%) reported taking at least 1 DS; 18.1% consumed DS implicated with increased risk of bleeding; 89.7% were not aware of potential side effects; and 97.1% denied knowledge of medication interactions. This large knowledge gap may have deleterious effects on surgical outcomes.

**Discussions and Conclusions:** The results from this study report and validate that the prevalence of DS use among military beneficiaries and veteran surgical patients is substantial. Furthermore, the large knowledge gap found provides opportunities for anesthesia providers to improve preoperative assessments and education regarding DS use and suspension prior to invasive procedures to abate potential surgical complications.

**Funding Sources:** This study was generously founded by the TriService Nursing Research Program (TSNRP).

## A30

### **Noninvasive and Continuous Hemoglobin Monitoring (SpHb)**

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**Introduction:** The rapid determination of a patient's hemoglobin can mean the difference between a lifesaving blood transfusion and inadequate tissue perfusion and oxygenation, which can lead to cell death and permanent disability or death of the patient. Recently, the Masimo Corporation (Irvine, California) invented noninvasive and continuous hemoglobin monitoring (SpHb), a breakthrough measurement that noninvasively and continuously measures total hemoglobin in the blood. Further exploration is needed to determine if SpHb monitoring is efficacious.

**Theoretical Framework:** A systematic review analyzed the current research regarding the accuracy, efficacy, economic savings ability, as well as the influence on blood transfusion behavior of SpHb monitoring.

**Literature Review:** Investigators used CINAHL, MEDLINE, and Embase databases to answer the PICO (ie, population, intervention, comparison, and outcome) question.

**Research Design:** There were several outcomes evaluated for this systematic review: bias (defined as the difference between SpHb and tHb), standard deviation, confidence interval, trend accuracy, Bland-Altman analysis, and limits of agreement (LoA).

**Methods:** Studies include SpHb levels measured continuously using a Masimo Radical-7 device and a spectrophotometric adhesive sensor (Masimo Corporation, Irvine, California), in addition to studies reporting data on efficacy, accuracy, transfusion behavior, and economic impact of SpHb monitoring.

**Data Collection:** The methods of data collection varied among the 12 included studies regarding dependent and independent variables and recording times; however, many of the variables were similar in the 12 studies, which made it possible to appraise them.

**Results and Data Analysis:** Twelve studies including 3 RCTs had a combined sample size of 809 patients. Nine studies found SpHb monitoring provides a noninvasive means for monitoring hemoglobin concentration with clinically acceptable accuracy. Four studies concluded SpHb monitoring affects transfusion behavior, allowing earlier cessation of RBC transfusion as well as earlier consideration of initiation of RBC transfusion. One study provides sufficient accuracy for trend monitoring. Two studies concluded that SpHb monitoring was not sufficient to monitor Hb levels or trends.

**Discussions and Conclusions:** There is sufficient evidence to conclude that SpHb provides clinically acceptable accuracy.

**Noninvasive Carbon Dioxide Monitoring in Patients With Cystic Fibrosis During General Anesthesia: End-tidal Versus Transcutaneous Techniques**

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**Introduction:** There are limited data comparing transcutaneous (TcCO<sub>2</sub>), end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>), and capillary CO<sub>2</sub> (CapCO<sub>2</sub>) monitoring as a reflection of arterial CO<sub>2</sub> in adult and pediatric patients with cystic fibrosis (CF) during general anesthesia.

**Theoretical Framework:** In this IRB approved study, we compare TcCO<sub>2</sub>, EtCO<sub>2</sub>, and CapCO<sub>2</sub> measurements to PaCO<sub>2</sub> values obtained from an ABG during general anesthesia in patients with CF, during general anesthesia.

**Literature Review:** While various publications have demonstrated the accuracy of TcCO<sub>2</sub> monitoring in NICU and PICU patients, no studies have been performed comparing this technique to traditional EtCO<sub>2</sub> monitoring in patients with CF during general anesthesia.

**Research Design:** Quantitative quasi-experimental research design on human subjects was used in this study.

**Methods:** The study included patients with CF undergoing scheduled surgical procedures requiring general anesthesia. Equipment included SenTec Digital TcCO<sub>2</sub> Monitoring System (SDMS, SenTec AG, Therwil, Switzerland. Patient sample was 47 patients (22 males, 25 females) with a mean age of  $13.4 \pm 7.8$  years.

**Data Collection:** After the induction of anesthesia, placement of airway (ETT/LMA), and prior to start of the surgical procedure, EtCO<sub>2</sub> and TcCO<sub>2</sub> were recorded. Simultaneously, a CapCO<sub>2</sub> and ABG were obtained.

**Results and Data Analysis:** There was no difference between the degree of bias in the population as a whole. When divided based on FEV<sub>1</sub>-% and BMI, there was greater bias with EtCO<sub>2</sub> in patients with a lower FEV<sub>1</sub> and higher BMI. CapCO<sub>2</sub> vs PaCO<sub>2</sub> difference was  $5.2 \pm 5.3$  mm Hg, with 16 (48%)  $\leq 3$  mm Hg and 20 (61%)  $\leq 5$  mm Hg. TcCO<sub>2</sub> vs PaCO<sub>2</sub> difference was  $9.1 \pm 7.2$  mm Hg, with 11 (27%)  $\leq 3$  mm Hg and 15 (37%)  $\leq 5$  mm Hg. EtCO<sub>2</sub> vs PaCO<sub>2</sub> difference was  $11.2 \pm 7.9$  mm Hg (SD), with 5 (12%)  $\leq 3$  mm Hg and 11 (26%)  $\leq 5$  mm Hg. All analyses were conducted using SAS 9.4 and GraphPad 7.03.

**Discussions and Conclusions:** ETcCO<sub>2</sub> significantly underestimates PaCO<sub>2</sub> ( $p < 0.0004$ ). PaCO<sub>2</sub> is the gold standard, followed by CapCO<sub>2</sub>, then TcCO<sub>2</sub>, then EtCO<sub>2</sub>. CapCO<sub>2</sub> most accurately reflects PaCO<sub>2</sub> in patients with CF. TcCO<sub>2</sub> was a more accurate and reliable measure of PaCO<sub>2</sub> than EtCO<sub>2</sub>, especially in patients with worsening pulmonary function and a higher BMI.

**Funding Sources:** Interdepartmental funds (Pulmonary) were provided. No government funding was received.



A32

**Novel Genetic Variants in RYR1, CACNA1S, or STAC3 in Subjects With Malignant Hyperthermia Susceptibility (MHS) From the North American Malignant Hyperthermia Registry (NAMHR)**

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**Introduction:** There are implications for anesthetic management of patients with malignant hyperthermia (MH) causative mutations. Pathologic significance of many variants of uncertain significance (VUS) in patients with MH phenotypes is unknown. Blood was collected from subjects in the NAMHR to sequence RYR1, CACNA1S, and STAC 3 then determine pathogenicity of VUS.

**Theoretical Framework:** Guidelines for determination of pathogenicity published by Richards (2015) and Tavtigian (2017) have not previously been applied to genetic variants in subjects enrolled in the NAMHR.

**Literature Review:** Genetic testing is useful for finding pathogenic mutations that can identify patients at risk for MH. However, as exome sequencing becomes more feasible, the pathogenicity of VUS in RYR1, CACNA1S, and STAC3 needs to be determined.

**Research Design:** This case control study sampled blood of NAMHR subjects with the goal of reporting abnormalities in 3 genes, RYR1, CACNA1S, and STAC3, as well as clinical history. Inclusion criteria were broad to include subjects whose clinical care would be altered due to suspicion of increased risk for MH.

**Methods:** Subjects included from the NAHMR had a previous MH event with a CHCT or experienced a suspected MH event without CHCT or a first degree family relative of a subject with an MH event. The study included 64 subjects, 57 were MHS and 7 were controls.

**Data Collection:** Blood was sent to Prevention Genetics (Marshfield, Wisconsin) where RYR1, CACNA1S, and STAC 3 were sequenced. Pathogenicity for variants was described using procedures published by Richards et al (2015) and Tavitigan et al (2018).

**Results and Data Analysis:** In the 64 subjects, 15 were found to have previously reported variants that were likely pathogenic when compared with the European Malignant Hyperthermia Group registry. Fourteen novel variants were reported in 12 subjects. All 12 reported an adverse anesthetic event. Posterior probabilities for pathogenicity using Bayesian methods described by Tavitigan et al (2018) in the guidelines for the American College of Medical Genetics and Genomics/Association for Molecular Pathology ranged from 0.003 to 0.753 for the novel variants.

**Discussions and Conclusions:** Genetic variants in RYR1, CACNA1S, and STAC3 continue to be observed in patients who experience anesthetic events suggestive of MH. Muscle contracture testing confirms that MHS is present and in vitro testing demonstrate that genetic variants alter the sensitivity of the RYR1 channel to increase intracellular calcium in muscle. Clinical evidence alone is not a reliable indicator of MH susceptibility observed in patients who experienced adverse anesthetic events suggestive of MH.

**Funding Sources:** Innovation Pilot Grant (PI: Sadhasivam) from Cincinnati Children's Hospital Medical Center

### **Pattern of Perioperative Gabapentinoid Use and Risk for Postoperative Naloxone Administration**

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**Introduction:** Preoperative gabapentinoid administration has been associated with respiratory depression during Phase I anesthesia recovery. The primary aim was to examine whether gabapentinoids increase the risk for over-narcotization in the postoperative period. The secondary aim was to assess for other potential associations between clinical factors and the need for postoperative naloxone administration.

**Theoretical Framework:** It is important to identify risk factors associated with postoperative respiratory depression, in order to focus efforts on the most high-risk individuals.

**Literature Review:** Gabapentinoids have been found to increase the risk of respiratory depression in Phase I and death in those also receiving opioids. More research is required.

**Research Design:** This study used a retrospective case-control design to assess the patient and procedural characteristics associated with the requirement of postoperative naloxone administration.

**Methods:** We reviewed institutional medical records from July 1, 2011 to December 31, 2015 to identify adult patients who underwent general anesthesia and who were administered naloxone within 48 hours of dismissal from the anesthetic. For each case, 2 control patients were matched on age, sex, exact type of surgery, and within 2 years of the case procedure.

**Data Collection:** Electronic medical records were abstracted for patient characteristics, comorbidities, perioperative variables, postoperative course, and complications using automatic search software. Data was manually confirmed by a reviewer.

**Results and Data Analysis:** The incidence of postoperative naloxone administration was calculated using the Wald method. Analyses to assess characteristics associated with naloxone were performed using conditional and multivariable logistic regression. Continuation of chronic gabapentinoids was associated with an increased rate of naloxone administration ( $P=0.001$ ). Obstructive sleep apnea ( $P=0.005$ ) and disability ( $P=0.003$ ) were associated with an increased risk for postoperative naloxone administration.

**Discussions and Conclusions:** Continuation of chronic gabapentinoids into the postoperative period is associated with the increased use of naloxone to reverse oversedation or respiratory depression. These patients warrant higher levels of postoperative monitoring. Episodes of respiratory depression during Phase I anesthesia recovery are associated with subsequent episodes of opioid-related adverse events after PACU discharge.

**Funding Sources:** Funding was provided by the Department of Anesthesiology and Perioperative Medicine, College of Medicine, Mayo Clinic

## **Perioperative Anesthetic Techniques to Reduce Phantom Limb Pain in Postoperative Amputee Patients**

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**Introduction:** By the year 2050, the number of amputees in the United States will have doubled to 3.6 million. While the cause of most amputation surgeries relates to peripheral vascular disease or diabetes, the number of amputees due to injuries sustained in war is rising. Amputation is associated with phantom limb pain (PLP), a chronic pain condition that results in amputees experiencing painful sensations in their amputated limb. Stump pain and painful phantom limb sensations are experienced by 30% to 90% of amputees. Anesthesia providers have the potential to decrease the incidence of PLP by utilizing different preemptive anesthetic techniques in the perioperative period. Research exists regarding different intraoperative anesthetic techniques providers may use to mitigate or, at times, eliminate PLP; however, prior to this project, these methods had not been standardized into an anesthetic protocol. The creation and implementation of the Amputation Improved Recovery (AIR) Enhanced Recovery After Surgery (ERAS) protocol standardized anesthetic methods to reduce PLP, which improved surgical outcomes for patients.

**Theoretical Framework:** Amputation surgery is the greatest predictor for the development of PLP. Other risk factors include amputations performed under general anesthesia with only opioid for postoperative pain control.

**Literature Review:** Preemptive anesthetic techniques that have the potential to limit the development of PLP, despite multiple risk factors, include: (1) continuous peripheral nerve blocks, (2) intravenous ketamine infusions, (3) gabapentin, and (4) short-term opioid use.

**Research Design:** The research design was a quasi-experimental, preimplementation/postimplementation design with 2 independent groups. IRB exemption was submitted and granted in order to conduct this quality-improvement project at the implementation site.

**Methods:** Patients in the postimplementation group were anesthetized for their amputation surgery using the Amputation Improved Recovery ERAS protocol. Patient outcomes were compared between groups. The setting was an academic, level I trauma center including a sample of 175 patients  $\geq 18$  years old, undergoing amputation surgery from September 2017 to November 2017 and April 2018 to July 2018.

**Data Collection:** Patient demographic data and aim measures were retrieved from the Electronic Health Record under IRB exemption. Data specific to the aims included continuous nerve block placement, amputees' reported pain scores, and opioid medication requirements in morphine equivalents.

**Results and Data Analysis:** Descriptive statistics and supplemental trajectory analyses were conducted to compare both groups following amputation. Comparatively, the postgroup had significantly lower mean pain scores during the first 24 hours after amputation ( $p=0.046$ ), fewer postoperative complications ( $p=0.001$ ), amputation revisions ( $p=0.003$ ), 30-day hospital readmissions ( $p=0.049$ ), readmissions related to amputation surgery ( $p=0.019$ ), and higher rates of early PLP resolved during hospitalization ( $p=0.012$ ).

**Discussions and Conclusions:** The primary goals of this project were to decrease the number of amputation surgeries performed under general anesthesia alone and increase the number of nerve blocks placed. General anesthesia-only technique decreased 5.6% and nerve block placement increased by 7.6%. Surgical morbidity was significantly reduced, with the infection rate halved. Trials of the AIR ERAS protocol at other facilities may help improve outcomes for patients having amputations across the United States and abroad.

## Postoperative Cognitive Dysfunction: Volatile Anesthetics and the Effects on Gene Expression

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**Introduction:** Postoperative cognitive dysfunction is a side effect of general anesthesia and this has been linked to volatile anesthetics. Volatile anesthetics have also been linked to alterations in gene expression. The slowpoke gene is the target of this study due to its role in neurotransmitter release and neuronal excitability. The aim is to determine the effects on gene expression of each agent.

**Theoretical Framework:** There is limited data comparing the 3 commonly used volatile anesthetics in relation to postoperative cognitive dysfunction. This study provides comparative data on behavior and gene expression.

**Literature Review:** A review of literature has identified a link between slowpoke gene expression and neurodegeneration, volatile anesthetic related cognitive decline, and the emphasis on epigenetic studies that allow for individualizing patient care.

**Research Design:** An experimental approach was used testing the effects of isoflurane, sevoflurane, and desflurane on *Drosophila melanogaster* that have a 75% correlation with the human genome. After exposure to the volatile anesthetics, behavior studies and RNA extraction allowed for testing of the hypothesis.

**Methods:** Utilizing wild type and slowpoke gene knockout, *Drosophila melanogaster* preexposure behavior data were collected. Exposure to volatile anesthetics was performed using standardized methods at various dose ranges. Postoperative behavior data were collected followed by standardized RNA extraction and RT qPCR techniques to extrapolate the data.

**Data Collection:** The behavior study was observational based on previous studies performed on this species with each member performing this task while adhering to defined protocols. RNA extraction was performed 24 hours postexposure using the TRI Reagent protocol.

**Results and Data Analysis:** The data collected was statistically analyzed using a 1-way ANOVA with a multiple comparison Tukey post hoc test. The results from initial behavior studies demonstrated a significant difference between behaviors in wild type and slowpoke gene knockout species. The knockout species overall had a decreased climb reflex. The results from the RT qPCR for slowpoke gene expression demonstrated a significant decrease in gene expression after exposure to isoflurane (p value <0.0001), sevoflurane (p value < 0.0045), and desflurane (p value < 0.0001).

**Discussions and Conclusions:** The data collected during this bench study lead to the rejection of the null hypothesis that stated: Isoflurane, sevoflurane, and desflurane exposure at 1 MAC will not decrease slowpoke gene expression in the *Drosophila melanogaster*. The study demonstrated a link between the slowpoke gene and behavior. Further, it demonstrated a significant impact on slowpoke gene expression.

**Practice Habits of CRNAs Utilizing Sugammadex for Reversal of Rocuronium**

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Webster University

**Introduction:** Residual paralysis and its associated complications are a common occurrence when using neuromuscular blocking agents. Sugammadex has offered the ability to eliminate residual paralysis when utilized for reversal of rocuronium. Unfortunately, many CRNAs still do not use the drug despite its cleaner safety profile when compared with other reversal agents. We composed this survey to understand why.

**Theoretical Framework:** Our research set out to discover reasons why a provider uses 1 reversal agent versus another, and whether further education needs to occur to prevent the consequences of residual paralysis.

**Literature Review:** An extensive review was performed to understand the frequency of residual paralysis occurrence, consequences of incomplete reversal, limitations of anticholinesterases, benefits of sugammadex, and currently understood provider practice habits.

**Research Design:** A cross-sectional internet-based survey research design was utilized to reach a population subset of members of the AANA, specifically actively practicing CRNAs, to solicit if practice habits impede transition to utilization of new drugs.

**Methods:** A survey was sent via email to 3,000 randomly selected CRNAs from the AANA database. The survey was available online from December 4, 2018 to January 2, 2019 and data from completed surveys were collected. Responses were analyzed, and frequency charts and cross-tabulations were constructed to assess correlation among practice habits of active CRNAs.

**Data Collection:** Data was collected through the AANA survey collection tool. No identifiable information was retrieved. An Excel spreadsheet was emailed to the researchers with raw data and no respondent information.

**Results and Data Analysis:** A total of 555 completed surveys were received. Most respondents (70.27%, n = 390) identified prevention of residual muscle weakness as the greatest indicator for sugammadex use. Cost was stated to be the largest factor against sugammadex use by 65.6% (n = 250) of respondents. No difference was found in the anesthesia experience of providers and their preference for reversal agent. Significance was demonstrated between respondents who placed importance on cost and their choice of reversal agent ( $p < .0001$ ).

**Discussions and Conclusions:** Our results suggest that neostigmine (or no reversal at all) is utilized with concerning frequency, and that the benefits of sugammadex are not fully realized by a large amount of CRNAs. Perceived cost and residual dogmas may take precedence in the practice habits of CRNAs when it comes to utilizing sugammadex as a reversal agent. Efforts to improve awareness and education are warranted.

**Funding Sources:** Webster University

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**Prospective Student Registered Nurse Anesthetists and Substance Use Disorder Education; Gaining Awareness Before Entering the Profession**

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**Introduction:** This study aims to validate the AANA's current position that substance use disorder education should be a prerequisite to nurse anesthesia school. Providing substance use disorder education to prospective students could deter those who recognize person vulnerabilities from pursuing the profession and ultimately impact the incidence of substance use disorder among CRNAs.

**Theoretical Framework:** The Iowa Model was utilized for this research study. It is evidence-based and serves as a guideline to help healthcare providers make decisions about practices that promote quality care.

**Literature Review:** Substance abuse is the most serious occupational safety issue for CRNAs; 1 in 10 CRNAs develop a substance use disorder. Current education lacks at-risk screening tools and self-awareness education. Education should begin with prospective students.

**Research Design:** Correlational: prospective Mayo Clinic nurse anesthesia students completed a presurvey, AANA Learn Module 4, "Risk and Exposure: The Signs, Symptoms, Pathophysiology, and Co-morbidities of Substance Abuse," and then a postsurvey.

**Methods:** Prospective Mayo Clinic DNAP students participated in a presurvey, Wellness Module 4 Education, and a postsurvey. All phases of this study were done electronically via email and responses remained anonymous.

**Data Collection:** All data were collected electronically and stored in REDCap. Participant's participation and responses remained anonymous. JMP software was utilized to analyze data.

**Results and Data Analysis:** Eighty-nine percent (N = 52) reported they are more inclined to engage in wellness resources. Thirty-five percent (N = 18) agreed they view themselves at risk for developing a substance use disorder. Nonparametric Spearman  $\rho$  test found statistical significance ( $p = 0.0031$ ) supporting the hypothesis that if individuals view themselves at risk for developing a substance use disorder it may deter them from pursuing the profession. Eighty-nine percent of the at risk group agreed they are now more inclined to engage in wellness resources.

**Discussions and Conclusions:** Prospective student registered nurse anesthetists should complete substance use disorder education as a prerequisite for CRNA programs to improve awareness, allow for self-reflection, and provide resources. Those who view themselves at risk may be deterred from pursuing the degree. Results provide the anesthesia community with scientific knowledge to support substance abuse education as a potential preventative intervention.

## **Reducing the Incidence of Postoperative Complications With the Use of Sugammadex Versus Typical Reversal Agents After General Anesthesia**

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**Introduction:** A common complication after surgery is PONV, an adverse physiologic response to the surgical process within 24 hours of surgery, queasiness, unsettled stomach, urge to retch, or vomiting and will occur in approximately 30% of all patients. Also, pain postoperatively can contribute to decreased mobilization, decreased respiratory function, and decreased satisfaction scores.

**Theoretical Framework:** Sugammadex decreases the time for reversal after surgery. Secondary benefits decreased are postoperative residual paralysis, adverse reactions, PONV, postoperative pain, and recovery time in PACU.

**Literature Review:** Yaran (2015) said “The use of sugammadex...is a better choice for patients with high risk or where the situation is undesirable.” Sugammadex allowed “opioid-sparing” effect in laparoscopic bariatric surgery trial (Castro, 2014).

**Research Design:** This is a quasi-experimental-retrospective, randomized review of electronic medical records of 100 patients undergoing general anesthesia performed between August 2017 and November 2017. The anesthesia records, medical history, and medication records for the first 48 postoperative hours were reviewed.

**Methods:** Surgery was performed at UPMC Shadyside hospital and consisted of 100 patients, using a retrospective chart review with randomized groups defined as sugammadex (50) or neostigmine (50). Nausea and vomiting was compared, along with pain scores, throughout 48 hours (if patient admitted). PONV was measured by WAKE, pain scores by 0 to 10 verbal numeric score. Cost analysis was evaluated by price per medication and additional costs required.

**Data Collection:** Data sheet including: age, sex, weight, race, ASA, smoking history, PONV history, surgical procedure, length of surgery, N/V, pain level, medications received prior to, during and 48 hours after surgery.

**Results and Data Analysis:** Descriptive statistics were used, along with contingency table with odds ratios and confidence intervals are used to compare prevalence of PONV/pain between groups, t tests for comparison of groups, and ANOVA for COMT. Data analyses were computed using SPSS (Version 25, SPSS, Inc, Chicago, Illinois). Not significant findings for PONV (N=0.326, V=0.562), significant pain (0.036).

**Discussions and Conclusions:** Sugammadex offers a slight protective factor for nausea and vomiting. Sugammadex shows statistical significance in reducing postoperative pain, most notably in abdominal and thoracic surgeries. There are benefits of using sugammadex in high-risk PONV/pain patient, as well as reducing overall cost and increasing patient satisfaction.

**Sex Differences in Chronic Low Back Pain**

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**Introduction:** Chronic low back pain is a leading cause of disability in the United States, with an annual cost of over \$100 billion. Cultural expectations suggest that women are more sensitive to pain than men. However, the nature and causes of the sex differences remain unknown. The purpose of this study was to examine differences between men and women with chronic low back pain to gain a greater understanding of sex.

**Theoretical Framework:** The objectives were to compare sex difference in functional pain, assess sex difference in perception of pain-related injustice, and assess sex difference in chronic pain stigma.

**Literature Review:** Psychosocial and biological factors such as stress, depression, anxiety, genetics, and anatomy influence chronic low back pain occurrence and severity.

**Research Design:** Prospective correlational design was used in this study.

**Methods:** Twenty-eight men and 40 women aged 19 to 85 years, with cLBP for at least 3 consecutive months, rated the pain intensity evoked by a standardized short physical performance battery that included tests of balance, gait, and transition from sit to stand. We also assessed depression, chronic pain stigma, and perception of pain-related injustice using valid instruments.

**Data Collection:** Data was collected using REDCaps. The participants rated their pain on 0 to 100, perception of injustice on a 0 to 48, and depression on 0 to 60 scales.

**Results and Data Analysis:** Data were analyzed using SPSS version 24. Student *t* test was used to compare mean differences between men and women. On average, men reported more movement-evoked pain, more pain-related injustice, and more chronic pain stigma than women. These differences were statistically significant ( $p < 0.05$ ). We did not observe any sex difference in depressive symptoms ( $p = 0.9$ ). However, the depressive symptoms correlated positively with pain intensity. Women in our study were significantly younger than men ( $p = 0.02$ ).

**Discussions and Conclusions:** Sociocultural studies suggest that woman are at an increased risk for chronic pain and experience higher pain severity. Prior studies have reported that women have less tolerance and more sensitivity to painful stimuli. However, we found that men report more pain with “normal” daily activities. Psychosocial factors such as stigma and perceived injustice may modulate sex differences in cLBP.

**Funding Sources:** This work was supported by the National Institutes of Health, National Institute of Minority Health and Health Disparities (grant number 3R01MD010441-01A1S1).



A40

**STOP-BANG as a Pre-procedure Risk Assessment Tool to Predict Intraprocedure Airway Maneuvers and Adverse Events in a Gastrointestinal Laboratory**

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**Introduction:** STOP-BANG, an obstructive sleep apnea (OSA) screening tool, is validated in surgical patients and general population to detect patients at high risk for OSA. The scope of OSA is unknown in the gastrointestinal (GI) laboratory setting. The purpose of this project was to identify undiagnosed patients who are at high risk for OSA (score >5) and evaluate their risk of intraprocedure airway maneuvers and adverse events.

**Theoretical Framework:** The theoretical framework involved the analysis STOP-BANG score and occurrence of airway maneuvers and adverse events during the intraprocedure period.

**Literature Review:** OSA is the most common sleep-related breathing disorder and associated with increased risk of perioperative complications. Eighty percent of people are undiagnosed. STOP-BANG is the most validated screening tool to detect patients at high risk for OSA.

**Research Design:** This study used a correlational design to analyze the association between STOP-BANG score and occurrence of airway maneuvers and adverse events during the intraprocedure period.

**Methods:** The sample included patients scheduled for elective procedures in the GI laboratory. STOP-BANG was implemented in the GI laboratory by having nurses conduct the questionnaire during the preprocedure assessment.

**Data Collection:** STOP-BANG scores were obtained from nurses. CRNAs were interviewed postprocedure about airway maneuvers and adverse events during the procedure. Patient electronic health records were reviewed for STOP-BANG scores and correlation of airway maneuvers/adverse events.

**Results and Data Analysis:** Eighty patients were part of the study. Sixty-two patients had STOP-BANG <5 and 18 patients had STOP-BANG >5. Outcomes were analyzed by comparing patients who scored <5 with patients who scored >5. Chi-square tests were used for categorical data, while t tests were used for continuous data. There was statistical significance for the average number ( $p=0.05$ ) of airway maneuvers and adverse events. There is clinical significance because 50% of the patients who scored >5 experienced an airway intervention/adverse event compared with 27% of those who scored <5.

**Discussions and Conclusions:** This study showed that a higher STOP-BANG score is associated with a trend for airway maneuvers or occurrence of adverse events. Anesthesia providers can anticipate intraprocedure airway interventions, consider preemptive interventions in a GI laboratory, and be more vigilant when caring for undiagnosed patients with high STOP-BANG scores at high risk for OSA.

## **Sugammadex Versus Neostigmine: Operating Room Time and Cost**

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**Introduction:** Anesthesia providers are not uniform in what reversal medication they use, creating discrepancies in operating room time and cost. The agents, sugammadex and neostigmine, differ in cost, effectiveness, and predictability. This project's purpose identifies differences in cost and operating room time and to simulate changes in cost based on alternative practice scenarios in choice of reversal agents.

**Theoretical Framework:** The Donabedian structure process outcome model guided this project. This model describes how enhancements in care structure lead to improvements in clinical processes improving patient care.

**Literature Review:** Systematic reviews reveal that sugammadex surpasses neostigmine as a more effective reversal agent with faster recovery times and fewer side effects. Reversing with sugammadex decreases cost and operating room times compared with neostigmine.

**Research Design:** This project was a retrospective, observational study examining the cost and time differences between 2 neuromuscular blockade reversal agents. Simulation modeling estimated total cost and operating room time under practice change scenarios adopting the 2 reversal agents.

**Methods:** IRB granted exemption. The project was completed at a tertiary care medical center in the Pacific Northwest. Included were patients aged >18 and <70 years, ASA I to III, BMI <40, and no pulmonary or neuromuscular disease, who received a reversal agent between 2015 and 2018. Contracted medication prices and operating room cost per minute was obtained. Surgical case duration was observed.

**Data Collection:** Deidentified data was extracted from the electronic health record. Cases were excluded when case duration wasn't calculated; where multiple agents were administered; and where unusual dosage of reversal agents were recorded.

**Results and Data Analysis:** A total of 9,384 cases were evaluated. Mean cost of sugammadex was \$100 per case and neostigmine/glycopyrrolate was \$32 per case. Case duration between sugammadex and neostigmine for each surgical procedure was assessed. The average surgical case duration reversed using sugammadex was 148 minutes, at an estimated mean case cost of \$14,497. Cases reversed with neostigmine averaged 153 minutes, at an estimated mean case cost of \$14,829 (p=0.048). Simulated total cost if used exclusively over 4 years for sugammadex was \$136,036,819 versus neostigmine at \$139,157,752.

**Discussions and Conclusions:** The mean cost of sugammadex exceeds neostigmine, but neostigmine extends mean surgical time by 5 minutes. A comparison between the 2 medications for like surgeries found that sugammadex shortened surgical duration for most procedures. In a simulated scenario, had the medical center reversed all cases using sugammadex exclusively, more than 3 million in total estimated costs would have been saved.

A42

### **TeamSTEPPS 2.0 Based Simulation Training of Obstetrical Teams for High-Risk, Low-Occurrence Obstetric Anesthetic Events**

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**Introduction:** The purpose of this study was to improve perioperative teamwork for high-risk, low-occurrence anesthesia related complications that could occur during obstetric surgery. To accomplish this purpose an educational curriculum consisting of simulation-based scenario training program was developed based on Team Strategies and Tools to Enhance Performance and Patient Safety.

**Theoretical Framework:** Knowles Theory of Andragogy or Adult Learning was used in this study.

**Literature Review:** Gaps in skills of team coordination and communication caused many errors reported within the OR. TeamSTEPPS provides a tool to incorporate teamwork, interpersonal skills, and communication skills into scenario simulation training.

**Research Design:** Quasi-experimental design used interrupted time series testing with 2 phases: pretraining simulations, and posttraining simulations.

**Methods:** TeamSTEPPS didactic training was given to measure teamwork knowledge, performance and attitude responses to 2 pretraining simulation scenarios and 3 posttraining simulation scenarios for TeamSTEPPS 4 pillars for team success via comparative mean scoring. Single site study took place at a rural low volume childbirth military facility in Washington State.

**Data Collection:** Simulation specific observer checklist included; TeamSTEPPS Team Performance Observation Tool, TeamSTEPPS Teamwork Attitude Questionnaire, TeamSTEPPS Teamwork Perceptions Questionnaire.

**Results and Data Analysis:** Comparative mean scores regarding team knowledge of simulation task, observed teamwork performance, attitudes, and perception were compared between pretraining and posttraining to assess the effectiveness of TeamSTEPPS program. Team knowledge improved from 74% to 84%. Team performance mean scores improved from 3.93 to 4.51 out of 5 points. T-TPQ and T-TAQ showed improvement in both team structure and communication where leadership scores decreased.

**Discussions and Conclusions:** The implementation of a TeamSTEPPS 2.0 based simulation-training program of this study has demonstrated team improvement within knowledge, performance, and attitudes. This study allowed a low volume rural childbirth facility to gain familiarity and training for high-risk, low-occurrence obstetric anesthetic complications while improving on team dynamics.

A43

### **The Association of Prescription Opioid Exposure and Patient Factors With Prolonged Postoperative Opioid Use in Opioid Naïve Patients**

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**Introduction:** Surgery places patients at risk for long-term opioid use through prescription opioids for pain management. The purpose of this research study was to identify factors associated with prolonged postoperative opioid use in opioid naïve patients in 2 domains: (1) specific patient characteristics and (2) exposure through postoperative opioid prescriptions.

**Theoretical Framework:** The Availability-Proneness Theory of Illicit Drug Abuse by Reginald Smart was used in this study.

**Literature Review:** A recent review of the literature indicates that prolonged postoperative opioid use is associated more with preexisting disorders than postoperative pain.

**Research Design:** An electronic medical record dataset analysis of opioid naïve adult orthopedic surgery patients from January 1, 2012 through December 31, 2017 was conducted. There were 7,323 patients meeting inclusion criteria. Data were analyzed using a multivariate logistic regression model.

**Methods:** A multivariate logistic regression model was used to evaluate the relationship of each domain to opioid refills 90 to 180 days after surgery. Data collection included patient demographics, payor type, specific comorbidities, ASA status, BMI, surgery type, and opioid prescriptions.

**Data Collection:** Electronic medical record data extraction included adult patients undergoing orthopedic surgeries. Data were extracted and deidentified by the Center for Health Informatics, the institutional honest broker, then provided to the research team.

**Results and Data Analysis:** In this cohort of opioid naïve orthopedic surgery patients, 4% continued to refill opioid prescriptions more than 90 days after surgery. Multivariate logistic regression indicated that independent predictors of prolonged postoperative opioid use were alcoholism (O.R. 2.0, C.I. 1.5-2.6), OME > 675 (O.R. 2.3, C.I. 1.5-3.4), female gender (O.R. 1.7, C.I. 1.3-2.1), black race (O.R. 1.6, C.I. 1.2-2.2), Medicaid insurance (O.R. 1.8, C.I. 1.3-2.5), and the following comorbidities: diabetes, mood disorders, hypertension, and chronic kidney disease.

**Discussions and Conclusions:** The results indicate that both opioid exposure and patient characteristics increase risk for prolonged opioid use following orthopedic surgery. We recommend developing evidence-based postoperative prescribing guidelines; implementing pain management strategies utilizing nonopioid pain control methods; and screening and educating patients preoperatively, followed by close monitoring after surgery.

**Funding Sources:** AANA Foundation Kay Wagner Fellowship

A44

### **The Effect of Amniotic Fluid on Serotonin Secretion in Platelet Rich Plasma**

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Webster University

**Introduction:** Amniotic fluid embolism (AFE) is a rare but fatal event that is thought to result from the entry of amniotic fluid into the mother's circulation. Due to the low occurrence, there is a lack in research necessary in understanding the pathophysiology. The A-OK protocol utilizes atropine, ondansetron, and ketorolac to reverse the supposed mechanism. Our focus is the role of serotonin in this process.

**Theoretical Framework:** Leighton proposes that platelet activation due to amniotic fluid (AF) exposure results in serotonin release, resulting in severe pulmonary hypertension and subsequent cardiopulmonary arrest.

**Literature Review:** Research has shown a link between serotonin release and pulmonary vasoconstriction leading to cardiopulmonary collapse. Case studies utilizing the A-OK protocol have shown successful outcomes in reversal of this process.

**Research Design:** This was an ex vivo experimental study containing control, positive control, and experimental groups.

**Methods:** Platelet rich plasma (PRP) suspensions prepared from 7 parturients undergoing cesarean delivery were analyzed for 5-HT presence after exposure to various concentrations of matched AF (0.6 ug, 1.8 ug, 6 ug), 0.9% sodium chloride, and thrombin (0.5 u/mL, 1.0 u/mL). Serotonin (5-HT) was measured using high performance liquid chromatography with electrochemical detection.

**Data Collection:** AF protein concentration was calculated utilizing a Lowry protein assay and spectrophotometer. Serotonin (5-HT) was measured using high performance liquid chromatography with electrochemical detection. The internal standard utilized was 5-hydroxy-N-methyltryptamine (5-HNMT).

**Results and Data Analysis:** The mean plasma 5-HT content was not significantly different in the control group compared with the amniotic fluid groups (2.77 +/- 0.97 versus 0.6 ug: 4.30 +/- 1.20; 1.8 ug: 3.73 +/- 0.69; 6 ug: 3.89 +/- 0.66 ng/mL, respectively). Statistical significance was found between the control and the 1.0 u/mL thrombin group in plasma (1.0 u/mL: 13.56 +/- 3.96 ng/mL, ANOVA, P<0.05) but not in the 0.5 u/mL thrombin group. The mean platelet 5-HT content was not significantly different in the control group compared with the positive control or AF groups.

**Discussions and Conclusions:** In this study there was no significant release of 5-HT from PRP exposed to matched AF. With the discussed recommendations for change in future studies, there may still be a statistically significant release of 5-HT from platelets exposed to amniotic fluid. Further investigation is encouraged.

**Funding Sources:** Webster University Nurse Anesthesia Program

## **The Effect of Melatonin on Perioperative Cortisol Levels and Opioid Consumption in Total Knee Arthroplasty Patient**

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Webster University

**Introduction:** The misuse of opioids in the United States has reached an all-time high. More than 47,000 opioid-related deaths occurred in 2017. Roughly 75% of opioid abusers have reported that their first opioid was prescribed. A multimodal approach to pain is 1 way to limit the amount of opioids a patient received during the stressful perioperative period of a total knee arthroplasty (TKA).

**Theoretical Framework:** Melatonin's antinociceptive properties may serve as adjunct to traditional therapies for anxiolysis and analgesia. Melatonin can affect perioperative opioid consumption and cortisol laboratory tests after TKA.

**Literature Review:** Research showed that 3 mg of melatonin the night before and 1 hour prior to laparoscopic cholecystectomy reduced fentanyl consumption. Another study concluded that 7 (5-mg) doses of melatonin improved sleep but did not reduce pain following TKA.

**Research Design:** This study is a prospective experimental study conducted on 67 ASA I to III patients undergoing TKA. Patients were randomly divided into 2 groups to participate in the randomized, double-blinded, placebo controlled study.

**Methods:** TKA patients received standard care with or without melatonin (10 mg) 1 hour prior to surgery and at 9 PM the same day. Saliva was collected for cortisol 1 hour prior to surgery, 1 hour after, and the following morning. Opioid consumption and pain scores were assessed using the visual analog scale at 6, 12, 18, and 24 hours postoperatively.

**Data Collection:** Cortisol levels were analyzed using ELISA assay kits from Salimetrics. Opioid consumption and pain scores were obtained via the electronic health record. Opioid consumption was converted to IV morphine equivalents using GlobalRPH narcotic converter.

**Results and Data Analysis:** A 1-tailed *t* test showed no significant difference in opioid consumption between the control and melatonin group ( $p=0.3655$ ). A 2-way ANOVA determined no significant difference in cortisol levels across time between the groups ( $p=0.5640$ ). A Tukey test compared cortisol in the PACU, showing no significant difference ( $p=0.9009$ ). A Tukey test compared pain scores between the groups at 6 ( $p=0.9821$ ), 12 ( $p>0.9999$ ), 18 ( $p=0.9867$ ), and 24 ( $p=0.9908$ ) hours showing no statistical significance.

**Discussions and Conclusions:** This research study evaluated the potential benefits of melatonin following TKA. The results supported researchers to accept the null hypothesis, stating that melatonin does not affect postoperative opioid consumption or cortisol levels following TKA. Based on the findings, there is lack of evidence to include melatonin as part of the multimodal approach to minimize perioperative opioid use.

**Funding Sources:** Funding was made possible through the Department of Nurse Anesthesia at Webster University.

## **The Utility of Cognitive Testing in the Nurse Anesthesia Admission Process as a Novel Predictor of Situational Awareness and Academic Success**

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Rutgers University Nurse Anesthesia Program

**Introduction:** Loss of situational awareness (SA) can lead to medical error with costly consequences, thus society needs student registered nurse anesthetists (SRNAs) with adequate SA. A challenge in academia is predicting potential students' abilities to develop SA, confounded by limited evidence-based admission criteria. The aim is to assess an evidence-based, cognitive tool in the admission process to predict students' SA and academic success.

**Theoretical Framework:** The Iowa Model-Revised was chosen, as it assists in channeling evidence into safe and effective practice, notably in academia. A strength is also in providing guidance when future research is needed.

**Literature Review:** SA is the ability to perceive, understand and react to optimize outcomes. Research indicates that one's degree of SA is best predicted by cognition. To date, no research has observed the utility of cognitive testing in the SRNA admission process.

**Research Design:** This study utilizes a quantitative, correlational design to examine participants' cognition against the traditional admission criteria. Additionally, the admission committee will be surveyed to assess the value they ascribe to situational awareness in anesthesia and the utility of cognitive testing.

**Methods:** Following interviews for admission to a northeast nurse anesthesia program, 37 applicants voluntarily completed the computerized Raven's Advanced Progressive Matrices (APM-III) to assess cognition. These results had no bearing on admission due to admission committee blinding. Subsequently, the committee was surveyed as described.

**Data Collection:** Cognitive scores were uploaded to a secured Pearson's online portal. The data was stripped of identifiers for blinded analysis in SPSS. The admission committee received an online survey composed through Qualtrics. This was also used to analyze their data.

**Results and Data Analysis:** No difference in APM-III exists between admitted and declined. Admitted have significantly higher interview scores. No association exists between APM-III, interview, CCRN, GPA and ICU years. Insignificant, negative associations exist among admission and CCRN, GPA and ICU years. APM-III and interview scores are insignificantly, positively correlated. Eighty-eight percent of the admission committee feel SA is extremely important. An objective cognitive report would affect most decisions, such that a higher APM-III score would increase overall interview rating.

**Discussions and Conclusions:** Insignificant results suggest that the admission process may be subjective without effectively measuring cognition. Notably, the highest APM-III score was not accepted, while the lowest score was accepted. Appraising the deidentified scores, the committee majority would have rated the higher APM-III likewise higher. This metric may offer evidentiary aid to enroll students with the most potential.

**Funding Sources:** The primary investigators received a research grant from Pearson's Inc. that offered a 50% discount on the purchase of 37 APM-III tests.

A47

### **Tibial Intraosseous Administration of Epinephrine is Ineffective in Resuscitation in a Pediatric Hypovolemic Cardiac Arrest Model in Swine**

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United States Army Graduate Program of Anesthesia Nursing

**Introduction:** The purposes of this study were to determine the effects of tibial intraosseous (TIO) and intravenous (IV) administration of epinephrine in a hypovolemic, pediatric swine model. Although current guidelines suggest that TIO and IV routes of administration are equally effective, there are no pediatric studies demonstrating the effectiveness of any vasopressor in a hypovolemia model of cardiac arrest.

**Theoretical Framework:** Our framework illustrated the relationship between trauma, hemorrhage, cardiac arrest, PALS epinephrine administration through IV and TIO vascular access, and measurable outcome measures.

**Literature Review:** Epinephrine administration is associated with a higher probability of ROSC. The American Heart Association recommends administration of epinephrine by interosseous or IV route. These recommendations, however, are based on anecdotal data and opinion.

**Research Design:** This study is a prospective, randomized, blinded, experimental design using a pediatric swine model. Male swine, weighing between 20 and 30 kilograms, simulating average male child of 5 to 6 years old, were randomly assigned to groups TIO, IV, CPR with defibrillation, and CPR only.

**Methods:** Subjects were anesthetized, hemodynamically monitored, intravascular access secured, exsanguinated of 30% of circulating blood volume, and then placed into cardiac arrest. Cardio-Pulmonary Resuscitation (CPR) started after 2 minutes and epinephrine according to PALS guidelines.

**Data Collection:** Samples were collected at 30-second increments until 5 minutes. High-performance liquid chromatography determined serum epinephrine concentrations among samples. Statistical analysis determined significant differences among identified outcome measures.

**Results and Data Analysis:** Cmax was significantly higher in the IV group vs the TIO group ( $p = 0.006$ ). The Tmax was shorter in the IV group, but there was no significant difference ( $p = 0.065$ ); the mean concentration was significantly more in the IV vs TIO group at the 60, 90, and 120 second times ( $p < 0.05$ ). The IV group vs TIO had significantly higher frequency of ROSC ( $p = 0.031$ ): The IV had 5 of 7 and the TIO had 1 of 7 to achieve ROSC. The odds of ROSC for the IV group was 17 greater compared with the TIO group.

**Discussions and Conclusions:** The IV vs the TIO route is much more effective relative to Cmax, mean concentration, and ROSC. We recommend that the IV route be used in the pediatric patient who is in arrest from hypovolemia. The American Heart Association advocates the use of IO devices as a primary alternative to IV for vascular access. However, these recommendations are primarily based on expert opinion: based on the results of our study, the IV route is more effective than the TIO route.

**Funding Sources:** This project was funded by the TriService Nursing Research Program.



**Transfusion Ratios Following Activation of a Massive Transfusion Protocol**

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**Introduction:** Accidental injury is one of the leading causes of death worldwide. How to manage hemorrhaging trauma patients has been evolving since the early 1900s. Recent studies have demonstrated the benefits of using a balanced resuscitation technique revolving around the goal of recreating whole blood. The aim of this project is to identify which transfusion ratios are being implemented in practice.

**Theoretical Framework:** The framework guiding this project is the Kotter 8-Step Process. This framework helps facilitate change in an organization. The step-by-step process eases the barriers to implementing change.

**Literature Review:** There are few high-level studies that examine transfusion ratios in trauma patients. Literature agrees that high ratio transfusions improve mortality outcomes, and patients have a lower chance of dying by exsanguination.

**Research Design:** IRB granted exemption. This observational, retrospective, descriptive project sought to determine the transfusion ratios being implemented during massive transfusions. Twenty-four-hour mortality for high and low transfusion ratios was examined.

**Methods:** This project was conducted at a tertiary care center in the Pacific Northwest. All adult patients requiring activation of the massive transfusion protocol between 2015 and 2018 were included. Units of packed red blood cells were compared with units of platelets and fresh frozen plasma to identify transfusion ratios.

**Data Collection:** Data from 305 adult patients that required activation of the massive transfusion protocol between January 1, 2015 and December 31, 2018 were extracted for analysis. Cases where no packed red blood cells were given were excluded from final analysis.

**Results and Data Analysis:** Massive transfusion ratios are 1:1 or higher 23% of the time when comparing fresh frozen plasma (FFP) with packed red blood cells (PRBC) and 37% of the time when comparing platelets with PRBC. High ratio ( $\geq 0.8$ ) resuscitation had a 24-hour mortality risk of 30.1% when observing FFP to PRBCs, whereas low ratio had a 37.8% risk of mortality at 24 hours (95% CI 0.85-1.84,  $P=0.25$ ). When observing platelets to PRBCs, 24-hour mortality was 38% and 31% for low and high ratios respectively (95% CI 0.87-1.75,  $P=0.23$ ).

**Discussions and Conclusions:** While a higher risk for mortality at 24 hours was observed, there was not sufficient power to make an association between low transfusion ratios and mortality risk. Survivor bias was not accounted for in this project, which may explain the higher rate of 24-hour mortality in the low ratio transfusions. Approximately 30% of the time are 1:1 or higher transfusion ratios being achieved.

# Evidence Based Practice

A49

## **A Comparison of Dexmedetomidine and Remifentanyl in Promoting Smooth Emergence and Recovery for Adult Patients Receiving General Anesthesia**

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**Introduction:** Certain surgeries, such as intracranial and ENT procedures, require smooth emergence since coughing and bucking may be detrimental. This review compares the effects of dexmedetomidine (Dex) and remifentanyl (Remi) on attenuating airway reflexes and hemodynamic changes during emergence and recovery in ASA I to II adult patients undergoing general surgeries.

**Methods:** A search was performed using PubMed and CLIO for full-text, scholarly publications in English from 2014 to the present. Search terms included remifentanyl, dexmedetomidine, and smooth emergence. Of the 38 articles that met the above criteria, 33 were excluded for their irrelevance to the topic, focused exclusively on the effects of either Dex or Remi alone, or inappropriate patient population. Five articles comprised of prospective, randomized controlled trials on adult population undergoing intracranial or ENT surgeries were ultimately chosen for this literature review. Two were double-blinded studies. One article published in November 2013 was included due to its strong relevance to the topic.

**Analysis of the Evidence:** The literature review shows that both Remi infusion (0.03 to 0.25  $\mu\text{g}/\text{kg}/\text{min}$ ) and Dex infusion or bolus dose (0.4 to 0.6  $\mu\text{g}/\text{kg}/\text{h}$  or single dose of 0.5 to 0.7  $\mu\text{g}/\text{kg}$ ) were successful in facilitating smooth emergence in adult patients undergoing craniotomy or ENT surgeries. Two studies show that Remi is superior to Dex in attenuating emergence cough. Both drugs exhibit comparable hemodynamic profiles during emergence, extubation, and immediate postoperative care. Most studies find that the incidence of PONV and administration of antiemetic and analgesics in the Dex group was significantly lower than that of Remi group.

**Recommendation for Practice:** Evidence shows that either Remi infusion or Dex, infusion or single-dose, can be safely used to maintain respiratory and hemodynamic stability during emergence and recovery in adults receiving general anesthesia. Remi may have a slight advantage in reducing emergence cough than the single-dose Dex, and Dex infusion may cause a delayed recovery from anesthesia compared with Remi. In patients with a higher risk of postoperative respiratory depression, pain, or PONV, administering Dex may be preferable to Remi. Further studies examining the optimal doses of Remi and Dex for smooth emergence may be needed.

## A50

### **A Comprehensive Literature Review of Hand Hygiene Practices of Anesthesia Providers**

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**Introduction:** Anesthesia providers underemphasize the importance of hand hygiene after patient contact and contact with the patient's environment. The aim of this research is to investigate the anesthesia provider's role in the contamination of anesthesia work environment and how it may contribute to healthcare associated infections in surgical patients.

**Methods:** Articles were selected through Albany Medical College's Schaffer Library using the following databases: ClinicalKey, PubMed, and Cochrane Library. Key terms included: anesthesia provider, contamination, hand hygiene, nosocomial infections, bacterial transmission, noncompliance, and anesthesia workstation. Articles were selected after reviewing the abstract to verify that it was relevant to the review. Once the initial selection was made, the articles were read in full and selected based on the following inclusion criteria: published in English, conducted within the past 8 years, relevancy to the topic, design of the study, and anesthesia providers as the subject. Outcomes of the studies must be stated using objective measures; self-reported outcomes were excluded. Five articles were selected.

**Analysis of the Evidence:** Five articles were included in the final analysis: Munoz-Price et al (2013), Loftus et al (2015), Porteous et al (2017), Megeus et al (2015), and Rowlands et al (2014). Review of the literature reveals that hand hygiene is inadequate and most likely contributes to the spread of bacteria to the anesthesia work area. Rowlands et al revealed that bacterial contamination during the induction and maintenance phase of anesthesia increased dramatically, suggesting that hand hygiene practices by anesthesia providers was substandard. The investigation carried out by Loftus et al demonstrated that a patient infected with *Proteus mirabilis* in case 1 lead to the transmission of that organism to the patient in case 2.

**Recommendation for Practice:** Results suggest that hygiene measures should include the anesthesia machine. During the induction phase, anesthesia providers hands are repeatedly inserted into and around the patient's mouth and nose. During this phase providers must also simultaneously manipulate the controls of the anesthesia machine and monitors. It may be impractical to adhere to hand hygiene protocols as this is a vulnerable time for the patient. Pathogens that spread from anesthesia provider hands to the anesthesia work area can survive on the anesthesia machine after routine cleaning. Focusing on the decontamination of the anesthesia work environment between patients to reduce the spread of pathogens may be beneficial.

A51

## **A Literature Review Comparing Intravenous Ketamine and Lidocaine With Opioids for Postoperative Analgesia in the Laminectomy Surgical Patient**

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**Introduction:** As the opioid crisis continues to be a prominent clinical issue, it is important to explore alternative approaches to control pain. In addition to pain scores and opioid consumption, this review will discuss the anti-inflammatory effects of both ketamine and lidocaine and their impact on opioid induced hyperalgesia.

**Methods:** The clinical question used to guide this research was formulated using the PICO format. (P) In the postoperative laminectomy patient, (I) is the continuous administration of low-dose ketamine and lidocaine (C) more effective than opioids (O) in improving postoperative pain? Databases searched included but were not limited to: Science Direct, EBSCO, SPORTDiscus, and Academic Search Complete. A total of 10 studies were used for this analysis, including both literature reviews and experimental studies. All articles included were evidence-based, peer-reviewed, and published within the last 8 years.

**Analysis of the Evidence:** Overall, these studies concluded that continuous ketamine and lidocaine infusions reduce pain scores, opioid consumption, and/or inflammation. Both medications were found to be most effective when administered as part of a multimodal pain treatment regime including opioids. Their administration may significantly decrease the incidence of opioid induced hyperalgesia by decreasing opioid consumption.

**Recommendation for Practice:** Administration of ketamine and lidocaine as part of a multimodal pain regime includes opioids to control postoperative pain in the laminectomy patient. A ketamine bolus of 0.5 mg/kg and lidocaine bolus of 1.5 mg/kg should be administered prior to induction. Following these bolus doses, a continuous ketamine infusion ranging from 0.03 mg/kg/h to 2.0 mg/kg/h and a continuous lidocaine infusion at a rate of 2 mg/kg/h should be initiated prior to incision. The ketamine infusion may be continued up to 72 hours postoperatively. The lidocaine infusion may be discontinued prior to emergence. Bolus doses of opioids may still be necessary to adequately control postoperative pain in the laminectomy patient.

A52

## **A Paradigm Shift in the Anesthetic Management of Patients Presenting for Breast Cancer Surgery**

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Florida International University

**Introduction:** Inhalation agents are the primary anesthetic technique for surgical resection of cancerous tumors in stimulating cancer metastasis including postoperative pain and stress-response to surgery. Inhalation agents affect the systematic inflammatory response, alter the immunological process, and promote recurrence and metastasis by impairing cell immunity diminishing the function of natural killer cells.

**Methods:** The purpose of this evidence-based project was to answer the following clinical question: “In patients undergoing surgery related to breast cancer, does the utilization of total intravenous anesthesia (TIVA) with multimodal analgesia versus inhalation agents decrease cancer metastasis and recurrence?” The investigator utilized PubMed, Google Scholar, and MEDLINE in accordance to the PICO question. The inclusion criteria concentrated on: population, surgical procedure, anesthesia, study, primary outcome, and publications dating 2000 to 2019. Exclusion criteria applied to a total of 17 studies for this systematic review; 10 randomized controlled trials and 7 retrospective studies.

**Analysis of the Evidence:** A randomized controlled study investigated propofol and sevoflurane on natural killer cytotoxicity (NKCC) on postbreast cancer surgery patients. Propofol had a greater effect on the function of NKCC in comparison with sevoflurane, which was statistically significant ( $P = 0.047$ ). A retrospective study assessed the effect of propofol-based TIVA on the recurrence and survival rates for breast cancer surgery patients compared with sevoflurane. The results exhibited a decreased rate of cancer recurrence with TIVA ( $P = 0.037$ ). Studies in vitro and in vivo have shown the antitumor effects of propofol to inhibit the infiltration and distribution of cancer cells.

**Recommendation for Practice:** The empirical evidence indicates inhalation agents increase the incidence of cancer metastasis. There is no evidence-based guidelines advocating for TIVA for the breast cancer surgical patient. TIVA decreases the recurrence of cancer due to its effect on the cancer gene. Propofol-based TIVA with multimodal analgesia decreases mortality, morbidity, cancer recurrences, and metastases, and it increases cell immunity in patients presenting with breast cancer surgery. This evidence-based quality improvement project creates a framework in the implementation of an opiate sparing protocol for patients presenting for breast cancer surgery utilizing TIVA and multimodal pain approach.

A53

## **A Paradigm Shift in the Treatment of Postdural Puncture Headache: The Implementation of a Greater Occipital Nerve Block**

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**Introduction:** PDPH produces a reduction in cerebrospinal fluid pressure and a loss of CSF in the epidural space created by a spinal or epidural anesthetic. PDP pain includes conservative, pharmacological, and invasive treatment. Symptoms of PDP headache include a dull throbbing pain with a frontal to occipital distribution. PDP headaches are relieved by the GONB with various local anesthetics and low volumes.

**Methods:** This systematic review answered the clinical question: (P) In adult surgical patients with postdural puncture headache who received a neuraxial anesthetic or dural tear (I) does a greater occipital nerve block compared with an (C) epidural blood patch (O) resolve a PDPH, decrease duration of PDPH, and hospital length of stay? PubMed, Embase, and MEDLINE were searched using the key phrases: greater occipital nerve block, GONB, postdural puncture headache and PDPH. Inclusion criteria included: articles in the English language, published from 2008, randomized clinical trials, case reports, and cohort studies who presented with a dural puncture, PDPH, and GONB administration prior to epidural blood patch (EBP). Nine articles were critically appraised for this systematic review.

**Analysis of the Evidence:** Nine studies displayed efficacy in resolving PDPH with a GONB and resulted in decreased pain, duration, and hospital length of stay. Four case reports showed an immediate resolution of PDPH. An RCT administered bilateral GONBs with bupivacaine and triamcinolone for PDPH after epidural placement. PDPH was assessed using the VAS every 8 hours. The GONB group had VAS scores below 4 after 24 hours, less than the control group. A study of 16 patients with PDPH after intrathecal anesthesia for cesarean delivery received a GONB presented VAS scores under 5 within 10 minutes. An analysis of the studies presented the efficacy of a GONB with decreased patient risk for the treatment of PDPH.

**Recommendation for Practice:** PDP headaches cause patient suffering, increases duration of hospital stay, and overall cost of treatment. The goal of GONB implementation as a treatment for PDPH aims to resolve the symptoms of PDPH, decrease its duration, increase patient satisfaction, reduce risk, and reduce hospital length of stay. GONB administration, along with conservative therapy, improves patient outcomes without the requirement for a more invasive EBP. A framework was established to implement GONB as first line treatment for patients who present with PDPH after neuraxial anesthesia versus EBP. The empirical evidence supports GONB over EBP for PDPH pain in implementing cost-effective, safe, quality care.

A54

**A Training Program for Obstetrical Staff on the Utilization of Nitrous Oxide for Parturient Analgesia: An Evidenced-Based Practice Project**

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**Introduction:** Fort Belvoir Community Hospital recently adopted a policy to offer nitrous oxide as an analgesic option to laboring women; however, the staff has minimal to no prior experience using this agent and its unique delivery system. The hospital desires an education and training program for the obstetric staff to ensure effective and safe delivery to parturients.

**Methods:** The purpose of this literature search was to answer the following clinical question: How does obstetrical staff knowledge and comfort with nitrous oxide use for parturient analgesia improve after participating in an evidence-based training program? The search used Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase, and PubMed databases to gather articles published between 2008 and 2018 addressing the relationship between training methods, staff knowledge retention, critical thinking, and skill mastery. The search yielded 492 unique articles and after further review of titles, abstracts, inclusion criteria, and exclusion criteria, a total of 10 articles were included for an in-depth analysis.

**Analysis of the Evidence:** The literature yielded 2 main themes to maximize learning outcomes: multimodal strategies and the application of adult learning theory. Interactive or self-guided methods facilitated the highest increase in knowledge retention, skill mastery, and critical thinking. This is potentially explained by adult learning theory, which recognizes adults display a wide variety of learning styles and speeds. Utilizing this evidence, a 2-phase training program was designed: an online activity for knowledge familiarization followed by an in-person workshop featuring a case study, discussion, and hands-on equipment training. Preeducation and posteducation assessments measured staff knowledge and comfort.

**Recommendation for Practice:** Preeducation assessments illustrated a baseline knowledge deficit and lack of comfort with nitrous oxide for parturient analgesia. Posttest scores (M=90%) for staff who completed the education module were 21% greater than pretests (M=78%). Additionally, a Likert scale revealed a 33% increase in staff's comfort; all participants reported they felt neutral to very comfortable discussing and managing the system. This project was successful in applying evidence-based methods and enhancing staff's readiness for a new labor analgesic. Other healthcare sites should analyze current training methods and consider incorporating similar strategies to effectively engage adult learners.

## **Achieving the Recommended Endotracheal Tube (ETT) Cuff Pressure: A Literature Review of Current Practice**

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**Introduction:** The tracheal wall capillary blood flow is compromised with pressure of 30 cm H<sub>2</sub>O, resulting in potential complications such as tracheal mucosal ischemia and postextubation stridor when the cuff pressure is increased. Thus, the monitoring of intracuff pressure has been suggested as 1 means to limit the potential for damage to the tracheal mucosa.

**Methods:** The purpose of this literature review was to answer the following question: In the setting of general anesthesia, cuffed endotracheal tubes (ETTs) are 1 aspect of airway management designed to maintain a secure and safe airway; what are current practices of measuring cuff pressure techniques that are most effective and that anesthesia providers can implement to prevent tracheal injury due to overinflation of ETTs cuff. Publications for review were identified through searches of PubMed, Embase, Cochrane, CINAHL, and UpToDate database from 2009 to present for the gathering of peer-reviewed studies. The following search terms were used: tracheal cuff monitoring, tracheal cuff pressure, tracheal cuff monitoring techniques, and airway complications related to cuff pressure.

**Analysis of the Evidence:** Peer-reviewed and the related studies indicated that the highest incidence of overinflation was recorded in the fingertip palpation group and the lowest in air-return and minimal volume method groups. Although the use of a manometer is the most accurate and reliable method, it may result in significant costs as manometers cost approximately \$300. The color-coded device has 3 zones on the barrel of the syringe, and it costs approximately \$2 per device. Lastly, the air-return back into the 10 cc syringe method emerges as attractive, cost-effective (\$0.3 per syringe), and simple-to-perform alternative regarding effective ETT sealing and low incidence of intubation-related morbidity.

**Recommendation for Practice:** ETT cuff pressure should be measured for all patients undergoing general anesthesia, especially during extended surgeries over 8 hours. There are various methods of measuring the ETT cuff pressure, and anesthesia providers should be able to determine the most accurate way in light of cost and ease of use. Some of the most common ways are use of manometer or pressure syringe with color-coded device. Palpating the pilot balloon has been shown to be an inaccurate estimation of the balloon pressure.



**A56**

**Adjunct Analgesics Used Outside of the United States for Postoperative Pain Management:  
A Review of Intravenous Nefopam and Parecoxib**

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**Introduction:** Two medications used outside of the United States for pain management are: nefopam, a centrally acting, nonsteroidal drug and parecoxib, a selective COX-2 inhibitor. The purpose of this review is to present evidence for the effectiveness of alternative agents, nefopam and parecoxib, on postoperative pain in surgical patients and recommend adding alternatives onto hospital formularies in the United States.

**Methods:** The literature was reviewed to answer the following PICOT question: Do surgical patients who are given intravenous nefopam or parecoxib during the perioperative period compared with similar patients who are not given nefopam or parecoxib have lower scores in the postoperative period? Keywords were used to search the CINAHL, PubMed, and Google Scholar literature databases. Nefopam search terms included nefopam, postoperative, and pain. Articles were published between 2008 and 2018. Parecoxib search terms included parecoxib, postoperative, and pain. Articles were published between 2015 and 2018. Six articles were included for nefopam, and 7 articles for parecoxib were included in the final analysis.

**Analysis of the Evidence:** The results of studies utilizing nefopam found that postoperative pain scores were decreased, and opioid requirements were reduced for up to 24 hours postoperatively. Nefopam has analgesic efficacy similar to ketamine and NSAIDs. Benefits were observed in laparoscopic, ureteroscopic, and breast surgical cases. Parecoxib administration significantly improved postoperative pain reduction in the PACU up to 12 hours with reduced opioid consumption. Parecoxib demonstrated efficacy comparable to ketorolac. Benefits were observed in laparoscopic, orthopedic, spinal, and gynecologic surgeries.

**Recommendation for Practice:** Evidence-based literature suggests that intraoperative IV nefopam and parecoxib be in consideration for hospital formularies in the United States as part of multimodal pain management to be given in the perioperative period in order to reduce postoperative pain scores and reduce narcotic administration for a variety of eligible patients and surgical cases. More prospective, randomized trials should be reviewed to evaluate the usage of nefopam and parecoxib as adjunct analgesics in understudied surgical cases. Further studies should standardize with weight-based dosing and timing of administration during the perioperative period to define the most useful regimen and adverse effect profile.

**Advanced Cardiac Life Support Simulation for CRNAs and SRNAs**

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**Introduction:** The infrequent occurrence of cardiac arrest in the surgical patient potentiates a decrease in ACLS knowledge and skill among Certified Registered Nurse Anesthetists (CRNAs) and student registered nurse anesthetists (SRNAs). It is critical that anesthesia providers endorse prompt recognition of patient decline and initiate early treatment measures. The use of ACLS simulation provides educational review and improves clinical skills in managing anesthesia-related cardiac arrest.

**Methods:** PICOT question - Does the integration of a simulation training session during the 2-year period before ACLS recertification, as opposed to the current practice of no intervention during the 2-year period, improve clinical skill among CRNAs and SRNAs? The literature review included articles from 2011 to 2018 in PubMed, CINAHL, and Scopus databases. Abstracts were assessed and 183 articles were identified. Twenty articles were chosen for final analysis. This project was implemented at the University of Cincinnati Medical Center. A pretest survey was administered, followed by 2 surgical ACLS simulations based on case studies found in the literature. These included a prone craniotomy case and a local anesthetic systemic toxicity (LAST) case. A posttest survey was then administered.

**Analysis of the Evidence:** Pretest data and a simulation assessment checklist demonstrated several knowledge gaps in ACLS fundamentals. Following the simulation education, participants demonstrated a knowledge improvement via posttest survey scores. A McNemar chi-square test found that 5 of 8 questions were statistically significant in the following content areas: high-quality CPR ( $p = .00009$ ), defibrillation ( $0.02165$ ), medication administration ( $p = .00128$  and  $p = .00015$ ), and local anesthetic toxicity treatment ( $p = .00097$ ). Additionally, 92% of participants strongly agreed that simulation training would benefit their practice and 96% rated simulation training as highly effective for cardiopulmonary resuscitation.

**Recommendation for Practice:** Current literature shows that simulation is a worthwhile tool for continuing education measures such as cardiopulmonary resuscitation. The goal of this simulation was to apply the ACLS algorithm to a surgical patient under anesthesia to provide educational review and determine if the knowledge and skill of managing emergency events deteriorates over time. The project was successful in implementing an educational simulation and demonstrated that key concepts and skills do in fact deteriorate when not utilized regularly. Simulation should be used in nurse anesthesia continuing education in order to improve clinical skill and adequately prepare providers for emergency resuscitation.

## **An Update on Ketamine's Mechanisms of Actions and Effects in General Anesthesia and Spinal Blockade**

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**Introduction:** Recent studies have implicated ketamine in inflammation and oxidative stress, inhibition of sodium and voltage-gated potassium currents in dorsal horn neurons, and in disruption of frontal-parietal communication. Reviewing ketamine's mechanisms of action will further educate anesthesia providers and potentially lead to better applications with less adverse side effects.

**Methods:** The literature presented in this review was selected from a comprehensive electronic search in the PubMed, MEDLINE, and Google Scholar databases. Key terms used for the search included ketamine and brain biology, molecular effects of ketamine anesthesia, effects of ketamine on the brain and spinal cord, ketamine effects on neural networks, and ketamine and neurobiology. Broad MeSH terms and Boolean operators were selected for each database search. In addition, the same search terms were used to identify further relevant research. All research had to be completed within the past 13 years and limited to the English language. Both human and animal studies were included in the search, and a total of 3 studies were chosen for analysis.

**Analysis of the Evidence:** The literature reviewed in this study has broadened our understanding of ketamine's mechanisms of action. Abelaira et al found ketamine increased nitrite/nitrate concentrations, myeloperoxidase activity, and decreased superoxide dismutase and catalase levels in the brain. Schnoebel et al found ketamine to have dose-dependent inhibition of Na<sup>+</sup> currents and delayed-rectifier K<sup>+</sup> currents, while decreasing firing of action potentials in tonically firing dorsal horn neurons. Lee et al found ketamine increased relative power of  $\delta$ ,  $\theta$ , and  $\gamma$  frequency bands and decreased relative power of  $\alpha$  and  $\beta$  frequency bands; while reducing feedback connectivity and preserving feedforward connectivity.

**Recommendation for Practice:** Ketamine may contribute to inflammation, oxidative stress and disruption of frontal-parietal communication when used in general anesthesia. Furthermore, there is a common correlate between non-GABAergic (ketamine) and GABAergic (propofol and sevoflurane) anesthetics; the inhibition of frontal to parietal feedback connectivity with preserved feedforward connectivity. When used for spinal blockade, ketamine likely impairs excitability in superficial dorsal horn neurons by blocking sodium and voltage-gated potassium channels. Larger blinded, randomized studies are needed to better understand ketamine's physiological effects when used as a perioperative adjunct in multimodal pain control.

## A59

### **Anesthesia and the Effect on Cancer Recurrence**

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**Introduction:** With the need for tumor resection, biopsies, and treatment, more than 80% of all cancer patients will need anesthesia care. Recent studies suggest a link between perioperative patient management and the risk of recurrence and metastasis. Since most cancer deaths after surgery are attributed to recurrence or metastases, we review anesthetic techniques and medications to minimize this risk.

**Methods:** PICOT (Intervention): In cancer patients undergoing surgery, does anesthetic technique affect cancer recurrence or metastasis. A literature search was conducted for this paper using MEDLINE Complete, CINAHL Plus, PubMed and EBSCOHost databases. Key terms used for the search included anesthesia techniques, anesthesia drugs, cancer, cancer recurrence, and cancer metastasis. English language articles published between 2009 and 2018 were included. Thirty-eight full text articles were included in the literature review.

**Analysis of the Evidence:** Regional anesthesia may currently be the best choice for oncological surgery, as it has been shown to increase survival and decrease mortality. Conversely, volatile agents may not be ideal for cancer patients, as they may augment cancer cell growth. Propofol can be considered protective, as it has anti-inflammatory effects, inhibits cancer cell invasion, and helps suppress cell proliferation. Opioids may have a negative effect due to the promotion of angiogenesis and suppression of NK cell activity. NSAIDs may also be helpful, as they modulate the inflammatory process and help prevent metastasis and recurrence, as well as decreasing the need for opioids.

**Recommendation for Practice:** Evidence suggests that some anesthetic agents, techniques, and adjunct medications may be more oncologically protective than others. Current evidence suggests regional anesthesia does not exacerbate cancer and may increase overall survival. In contrast, volatile anesthetics and many drugs used during general anesthesia have been found to be detrimental and increase the likelihood of cancer recurrence. Research regarding propofol is promising, demonstrating protective qualities and anti-inflammatory effects. The negative effects of opioids on cancer are due to the promotion of angiogenesis and suppression of NK cells.

## A60

### **Assessment of Patient Preoperative Fasting From Clear Liquids Prior to Elective Surgery**

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**Introduction:** Patient compliance to nothing by mouth (NPO) guidelines preoperatively is important for many reasons including reducing the risk of patient aspiration. Recent studies indicate that patients may overfast from clear liquids resulting in dehydration, anxiety, increased postoperative nausea, and increased generalized weakness.

**Methods:** A 16-question anonymous survey was administered to patients when they arrived to check in for surgery. Surveys were administered by preoperative nurses and exclusion criteria including patients presenting to the preoperative clinic, obstetrics, pediatrics, and anyone unable to provide their own consent. The primary outcome of the survey was to assess patient compliance with current Mayo Clinic NPO guidelines. Secondary outcomes included assessing what education patients received, who provided them with that education, and what they actually did in regard to fasting before surgery.

**Analysis of the Evidence:** Overall compliance to clear liquids was 34.7% (n=435). Nearly all patients were given preoperative instructions with 16.8% receiving conflicting information. Patients were educated incorrectly 44% of the time with the majority of education coming from a member of the surgical team. Almost all patients believed they were correctly following the instructions given. There was a statistically significant difference in fasting based on procedure type ( $p=0.001$ ) with orthopedic and colorectal surgery being the least compliant.

**Recommendation for Practice:** Providers should not only educate according to the NPO policy, they also should encourage the continuation of drinking clear liquid. Many times, the people providing the education are unaware of the actual compliance of patients. Increasing provider awareness to overfasting may create a practice change in the ways patients are educated. Consistency with education and even having an anesthesia provider preoperative fasting education could increase patient adherence. Standardizing and simplifying fasting instructions will not only make education easier for patients but also could improve understanding and compliance.

## A61

### **Atrial Fibrillation Prediction Utilizing Genomics in the Perioperative Period**

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Florida International University

**Introduction:** Atrial fibrillation (AF) is the most common complication after CABG surgery occurring in 25% to 40% of patients. Embolic stroke, myocardial infarction, congestive heart failure, perioperative morbidity, mortality, and prolonged hospital stay are risks associated with postoperative CABG. The impact of AF on hospital costs exceeds \$10,000 per patient, which translates into \$2 billion annually in the United States.

**Methods:** This systematic review answered the following clinical question: (P) In patients undergoing coronary bypass grafting surgery, (I) will the prognostic capability of genetic testing, (C) compared with transthoracic echocardiography, CHARGE-AF and CHA2DS2-VASc risk score assessment (O) predict the risk for postoperative atrial fibrillation? Search terms included atrial fibrillation, genetics, genomics, risk scores, and transesophageal echocardiography. Inclusion criteria included patients greater than 18 years old, cohort studies, double blind randomized studies, meta-analysis, and studies within the last 10 years. Exclusion criteria included patients with a history of AF, permanent pacemaker, and studies greater than 10 years. Fifteen articles were critically appraised and synthesized.

**Analysis of the Evidence:** Seven cohort studies showed that patients who developed AF postoperatively had genotypes that increased their risk for AF. Two cohort studies showed the single nucleotide polymorphisms (SNPs) in the 4q25 chromosome and the Gly389 variant in the Beta1-adrenoreceptor is found to be associated with postoperative AF. One cohort study showed the LY96 gene is associated with a reduced risk of atrial fibrillation postoperatively. For the LY96 gene, beta-blocker therapy was protective and decreased patient's risk of AF postoperatively. In 2 meta-analyses, preoperative genetic testing diagnosed postoperative AF in CABG patients versus the traditional diagnostic transesophageal echocardiogram.

**Recommendation for Practice:** Atrial fibrillation is the most common heart rhythm disorder and the leading cause of heart failure and stroke. The current treatments for AF are implemented after diagnosis. Thirty genes have been identified and researched for the diagnosis of postoperative AF. Preemptive diagnostics by collecting blood preoperatively for genetic testing is warranted in the prevention of postoperative AF. The socioeconomic consequences to the healthcare industry, complications, morbidity, and mortality warrants the use of genetic testing and genomics to decrease the prevalence of AF. Identification of genes and various polymorphisms will optimize therapy and guide clinicians in providing safe, quality, cost-effective care.

## A62

### **Benefits of Xenon Inhalational Anesthesia in Cardiovascular Surgical Patients**

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**Introduction:** Myocardial damage during and after cardiac surgery remains an anesthetic challenge. Inhalational xenon alone or in combination with total intravenous anesthesia (TIVA) in cardiovascular surgical patients provides several advantages over other anesthetic techniques. Through its cardioprotectant effects, inhalational xenon can significantly improve patient outcomes in cardiovascular surgery.

**Methods:** The purpose of this systematic review was to answer the clinical question: “In adult cardiovascular surgical patients, does the use of balanced xenon inhalational anesthesia alone or as an adjuvant to propofol intravenous anesthesia (TIVA) compared with inhalational and intravenous anesthetic agents provide improved myocardial, renal, or cognitive recovery outcomes?” Search terms included xenon, Xe, cardiac surgery, myocardial protection, troponin I release, and cardiac surgery. Inclusion criteria were RCTs, English language, full text studies, and studies published from 2003 to 2018. Exclusion criteria were language other than English, nonhuman, children, and lack of inhalational xenon use. A total of 15 randomized controlled trials were critically appraised in this systematic review.

**Analysis of the Evidence:** A single-blinded randomized trial investigated 492 CABG patients who received inhalation xenon alone versus sevoflurane or TIVA. Results showed lower postoperative release of troponin I in the xenon group. In a prospective RCT, inhalation xenon was administered to 30 patients for CABG versus sevoflurane. The xenon group showed an increase in erythropoietin levels,  $P=0.017$ , decreased BUN, creatinine levels, increased creatinine clearance and decreased postoperative delirium. An RCT double-blind trial assessed hemodynamic effects of inhalation xenon compared with sevoflurane and showed considerably higher systolic, diastolic, and mean blood pressures in the sevoflurane group versus the xenon group.

**Recommendation for Practice:** Empirical evidence indicates a number of benefits of inhalational xenon contributing to improved outcomes in the adult cardiovascular surgical patient. These benefits include increased hemodynamic stability, increased erythropoietin release, decreased troponin I release, faster awakening from anesthesia, decreased incidence of postoperative delirium, and decreased incidence of acute kidney injury. It is recommended that inhalational xenon be administered at minimum alveolar concentration (MAC 60%) values or at half MAC values in combination with TIVA in adult cardiovascular surgical patients in order to improve surgical and anesthetic outcomes in providing quality, safe, cost-effective care.

A63

## **Bispectral Index Monitoring and Postoperative Delirium Among Older Adults**

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**Introduction:** Postoperative delirium (POD) is a form of delirium that encompasses vague neurologic symptoms, worsening of existing disturbances, and new functional deficits after undergoing surgery and/or anesthesia. Current metrics estimate POD affects 10% to 30% of older adults receiving anesthesia for a surgical procedure.

**Methods:** Do older adult surgical patients receiving anesthesia (P) in which bispectral index (BIS) monitoring is used to tailor anesthetic depth (I) compared with depth based on clinical signs or end-tidal concentration (C) have a reduced incidence of postoperative delirium (O)?

**Analysis of the Evidence:** The results of the 4 studies consistently found: BIS guided anesthesia resulted in 5% to 10% less POD when compared with adjusting anesthesia dosages (MAC) based on clinical signs/traditional methods. The targeted BIS value range was 40 to 60. Three of the studies found the reduction of POD to be statistically significant. The outlier was a substudy of an unrelated trial and did not measure baseline neurologic statuses of the participants.

**Recommendation for Practice:** Incorporating BIS monitors in the routine anesthetic of older adults can reduce the incidence of POD. Utilizing BIS monitors generally reduces the overall total amount of volatile anesthetic vapor a patient receives when under general anesthesia. Although BIS monitors have been used for more than a decade, some providers do not feel the machine provides an accurate measurement. Purchasing additional BIS monitors may also be needed to ensure adequate supply for the increased demand. Ideally, all operating rooms would have a permanent BIS monitor installed. However, this may be initially cost prohibitive.



A64

### **Continuous Peripheral Nerve Blocks for Patients With Traumatic Orthopedic Injuries**

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Medical University of South Carolina

**Introduction:** Treating pain in patients with traumatic orthopedic injuries is difficult. As many as 97% of patients suffering traumatic orthopedic injuries have pain at discharge. This project seeks to assess the efficacy of continuous peripheral nerve blockade to improve pain scores and reduce opioid requirements in patients who suffer traumatic orthopedic injuries as compared with similar patients who received opioids alone.

**Methods:** Data were obtained from the charts of patients who suffered traumatic orthopedic injuries and underwent open corrective surgery at MUSC from July 1, 2014 to January 1, 2017. Medical record numbers (MRNs) were obtained from MUSC's informatics center. The charts were separated into 3 categories: patients who received a continuous peripheral nerve block (CPNB), patients who received a single shot peripheral nerve block (SSB), and all patients who received open corrective orthopedic surgery during the time frame. Of the 5 MRNs provided for the CPNB group, 3 met criteria. Thirty-eight MRNs were provided for the SSB group, 29 met criteria. A total of 972 patients received open corrective orthopedic surgery during the specified time frame. Every fifth chart was reviewed. Data were placed in a data collection tool and sent to a statistician.

**Analysis of the Evidence:** CPNBs lead to lower postoperative pain scores. CPNBs not only treat pain but also prevent central sensitization. Numerous research studies support this. CPNBs also reduce opioid requirements. Patients on a morphine PCA pump require on average 30 times more morphine than patients with CPNBs. Reduced opioid requirements lead to less opioid related side effects, including less nausea, sedation, and itching. Numerous case studies have demonstrated that compartment syndrome can be diagnosed through a CPNB. CPNBs allow patients to participate in physical therapy sooner and reduces time until discharge all leading to better patient outcomes.

**Recommendation for Practice:** Patients who received some type of peripheral nerve block (PNB) had statistically significant lower pain scores on average, spent less time in pain, required less opioids, and were discharged sooner. Average weighted hours in pain was 3.3 hours for PNB patients and 6.4 for no nerve block (NNB) patients ( $p=0.000$ ). Average morphine equivalents required was 41.3 for the PNB group and 123.5 for the NNB group ( $p=0.000$ ). Average hours to discharge was 16.2 for the PNB group and 34.4 for the NNB group ( $p=0.000$ ). No complications were noted. Based on the results of this study, I recommend that anesthesia providers utilize CPNBs as an analgesic adjunct in patients with traumatic orthopedic injuries.

**Creation of an Anesthesia Mass Casualty Incident Protocol at a Level I Trauma Center**

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**Introduction:** Mass casualty incidents (MCIs) can occur at any time and result in a high volume of surgical trauma patients. This can place excessive strain on staff and resources at level I trauma centers. The anesthesia department plays a vital role in caring for surgical patients, therefore it must have a plan in place for MCIs. An evidence-based MCI protocol is needed to facilitate safe and effective anesthesia care.

**Methods:** Among UCMC Department of Anesthesia team members, will the creation of a formal mass trauma/disaster protocol specific to the anesthesia department affect understanding of the role and expectations of each team member if such an event were to occur when compared with their current understanding with no formal protocol in place as measured by a preeducation and posteducation survey distributed before and after the education session? PubMed, CINAHL, and Google Scholar databases were utilized to search the literature. Forty-seven abstracts were reviewed. Evidence was evaluated according to the Stetler Hierarchy of Evidence for strength of evidence. Fifteen articles were graded using this scale. The largest group of resources utilized were evidence-based clinical practice guidelines based on systematic reviews.

**Analysis of the Evidence:** All articles/guidelines with titles pertaining to the specific topic of interest were reviewed. There is a minimal amount of research available pertaining to mass casualty incident management. A total of 15 studies met the inclusion and exclusion criteria and were reviewed. Four systematic reviews were reviewed with Stetler grade 1 evidence, and 1 article was reviewed with grade 2 evidence from a well-designed RCT. Three articles were reviewed with grade 3 evidence from a quasi-experimental nonrandomized trial, and 4 articles were reviewed with grade 4 evidence from nonexperimental/correlational research. Two grade 5 evidence case reports were reviewed, and 1 grade 6 article was reviewed.

**Recommendation for Practice:** An education deficit exists among anesthesia providers pertaining to mass casualty incident management. A formal mass casualty incident protocol for the anesthesia department can serve as a reference to guide clinicians during such an event. Education of anesthesia staff pertaining to mass casualty management and the formal MCI protocol significantly improved understanding and awareness of the anesthesia department's plan and providers' role and responsibilities during an MCI.

**Cricothyrotomy Simulation for Nurse Anesthetists and Student Nurse Anesthetists**

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**Introduction:** Anesthetists are one of few providers capable of performing cricothyrotomy in the event of an emergency. Education is essential for professionals involved in managing life-threatening scenarios. Due to low incidence rates, many providers are unable to proficiently perform this skill. Simulation training is deemed superior compared with didactic education and is a potential solution for this issue.

**Methods:** The purpose of this literature search was to answer the following clinical question: In Certified Registered Nurse Anesthetists (CRNAs) and student nurse anesthetists does using a porcine model with ultrasound during cricothyrotomy simulation compared with prior training help anesthesia providers identify correct anatomical landmarks and improve confidence levels among CRNAs and student nurse anesthetists during an advanced airway simulation? The search used PubMed, CINAHL, and Scopus. Sources were limited to peer-reviewed articles from 2008 to 2018. The original search yielded 121 results. Sixty-four abstracts were examined, and a total of 25 articles were read in full. Fifteen articles were included in the literature review based on selection criteria.

**Analysis of the Evidence:** The literature reviewed showed simulation training is superior for airway management skills, increasing anesthetists' performance and knowledge. A high failure rate was attributed to the inability to correctly identify the cricothyroid membrane. Ultrasound is the best technique to improve success rate of placement. Utilizing porcine models allows for easier identification of anatomical landmarks and provides a more life-like model. Simulation is a great tool that can bridge the educational gap that occurs as a result of inconsistency in clinical practice; furthermore, proven to increase self-efficacy, knowledge, and skill of anesthesia providers performing cricothyrotomy.

**Recommendation for Practice:** Simulation can have a potent impact for scenarios that are not frequently encountered in the clinical setting. Incorporating hands-on training at regular intervals for anesthetists can improve preparedness, skill, and retention. The implementation of a cricothyrotomy simulation for CRNAs and student nurse anesthetists was successful and echoed the results of the articles reviewed. Providers' confidence levels, technique, and knowledge base all significantly increased. In fact, 70% of subjects felt confident they could perform a cricothyrotomy in the event of an emergency, compared with only 16% presimulation. Recurrent education can bridge the gap that occurs as a result of inconsistency in clinical practice.

A67

**CRNA Education on Unique Pain Considerations for Patients on Medication Assisted Treatment (MAT)**

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**Introduction:** Current anesthesia practice lacks guidelines for pain management of patients on medication assisted treatment. Without knowledge of the unique considerations of each medication, pain management may be inadequate leading to relapse and/or subsequent opioid overdose. The integration of education and use of a clinical decision making tool during the perioperative phases presents a possible solution.

**Methods:** The purpose of this literature review was to identify a needs assessment and evidence-based care for the creation of an educational video and clinical decision making tool. Electronic search engines included were PubMed, CINAHL, and Google Scholar. Key terms utilized for the search included opioid use disorder, opioid recovery, medication assisted treatment, anesthesia and pain management. Boolean Operator AND was used to connect the relationship between medication assisted treatment, anesthesia and pain management. Articles published in English between 2015 and 2018 were included. Initially, there were 144 results with 14 selected for final analysis.

**Analysis of the Evidence:** A quality improvement project was conducted to develop and implement an educational video and clinical decision making tool at Highland District and Baptist Health hospitals with a total of 20 participating CRNAs. Preeducation and posteducation data were collected and analyzed. Results indicate education was effective as evidenced by higher posttest scores, an increase in provider comfort when planning pain management when caring for patients on methadone, suboxone, or vivitrol.

**Recommendation for Practice:** With the current opioid epidemic, it is imperative nurse anesthetists understand current treatments for opioid addiction and how these might impact their care. The use of a clinical decision-making tool to standardize care and pain management may increase patient safety and satisfaction, greatly reduce patient suffering, allow for faster healing and discharge, decrease healthcare costs, and benefit not only the profession but also patients in all areas of care and within the community. Nurse anesthesia education and potential utilization of a clinical decision-making tool is a low-cost and timely intervention to improve provider knowledge and patient outcomes.

## A68

### Cut to Air

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**Introduction:** A cannot ventilate, cannot intubate scenario is a rare, high risk anesthesia event. Cricothyrotomy is the final solution, but anesthesia training and maintenance of surgical airway skills are variable. The ability to “cut to air” may be all that prevents a patient from suffering anoxic brain injury or death. The goals were to perform cricothyrotomy in < 2 minutes and to increase confidence.

**Methods:** In a survey, staff CRNAs identified cricothyrotomy as the number 1 critical event they wished to learn/review. An “anesthesia stat” call for a “cannot ventilate, cannot intubate” simulation scenario was designed. Over the course of 2 months, 43 individual CRNAs were spontaneously relieved from clinical duties to participate in the simulation. They were given 3 choices for cricothyrotomy laid out on a Mayo stand: (1) a Melker Cuffed Emergency Cricothyrotomy Catheter Set (Seldinger), (2) a scalpel/6 Shiley tracheostomy, and (3) a scalpel/bougie/6 mm endotracheal tube. Cricothyrotomy selection, baseline performance, and then sequential attempts were recorded until time for successful confirmation of placement of less than 2 minutes was achieved.

**Analysis of the Evidence:** A cannot ventilate, cannot intubate scenario is a rare, high risk event that occurs in approximately 1 out of 5,000 to 10,000 general anesthetics with emergency surgical airways performed in about 1 out of 50,000 general anesthetics. Recently, a closed claims analysis by the AANA identified that 23% of anesthesia-related events leading to death were due to loss of a patient’s airway. The cricothyrotomy is recommended as the final solution in the algorithm for a cannot intubate, cannot ventilate scenario. The literature is divided in identifying which cricothyrotomy technique is superior, as each technique has its own shortcomings.

**Recommendation for Practice:** The majority of CRNAs (53.5%) selected the cricothyrotomy kit, and all but 1 completed the cricothyrotomy in less than 2 minutes. The scalpel/bougie/endotracheal tube combination was the fastest, with an average completion time of 86.6 seconds. A significant difference in confidence to perform a successful cricothyrotomy in less than 2 minutes was observed ( $p < .000$ ). Simulating airway skills improved performance speed and confidence. As not all CRNAs have had extensive education in performing surgical airways and practicing these skills, simulation may have additional value in developing and maintaining skills and confidence.

A69

## **Developing a Disaster Preparedness Curriculum for Nurse Anesthesia Programs**

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**Introduction:** Nurse anesthesia clinical skills does not prepare student registered nurse anesthetists (SRNAs) to provide comprehensive, emergency, and trauma care to a diverse patient population during mass casualty events. Due to the critical nature of anesthesia delivery, appropriate crisis management in nurse anesthesia curriculum is imperative in preparing students to provide safe anesthesia care.

**Methods:** The purpose of this evidence-based project was to answer the following clinical question, “In nurse anesthesia programs, does a disaster preparedness curriculum for SRNAs compared with no disaster preparedness curriculum improve competency and skills in disaster management?” Search terms included disaster, mass casualty, crisis, disaster preparedness, curriculum, anesthesia, and nurse anesthetists. Inclusion criteria consisted of full-text articles, English language, and articles published from 2010 to 2018. Articles excluded were non-English language and experiences without disaster assistance. Eleven research articles were utilized for this systematic review and critically appraised; the articles consisted of randomized control trials, cohort studies, quasi-experimental studies, and report reviews.

**Analysis of the Evidence:** The evidence from an article review showed Thomas Jefferson medical university in Philadelphia implemented a mandatory disaster preparedness curriculum for medical students for more than 10 years without compromising the existing curriculum. A RCT explained the effectiveness of student centered disaster management curriculum in Saudi Arabia, where the curriculum incorporated both didactic and simulation sessions. A cohort study described the efficiency of a software based simulation program developed for Medical residents at the Alberts University,  $P < 0.05$ . Their curriculum provided didactic and software based simulation lessons in obtaining access to participants via student computers.

**Recommendation for Practice:** Disaster preparedness is vital for patient and provider safety in mass casualty events. The evidence shows the didactic component of educational training helps to prepare SRNAs and future CRNAs in unfamiliar and challenging mass casualties. Educational modules should incorporate interrelated learning through didactic teaching, simulation-based curriculum and participation in disaster drills. It is recommended to integrate disaster management into anesthesia curriculum, to help prepare confident and competent nurse anesthetists in mass casualty triage. Educational training of disaster preparedness prepares SRNAs in unfamiliar challenging mass casualties in providing safe, quality care.

A70

### **Development and Evaluation of Usability of Anesthetic Recommendations for Parturients With Fontan Palliation**

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**Introduction:** The perception that Fontan palliated patients are unable to handle the physiologic demands of pregnancy are quickly changing to a more positive opinion. Anesthetic management of Fontan palliated patients during delivery requires expansive understanding of the cardiac anatomy in addition to expert anesthesia administration catered to cardiac demands and fluid balance.

**Methods:** A systematic review was completed using the PRISMA guidelines through the Health Services Library at the University of Pittsburgh to identify key anesthetic recommendations. The PRISMA algorithm was followed, and the systematic review was registered on PROSPERO. Publications reviewed were narrative reviews, expert opinions, and case reports. Keywords were used to search databases including PubMed, Cochrane Central Register of Controlled Trials, CINAHL, and Embase. Articles fulfilling keyword search were selected. Two reviewers sorted through 4,000 articles utilizing the Distiller SR application. The second component of this project will include a new mobile application developed and tested in simulation scenarios.

**Analysis of the Evidence:** Nearly 4,000 articles were reviewed covering anesthetic management of Fontan-palliated parturients during labor and delivery in the categories of: New York Heart Association (NYHA) class, preterm deliveries, invasive monitors, type of delivery, anesthesia, anticoagulation, fluid management, and complications. Twenty-six articles were used during data extraction. Most patients were NYHA class I and II, 2 patients developed NYHA class III during third trimester. There was a high incidence of premature delivery and small for gestational age (SGA) in this population, consistent among all articles reviewed.

**Recommendation for Practice:** Anticipated increased risks in this population include preterm delivery and postpartum hemorrhage. Indications for cesarean versus vaginal delivery is based on patient presentation and obstetrical indications. Epidural and combined spinal epidural anesthesia are described and preferred over single shot spinal or general anesthesia. Low concentration of local anesthetic for labor epidural and slow dosing for cesarean delivery is used. General anesthesia is more likely to be used in urgent settings and contraindications to neuraxial techniques. Vigilance, invasive monitoring, and tertiary care environment are considerations of multidisciplinary planning before initiating anesthesia.

A71

## **Dexamethasone Effects on Cognitive Dysfunction in the Older Adult**

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**Introduction:** Dexamethasone is a common glucocorticoid administered at low doses during general anesthesia to decrease inflammation and to reduce the incidence of postoperative nausea and vomiting (PONV). A potential negative side effect of dexamethasone is cognitive dysfunction; however, the dose that results in this effect is unspecified.

**Methods:** In the older adult undergoing surgery (P), what is the effect of high dose dexamethasone (I) compared with low dose dexamethasone (C) on postoperative cognitive dysfunction (O) in the 7-day postoperative period (T)? Databases that were used were CINAHL, PubMed, Web of Sciences, and PsychInfo. Keywords and synonyms were used to search these databases. The Cochrane database was also searched using the phrase “dexamethasone effects on cognitive dysfunction.” Each study is a prospective randomized controlled trial.

**Analysis of the Evidence:** Dexamethasone is commonly administered during general anesthesia for the prevention of postoperative nausea and vomiting. One of the potential adverse effects of dexamethasone is contribution to cognitive dysfunction, which is a concern for older adults receiving general anesthesia. A review of current literature comparing a variety of doses of dexamethasone answered the PICOT question in that 0.1 mg/kg or about 8 mg of dexamethasone may reduce the risk of postoperative cognitive dysfunction, while a dose greater than 0.2 mg/kg may increase the risk of developing cognitive dysfunction in the postoperative period.

**Recommendation for Practice:** Implementing a change in practice would be feasible since dexamethasone is routinely administered by anesthesia providers. Educating anesthesia providers, PACU nurses, and surgeons on the benefits of an 0.1 mg/kg dose of dexamethasone should be provided to facilitate change in practice. Evaluation of practice change through follow-up assessments should be conducted in order to address struggles stakeholders may experience with the change in practice.



A72

## **Dexmedetomidine for Cardiovascular Surgical Patients**

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**Introduction:** This evidence-based practice paper focuses on the drug dexmedetomidine and its chemical properties as an alpha 2 agonist and its potential benefits when used in cardiovascular surgery, specifically coronary artery bypass grafting (CABG) on and off pump.

**Methods:** The PICO question is “Does dexmedetomidine in CABG patients perioperatively improve renal outcomes when administered as an adjunct to general anesthesia?” The research process began with a baseline search of “dexmedetomidine in general anesthesia” utilizing the Google Scholar database that was subsequently connected to the FGCU Library and included connections to PubMed and CINAHL. The research included multiple level 1 studies and provided sufficient statistical data that dexmedetomidine did indeed improve renal function perioperatively during CABG.

**Analysis of the Evidence:** The use of dexmedetomidine has far reaching implications when considered as part of general anesthesia. CABG patients who received dexmedetomidine consistently had improved sedation and analgesia control, fast extubation times facilitating fast-track CABG goals, improved renal function, and a decrease in morbidity and mortality when reviewing. Overall, the use of dexmedetomidine can be implemented in CABG protocols when not contraindicated as described.

**Recommendation for Practice:** Examining the use of dexmedetomidine in addition to the consideration of vasopressor treatment needs to be examined in greater detail. Studies frequently compared the use of dexmedetomidine with other anesthetic adjuncts; however, the analysis of vasopressor support was not brought into light, which could potentially cause discrepancies in findings when determining whether or not dexmedetomidine is truly beneficial when providing renoprotective effects in the patient who is undergoing cardiovascular surgery, specifically CABG and off-pump CABG.

A73

## **Diagnosis and Treatment Modalities of Postdural Puncture Headache in Obstetrical Population**

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University of Maryland

**Introduction:** PDPH after an ADP can lead to increased morbidity, extended LOS, and decreased patient satisfaction. Lack of consistent diagnosis and treatment for PDPH was identified in a hospital in Baltimore, Maryland. The purpose of this scholarly project was to develop a CPG to guide diagnosis and treat PDPH. Also, a simplified differential diagnosis decision tree and patient handbook was created.

**Methods:** A total of 50 studies were initially identified, but only 13 were included in final review based on inclusionary criteria. These 13 studies included 4 randomized controlled trials (n=300), 4 systematic reviews (n=3,383), and 5 retrospective reviews (n= 772). A CPG was then developed based on these results. An expert panel (n=4) scored the CPG on AGREE II tool, which is a scoring system based on a Likert scale. The CPG was revised and then evaluated by anesthesia department members using a 23-item Likert scale called a practitioner feedback questionnaire (PFQ). All data were analyzed using descriptive statistics. Final revisions were made to the CPG, which was adopted as a institutional policy and disseminated throughout the department.

**Analysis of the Evidence:** Multiple treatment regimens were identified in the prevention and treatment of PDPH. Most prophylactic measures were not effective in decreasing the incidence of PDPH; however, administration of prophylactic intravenous (IV) cosyntropin has been shown to decrease the severity of the PDPH. Multiple treatment modalities were identified, but the only consistently effective treatment was the placement of an EBP and/or placement of a sphenopalatine ganglion (SPG) block. It was also recommended that conservative treatment regimens such as psychological support, caffeine administration, abdominal binders, mild analgesia, and maintaining euolemia should always be recommended to the patient.

**Recommendation for Practice:** If a patient presents with a PDPH <24 hours postprocedure, start conservative treatments. If a patient presents with a PDPH > 24 hours postprocedure, counsel patient on options for treatment, start conservative measures if these have not been started. A SPG block is recommended for patients with mild to moderate headache symptoms 24 hours or more postprocedure. An EBP is recommended 24 hours or greater for patients presenting with a moderate to severe headache. The utilization of Differential Diagnosis Decision Tree was created to facilitate diagnosis and treatment modalities for the providers. A patient education handbook describes PDPH and treatment options with focus on EBP.

A74

**Difficult Airway Intubation: Glidescope Versus McGrath**

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Florida Gulf Coast University

**Introduction:** Video laryngoscopy has been shown to improve the success rate of endotracheal intubation in the patient with a difficult airway when compared with that of direct laryngoscopy. The video laryngoscope is often used when attempted endotracheal intubation with direct laryngoscopy has failed. It is important to know how they perform in a difficult airway situation.

**Methods:** In the patient with a difficult airway, which video laryngoscope—the Glidescope or McGrath—provides the best intubating conditions? The FGCU Library database, CINAHL database, MEDLINE database, and Cochrane Database were used to search for current peer-reviewed, evidence-based practice research articles. Keywords included Glidescope, difficult intubation, McGrath, video laryngoscope, difficult airway, endotracheal intubation, and laryngoscopy. The articles reviewed for this poster consist of a retrospective observational study, 6 randomized controlled trials, and 3 randomized manikin studies.

**Analysis of the Evidence:** In manikin studies, both video laryngoscopes do not significantly differ from each other in intubation time and success rate (intubation times: Glidescope, 23.8 seconds; McGrath, 25 seconds; success rate: Glidescope, 89.7%-97.4%; McGrath, 87.1%-100%). In a difficult airway scenario, with a cervical spine immobilizer, the McGrath is superior to the Glidescope (first attempt success rate: Glidescope, 85%; McGrath, 98%). However, in the obese population it was found that the Glidescope outperforms the McGrath (first attempt success rate: Glidescope, 93%; McGrath, 70%).

**Recommendation for Practice:** It was concluded that a successful first attempt rapid intubation depends on the patient scenario, the skill of the anesthetist, and the laryngoscope that is available. One size does not fit all, multiple types of video laryngoscopes should be available in practice.

A75

**Does Music Therapy Decrease Anxiety or Pain in the Postsurgical/Procedural Intervention in Cardiac Patients?**

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**Introduction:** North America is currently experiencing an opioid health crisis Administration of opioids and benzodiazepines in order to reduce pain or anxiety is common practice. Music, a non-pharmacological and inexpensive intervention, may have the ability to reduce anxiety and pain in cardiac patients. This review assesses the reduction in post-operative anxiety or pain due to music therapy in cardiac patients.

**Methods:** A search was performed on OVID MEDLINE and Web of Science with keywords: music, cardiac, pain, and anxiety in a timeline from 2000 to 2019. Twenty-nine articles were found within cited criteria, 3 were excluded due to duplication, 14 were then excluded after title/abstract was screened. Twelve articles were applicable to the topic but further exclusion of an additional 7 articles was permuted due to their publication being more than 8 years old. The remaining 5 articles were within 5 years of publication and illustrate and answer the PICOT question.

**Analysis of the Evidence:** All appraised articles selected in this research provided results with a statistically significant reduction in stress/anxiety and pain or, at times, both. The evidence is based on quasi-randomized or double-blinded controlled trials set on various populations from pediatric to adult. These results have also shown to have had an impact on physiological vital signs and cortisol levels. The evidence delivers qualitative and quantitative data that music provides a reduction in the experience of stress and perception of pain in the postoperative period in cardiac patients.

**Recommendation for Practice:** Based on the evidence displayed by the studies, listening to music can reduce preoperative/postoperative anxiety, as well as pain in cardiac patients. This reduction can, in turn, decrease the use of the prescribed opioid. Music is a nonpharmacological, inexpensive intervention with no known side effects that should be included as an adjunctive or alternative intervention to pharmacotherapy. It can be presented to patients as part of their preoperative package, along with teaching tools and the option to select preferred sound.

**Dural Puncture Epidural Technique: A Novel Alternative for Labor Analgesia**

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**Introduction:** The dural puncture epidural (DPE) is a neuraxial technique that is an intermediate between a spinal and epidural. The DPE technique has great significance for the obstetric population. In laboring parturients, the DPE technique has been associated with better quality pain relief, faster onset of sacral spread, and symmetrical blockade without any more side effects than the traditional epidural.

**Methods:** An extensive search was done using online search engines and databases including Google Scholar, CINAHL, Pubmed, Cochrane Library, and MEDLINE. RCTs and case studies were selected for review and analysis. Common themes were discovered in the literature search. Results and conclusions from the studies were organized into subcategories consisting of: subarachnoid spread and needle size, sacral spread, block symmetry, analgesia, postdural puncture headache, epidural catheter function, and maternal and fetal side effects. PICOT question: Can dural puncture epidural technique improve labor analgesia when compared with standard epidural technique, while minimizing the side effects associated with the combined spinal epidural technique?

**Analysis of the Evidence:** Translocation of drug from the epidural to subarachnoid space was largely dependent on the size of the needle used to perform dural puncture. Compared with epidural analgesia, patients who received DPE for labor analgesia had enhanced quality analgesia, faster onset of sacral spread, and increased incidence of symmetrical blockade. Compared with CSE, patients who received DPE had reduced incidences of maternal and fetal side effects. A study by Chau et al provided the best evidence to support these findings. Among the research, the most benefits were seen when a 26-gauge or larger spinal needle was used and when an epidural bolus was administered (versus continuous infusion) following DPE.

**Recommendation for Practice:** Future studies addressing some of the gaps in the research would be necessary to justify DPE as a gold standard for neuraxial analgesia for laboring women. Nonetheless, DPE offers a favorable risk-benefit ratio and is a safe and reasonable neuraxial alternative to epidurals for labor analgesia. In order to maximize benefits of the DPE technique, a 26-gauge or larger needle should be used for dural puncture and an epidural bolus should be administered following DPE.

A77

## **Effectiveness of an Evidence-Based Workshop to Train Peer Supporters for Second Victims of Perioperative Adverse Events**

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**Introduction:** A survey at Mayo Clinic found that 68% of anesthesia providers had been affected by an adverse event and perceived support was inadequate. A workshop was developed to increase awareness of the second victim phenomenon while augmenting peer support.

Adequate support systems help clinicians cope, while strengthening the organization's culture of safety and enhancing the quality of care provided.

**Methods:** Among anesthesia providers at Mayo Clinic, does attending an evidence-based workshop for providing peer support to second victims increase confidence related to providing peer support and knowledge of the second victim phenomenon? The literature search was developed from keywords including second victim phenomenon, peer support, emotional first aid, and postevent support. Google scholar and PubMed were used and articles were selected after manual review. Additionally, I attended Dr. Scott's Second Victim Train the Trainer Workshop, sponsored by the Center for Patient Safety. This workshop provided tools, supportive interventions, and instruction enabling participants to return to their organization with the knowledge and skills necessary to augment peer support.

**Analysis of the Evidence:** There is a lack of support for clinicians suffering as second victims. In January 2018, the Joint Commission issued a safety report "Supporting Second Victims," encouraging institutions to develop support programs that proactively reach out to clinicians after adverse events including immediate peer-to-peer emotional support. Peer support is the most desired form of support after experiencing an adverse event or unanticipated outcome. It is estimated by acknowledging the second victim, 60% of second victims' needs are met. Recent studies have confirmed investing in support systems strengthens the organizational culture of safety and improves the quality of care provided.

**Recommendation for Practice:** To effectively support colleagues as second victims, peers should possess knowledge of the second victim phenomenon and confidence in leading supportive interactions. Workshop participants demonstrated statistically significant increase in both knowledge and confidence from preworkshop to postworkshop. The results showed a mean  $\pm$  SD change in knowledge of  $25 \pm 12\%$  ( $p < .001$ ) and a median (25th, 75th) change in confidence of 2.4 (1.8, 3.1) ( $p < .001$ ). The majority of participants (91%) indicated interest in serving as Trained Peer Supporters for the newly deployed second victim peer support program, and all participants said they would "recommend the workshop to others."

**Funding Sources:** Funding obtained from Mayo Clinic Department of Anesthesiology and Perioperative Medicine.

A78

## **Emotional Intelligence as a Predictor of Clinical Performance in Nurse Anesthesia Students**

*Kenneth Simmons, RN*

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**Introduction:** Predicting success in nurse anesthesia programs is routinely analyzed using cognitive measures such as, but not limited to, GPA, science GPA, years of experience, and GRE scores. The purpose of this review is to analyze the current literature and evaluate if EI can be measured and utilized to determine a nurse anesthesia student's success in the clinical setting.

**Methods:** Is high emotional intelligence in nurse anesthesia students associated with successful clinical performance in a nurse anesthesia program? Focused studies involved randomized controlled trials, systematic reviews, and retrospective studies. An electronic database search was performed using the following: PubMed, CINAHL, and Google Scholar.

**Analysis of the Evidence:** Research does not claim emotional intelligence as the most predicative factor of success in nurse anesthesia students but shows its role is significant. There is inconclusive evidence on the effect of EI on clinical performance of nurse anesthesia students due to the lack of research on nurse anesthesia students.

**Recommendation for Practice:** The inclusion of EI assessment is recommended during the admission process for nurse anesthesia programs due to the positive correlation between EI and academic performance. Further research is recommended to analyze whether EI training within a nurse anesthesia curriculum can increase clinical performance.

**Enhanced Recovery After Surgery for Posttraumatic Stress Disorder**

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**Introduction:** As much as 8% of the general population is afflicted by posttraumatic stress disorder (PTSD). The disorder contributes to unique challenges for the anesthesia provider. Enhanced recovery after surgery (ERAS) pathways serve to optimize the surgical experience of patients by improving surgical outcomes. This study will serve to create an evidence-based ERAS pathway for the patient with PTSD.

**Methods:** Exhaustive literature searches were used to identify assessments and interventions, applicable to the patient with PTSD, throughout the perioperative period. Databases used included MEDLINE, PubMed, CINAHL, Cochrane library databases, and the Emerson Library at Webster University. Keywords include posttraumatic stress disorder, enhanced recovery after surgery, protocol, pathway, anesthesia, and emergence delirium. Many studies were used in order to determine the estimated prevalence of PTSD and the methods that are used in assessment and diagnosis. Interventions were selected from available research, yet the volume of published data is lacking. Data included in this review were primarily published between 2009 and 2019, but due to a lack of data, older studies were included.

**Analysis of the Evidence:** Articles were reviewed to show the prevalence of PTSD. Due to changing diagnostic criteria, additional articles were included to show validity of previous studies. Articles showed a poor diagnosis rate, and additional attention was given to diagnostic tools, in order to identify at-risk patients and to develop an “index of suspicion.” Next, signs, symptoms, treatment, and comorbidity of the disorder were investigated. Finally, case studies involving patients with PTSD and clinical practice guidelines for PTSD were examined to develop best practice. Perioperative interventions should be focused on recognition and treating physical symptoms of PTSD while minimizing stressors or trauma.

**Recommendation for Practice:** Continuity of care is critical. The preoperative environment should focus on identification of patients with PTSD. The PC-PTSD-5 assessment is an effective predictive tool in identifying PTSD. Premedication should be at the discretion of the patient as loss of control represents a potential stressor. Pain should be well controlled, prior to emergence, using multimodal techniques. The patient should be allowed to emerge free from stimulus and airway devices when practicable. Dexmedetomidine may facilitate an uneventful emergence. Familiar persons may be present to aid in reorientation. Finally, debriefing and PRN psychotherapy may be warranted in the event of negative perioperative events.



**Enhanced Recovery Pathway for Multimodal Analgesia in Elective Cesarean Surgery: Literature Review with Practice Recommendations**

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**Introduction:** Women undergoing cesarean surgery experience postoperative pain that can negatively impact mobility, breastfeeding, and maternal caring for the neonate. This extensive literature review identifies key components of effective intraoperative and postoperative multimodal pain management as part of an enhanced recovery pathway (ERP) that improves postcesarean maternal outcomes such as pain control.

**Methods:** An extensive literature search was performed using PubMed, Embase, Web of Science, and Scopus. The primary search terms were “enhanced recovery” and “cesarean surgery.” The population focus was women undergoing elective cesarean surgery and postoperative maternal outcomes were reviewed. Results yielded 26 abstracts, which were reviewed. Seventeen abstracts were excluded for not meeting criteria. Nine articles were reviewed and 2 were included for final analysis. To focus the literature review on the multimodal analgesia component of enhanced recovery, a separate search for “multimodal analgesia” and “cesarean” was performed. The search yielded 180 articles, which were evaluated, based on preset criteria. A total of 6 articles were included in the final multimodal analgesia component of this analysis.

**Analysis of the Evidence:** The 2 articles included that addressed ERPs and cesarean surgery demonstrated improved maternal satisfaction, earlier mobility, and shorter length of stay. The 6 articles addressing best multimodal strategies for intraoperative and postoperative pain control for cesarean surgery demonstrated improved maternal pain control with the use of intrathecal opioids for intraoperative subarachnoid blocks. Studies that investigated adjunct modalities found statistically significant opioid-sparing effects from the use of local anesthetic wound infiltration catheters and quadratus lumborum regional nerve blocks.

**Recommendation for Practice:** Use of long-acting opioids in spinal anesthesia for women undergoing elective cesarean surgery is recommended. Long-acting spinal opioids in this modality improve pain control during the immediate postoperative period, increase sensory block, decrease motor block, and decrease postoperative opioids. Adverse effects can be treated with targeted medications. Adjunct analgesic considerations include local anesthetic wound infiltration infusion and regional blocks, which were shown to have significant analgesic and opioid-sparing effects. Future research should standardize cesarean ERPs and consider measurement of targeted outcomes such as breastfeeding and bonding.

**A81**

**Etomidate as an Induction**

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**Introduction:** Although etomidate seems like the ideal induction agent in critically ill patients, the transient decrease in cortisol production, once considered minor, may have detrimental effects in septic patients. A review of literature was performed to determine the safety of etomidate administration in the septic patient requiring emergency intubation.

**Methods:** In the septic patient requiring emergency intubation, does the administration of etomidate increase the risk of prolonged adrenal suppression and hemodynamic instability? A review of literature was conducted through the CINAHL, and PubMed databases using the keywords etomidate, sepsis, adrenal suppression, and intubation. Eight studies were identified, which included 5 systematic reviews and 2 retrospective cohort studies.

**Analysis of the Evidence:** Five studies suggested that an alternate to etomidate be used during intubation of a patient with sepsis. All warned that practitioners should be aware of the potential risk for sustained adrenal suppression and increased mortality with etomidate in critically ill septic patients. On the opposite side, 1 study concluded that almost all the studies evaluated were observational in nature, and data were not convincing that etomidate should be abandoned for use in rapid sequence induction (RSI), while another stated that single-dose etomidate used during RSI in patients with severe sepsis and septic shock was not associated with increased mortality.

**Recommendation for Practice:** When securing a patients' airway with a diagnosis of sepsis, it may be best to look for alternative induction agents in this population. It is unclear if there is enough evidence to remove etomidate altogether from RSI for septic patients requiring endotracheal intubation. There needs to be more research on etomidate administration and the safety margin when used in sepsis or septic patients. There also needs to be early identification and communication of sepsis during an emergent situation. The diagnosis should be either directly communicated to the provider or placed as patient identifier, such as an armband, an alert in their chart/electronic record, or warning above the patient's bed.

**Evaluation of the AANA Postcesarean Analgesia Guidelines at a Community Hospital**

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**Introduction:** Cesarean delivery affects about 1.3 million women yearly. Traditional pain management includes mostly opioids, increasing the risk of tolerance and abuse. The AANA recently updated the Analgesia and Anesthesia for the Obstetric Patient Practice Guidelines. A hospital in Ohio recently implemented the guidelines. This project is evaluating the effects of the implementation of the guidelines.

**Methods:** Does the implementation of AANA multimodal analgesia guidelines decrease opioid consumption in postcesarean patients compared with standard medication administration within the time until discharge? A literature review was performed using PubMed and CINAHL databases to determine the effect of multimodal pain management in the cesarean population. Research demonstrates multimodal analgesia provides cesarean patients optimal pain control while reducing exposure to opioids. Recently the AANA multimodal analgesia guidelines were implemented at a hospital in Ohio. The aim of this project includes evaluating via chart review: provider adherence to the guidelines, patient pain scores, and administration of analgesic medications while also obtaining provider feedback via questionnaire.

**Analysis of the Evidence:** The primary tool for analysis is statistical process control of the chart using the hospital's electronic charting software and provider feedback via questionnaire. Preliminary data after implementation: oral opioid administration decreased 60%. Oral acetaminophen and ibuprofen increased 50%. Intraoperative administration of ketorolac increased 10%. Intraoperative administration of dexamethasone increased 60%. Provider barriers to implement included: 13% role strain, 25% unable to edit order sets, 13% not adhering to order sets, 25% denying barriers to implement, 12% of patients allergic to medications, and 12% of patients refusing medications.

**Recommendation for Practice:** Recommendations include establishment of a multidisciplinary team with key stakeholders including: obstetricians, pharmacists, nurses, and anesthesia providers. Providing patient and provider education pieces. Based on feedback, providers are suggesting revisions in the guidelines including changing administration times from every 6 hours to every 8 hours to allow adequate rest throughout the night and aligning medication administration with breastfeeding schedule. The justification of acetaminophen and ibuprofen as anti-inflammatory medications rather than pain medications will decrease RN workload regarding pain assessments.

**Evidence-Based Practice: The Effectiveness of Transversus Abdominis Plane Block to Reduce Postoperative Pain**

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**Introduction:** It was unclear whether the transversus abdominis plane (TAP) block reduced postoperative pain in abdominal surgical patients undergoing general anesthesia. This work describes the evidence on the effectiveness of TAP blocks in reducing postoperative pain for patients undergoing abdominal surgery. Based on this evidence, a change in anesthesia practice was made to increase the use TAP blocks.

**Methods:** The following PICOT question was used to search the CINAHL Plus, Cochrane Library, PubMed, and Web of Science literature databases: Do adult patients undergoing abdominal surgery (P) who receive a transversus abdominis plane (TAP) blocks (I) compared with similar patients who do not receive a TAP block (C) have less pain (O) postoperatively (T)? Two meta-analyses and 3 RCTs were critically appraised.

**Analysis of the Evidence:** The results of these studies consistently showed the TAP block reduced postoperative pain and narcotic consumption. Variations in surgery types, TAP block technique, and local anesthetic may account for the variability in other results between studies. It is recommended from this evidence that the TAP block be incorporated into clinical practice for abdominal surgical patients.

**Recommendation for Practice:** At Memorial Hospital of Jacksonville, Florida, following IRB waiver, a Mentimeter (an interactive teaching and data collection tool) presentation was given to the anesthesiology staff at a monthly departmental meeting. A website with project information, effectiveness of TAP blocks information, and practice resources related to the TAP block was created for ease of access for the anesthesiology staff. To determine if a change in practice was made, the frequency of use of the TAP block and narcotic use was monitored before and after intervention for 30 days using tracking sheets included in postoperative packets for all nonobstetric surgical patients.

**Evidence-Based Practice: The Efficacy of Intravenous Magnesium Sulfate to Reduce Postoperative Opioid Consumption**

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**Introduction:** CRNAs use multimodal anesthesia techniques, but it was unclear if administration of magnesium sulfate was an effective analgesic adjuvant. The purpose of this work was to describe the evidence from the literature of the analgesic effects of intravenous magnesium sulfate on postoperative opioid consumption. Based on this evidence, a change in clinical anesthesia practice was made.

**Methods:** Keywords for the following PICOT question were used to search the 4 selected literature databases. Do patients undergoing surgeries (P) who receive intravenous magnesium sulfate intraoperatively (I) compared with those who do not receive intravenous magnesium sulfate (C) have less pain and less opioid consumption (O) postoperatively (T)? The search terms for magnesium included magnesium, magnesium sulfate, and intravenous magnesium sulfate. One systematic review of RCTs, 1 meta-analysis of RCTs, and 4 RCTs were critically appraised.

**Analysis of the Evidence:** The systematic review, meta-analysis and RCTs yielded evidence in which doses of perioperative intravenous magnesium sulfate ranging from 750 mg-loading doses to 50-mg/kg loading doses followed by 15- mg/kg/h infusions reduced postoperative pain and postoperative opioid consumption. The results of these studies were consistent in their findings of systemic magnesium sulfate administration in the perioperative setting leading to reductions in postoperative pain and opioid consumption. These findings demonstrate the effectiveness of magnesium sulfate as an adjunct analgesic in the surgical patient population.

**Recommendation for Practice:** Following IRB waiver, the use of intraoperative intravenous (IV) magnesium sulfate was implemented at a local hospital. Administration of 2 grams of magnesium sulfate infusions were recommended. Prior to implementation, a presentation was made to hospital anesthesia providers and recovery unit nursing staff discussing the evidence and why the change was needed to improve patient outcomes. A trend analysis using SYS Analytics was done to determine the frequency of use of IV magnesium 6 months prior to and 3 months postimplementation of the practice change. The frequency of use of IV magnesium by anesthesia providers increased by 151% after implementation.

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**Evidence-Based Practice: Using the STOP Bang Questionnaire to Identify Obstructive Sleep Apnea**

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**Introduction:** Undiagnosed OSA surgical patients are more likely to have postoperative hypoxemia. It was unclear if the SB tool for OSA in the preoperative period would reduce postoperative hypoxemia for these patients. This work describes the evidence from the literature on the effectiveness of the SB tool at reducing postoperative hypoxemia. Based on this evidence, a change in clinical practice was made.

**Methods:** Literature databases, CINAHL, Ovid MEDLINE, PubMed, and Cochrane were searched using keywords from this PICOT question: Do patients (P) who have high SB scores (I) compared with patients who do not have high SB scores (C) have a higher incidence of pulmonary complications (O) postoperatively? One prospective and 4 retrospective observational cohort studies were critically appraised. Following IRB review and exemption, a change in practice was developed and implemented at Brooke Army Medical Center in San Antonio, Texas.

**Analysis of the Evidence:** The results of these studies consistently found patients with an SB score of 3 or greater had statistically significantly greater postoperative pulmonary complications including lower oxyhemoglobin saturation (SpO<sub>2</sub>), increased adverse respiratory events in the postacute care unit (PACU), increased hospital length of stay, lower respiratory rates and increased 30-day mortality.

**Recommendation for Practice:** At the Brooke Army Medical Center in San Antonio, Texas, the STOP Bang questionnaire was implemented during the preanesthesia assessment. Prior to implementation a presentation was given to anesthesia and nursing staff discussing the evidence, the practice change, and the anticipated improved patient outcomes. Patients received educational material preoperatively. Using the electronic medical record system, undiagnosed OSA patients and patients with hypoxemia (SpO<sub>2</sub> < 94%) in PACU were identified. After implementation of the SB tool, identification of undiagnosed OSA patients increased by 78% prior to surgery and hypoxemia in PACU was reduced.

## **Evidence-based Dexmedetomidine Dosing Recommendations for the Prevention of Pediatric Emergence Delirium**

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**Introduction:** Emergence delirium (ED) occurs frequently in the pediatric population. The negative impacts of ED are physical, psychosocial, and economic. Dexmedetomidine has proven effective in preventing ED. Intraoperative bolus dosing may be the preferred method of delivery due to the ease of utility, while dosing recommendations and suggestions on time of administration could improve patient outcomes.

**Methods:** The PICO question was: In pediatric patients aged 1 to 15 years at risk for emergence delirium (population), what is an optimal bolus dose of dexmedetomidine (intervention) during general anesthesia for surgical procedures (context), to decrease the incidence with minimal side effects (outcome)? The search for evidence examined PubMed, CINAHL, and Cochrane databases. Keywords included: emergence delirium, pediatric, and dexmedetomidine. We directed our search toward the use of dexmedetomidine administered intraoperatively as an intravenous bolus with the primary purpose of ED prevention, rather than as a rescue agent administered in the PACU. Seven studies (2 meta-analyses, 4 RCTs, and 1 prospective double-blinded randomized trial) met the inclusion criteria (2,142 subjects).

**Analysis of the Evidence:** The evidence revealed that dexmedetomidine as an intraoperative intravenous bolus, ranged in dose from 0.5 to 2 mcg/kg, was shown to reliably decrease the incidence of ED. Doses under 0.5 mcg/kg did not consistently prevent ED. While delays in emergence or time to extubation were not always measured, when dexmedetomidine was given after induction there are conflicting results regarding increased time to extubation, time to awakening, and PACU length of stay. The evidence suggests that even in the presence of decreased heart rate and decreased blood pressure, no hemodynamic interventions were needed.

**Recommendation for Practice:** Maximizing the benefits of dexmedetomidine is dependent on the dosage and timing of administration. Higher doses of dexmedetomidine appear to decrease both the incidence and severity of ED. However, dosages greater than 0.5 mcg/kg may not provide additional protection against the occurrence of ED and have been shown to delay recovery from anesthesia. Therefore, a total dose of 0.5 mcg/kg seems optimal for preventing ED in the pediatric population. The anesthetist should consider administering dexmedetomidine immediately following the induction of anesthesia to reduce the anesthetic requirement as well.

**Exposure to Surgical Smoke in the Operating Room and the Potential Health Risks to Staff**

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**Introduction:** Smoke generated in the operating room by the use of electrocautery, ultrasonic scissors, and lasers leads to the formation of chemical compounds that have the potential to cause harm to the personnel in the operating room (OR). These chemical compounds have both short-term and long-term consequences to the health of OR staff.

**Methods:** A review of the literature was performed using a PubMed search in June 2018.

Articles were limited to 5 years. MeSH terms used in the search included: electrocautery smoke, hazard, and surgical smoke. Additional articles were selected from the references of articles that were found using the PubMed search. Only articles written in English were utilized for this study. Articles were included if they analyzed surgical smoke that was derived from the cauterization of human tissue and identified chemical compounds found in the smoke. Articles were also included if they sought to investigate the biological implications of surgical smoke on OR personnel.

**Analysis of the Evidence:** These studies showed that there are a multitude of chemicals found in surgical smoke. Some of these chemical compounds identified are known carcinogens. Lifetime cancer risk identified for anesthesia providers was found to be higher than that of a surgeon's due to prolonged exposure over the course of their career. Analysis of surgical smoke revealed that it is composed of several volatile organic compounds. Some of these chemicals can cause short-term symptoms in OR personnel such as a cough or headaches. Some of these chemicals can also be carcinogenic; other long-term problems can range from kidney damage to leukemia.

**Recommendation for Practice:** The avoidance of this surgical smoke is the best way to minimize the potential health risks to OR staff. While this isn't always possible, measures that help to minimize exposure to surgical smoke are the next best option. Laparoscopic cases can utilize built-in-filter trocars to reduce the chemical concentration of smoke from the pneumoperitoneum. Surgical smoke evacuators can also be a useful tool for reducing exposure to surgical smoke from open procedures. Appropriate personal protective equipment such as high-filtration masks and goggles can also decrease potential health risks to staff.



**Focused Review: Lower Extremities Injuries in Patients Undergoing Procedures in Lithotomy Position – What are the Risks?**

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**Introduction:** The American Society of Anesthesiologists (ASA) Closed Claim Database stated that nerve injury accounted for 12% of malpractice claims between 1990 and 2013 for patients who had general anesthesia. Findings suggest an increased risk for developing nerve injury the longer the patient is in lithotomy, the degree of elevation of the extremities, and patient-related factors and health conditions.

**Methods:** A literature search was conducted using the CINAHL, MEDLINE, and UpToDate databases for the published articles from 2000 to current. Inclusion criteria included: peer-reviewed studies in English and keywords searched were neuropathy, compartment syndrome, peripheral nerve, “nerve injury, and lithotomy. The appraisal of evidence was performed with the Johns Hopkins Appraisal Tool.

**Analysis of the Evidence:** The findings from the literature indicated that most common patient risk factors include male sex, age, BMI, smoking, peripheral vascular disease, diabetes, and hypertension. Iatrogenic risk factors include length of surgery, blood loss, and maintenance of mean arterial pressure (MAP) within 20% of patient’s baseline MAP. For every centimeter the extremities are elevated above the level of the heart, the systolic blood pressure decreases 0.78 mm Hg. For every hour a patient is in the lithotomy position, the risk for developing a nerve injury increases by nearly 100-fold. In consideration, a more comprehensive understanding of risk factors is required to address this persistent issue.

**Recommendation for Practice:** Recommendations based on synthesis of the evidence include obtaining a thorough preanesthetic patient history including physical alterations that require additional precautions for procedure specific positioning. Moreover, maintaining a multidisciplinary open communication with the surgical team is paramount in relation to patients’ position changes during procedures longer than 4 hours. Furthermore, maintenance of hemodynamic parameters, particularly the MAP within 20% of patient’s baseline is advised to minimize nerve related lower extremities injuries.

**For Patients Requiring General Anesthesia With an Increased Risk of Aspiration, Should the Sellick Maneuver Be Used?**

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**Introduction:** Sellick's study of cricoid pressure in 1961 led to his recommendation for its use in high risk patients to prevent aspiration. Since then, cricoid pressure has been under scrutiny for its true capability of preventing aspiration and effect on laryngeal view, among other factors.

**Methods:** For this review, only original reports that were peer-reviewed and less than 8 years old were selected. Search strategies included exploring keywords: Sellick maneuver, cricoid pressure, aspiration, laryngoscopy view, intubation time, and rapid sequence induction. Articles were then reviewed for their references until the cycle brought back most of the original articles. This method allows the literature review to encompass most of the research on the topic. The 2 most prevalent variables tested against cricoid pressure are prevention of aspiration and laryngeal view. A third variable encompasses general effect of cricoid pressure. The question sought to be answered is: For patients requiring general anesthesia with an increased risk of aspiration, should the Sellick maneuver be used?

**Analysis of the Evidence:** Major conclusions are that cricoid pressure mostly does not prevent aspiration. Cricoid pressure has either no effect or a worsening effect on laryngeal view. When used, the esophagus is either not occluded or laterally displaced; and when it is effective, Sellick's original suggestion of 40 newtons is not attainable. The theme of most literature is that cricoid pressure should not be an unbroken standard. If it impedes view or lengthens time to airway securement, it should be released.

**Recommendation for Practice:** The risk-benefit ratio does not appear to favor routine cricoid pressure. At best, cricoid pressure has no influence. At worst, it is traumatic, obstructs laryngeal view, and lengthens intubation time. The statistical significance of it to provide its worth is not convincing. More studies can only solidify the break against tradition of cricoid pressure.

## **Impact of Overinflated Endotracheal Tube Cuffs on Tracheal Injury and Healthcare**

### **Costs: A Focused Review**

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**Introduction:** Over-inflation of the cuff beyond 30 cm H<sub>2</sub>O has been associated with tracheal morbidity such as sore throat, tracheal stenosis, and ischemia. Utilization of handheld manometers or specialized syringes can be used to quantitatively measure ETT cuff pressure. In many circumstances, these devices are inconveniently located or unavailable for practitioners to use in the clinical setting.

**Methods:** The primary databases used to perform this literature review included CINAHL Plus, MEDLINE, and PubMed. To appraise each article throughout the literature review, the Journal Article Reporting Standards (JARS) was utilized. Keywords for the search included tracheal injury, ETT cuff injury, healthcare costs, cost effective, and overinflated. Inclusion criteria were full length articles; scholarly, peer reviewed journals; and published between the years 2010 and 2018.

**Analysis of the Evidence:** Seventy-nine percent of ETT cuff pressures are beyond the recommended ranges when estimated by palpation techniques. Histopathological changes in animal models can occur during short periods of intubation, even at recommended cuff inflation pressures. Postoperative sore throat (POST) is a common adverse effect of endotracheal intubation. This may affect hospital reimbursement rates if POST negatively affects Hospital Consumer Assessment of Healthcare Providers and Systems (HCAPS) scores. In addition, ETT cuff related injuries can influence length of hospitalization and increase healthcare costs. An average length of hospital stay due to tracheal injury can be increased by 1.1 days. The average cost of treatment for tracheal injury may be as high as \$2,000 per patient.

**Recommendation for Practice:** Cuff-related tracheal injuries may be prevented by monitoring of cuff pressure and preventing overinflation. Measuring ETT cuff pressures through the use of a handheld manometer or pressure indicator syringe has been proven to be a reliable and cost-effective technique. Objective measures to monitor ETT cuff pressures intraoperatively are recommended, especially during long surgical cases. Anesthesia providers have low awareness of tracheal injuries due to use of subjective methods to evaluate cuff pressures and low rate of patient followup.

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## **Implementation of a Modified Dosing Strategy to Reduce Pruritus Following Intrathecal Morphine**

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**Introduction:** Pruritus occurs in nearly 90% of women who receive intrathecal (IT) morphine for cesarean delivery (CD). This side effect severely impacts patients' well-being during their inpatient stay by interfering with mother-baby bonding, increasing the risk for postpartum depression and risk for infection. There are no practice guidelines for optimal IT morphine for proper analgesia while avoiding pruritus.

**Methods:** In parturients undergoing scheduled cesarean delivery, does an evidence-based intrathecal morphine dose of 0.1 mg reduce the incidence of treatment required pruritus compared with current clinical practice at Naval Hospital Jacksonville (NHJAX). We searched PubMed, Excerpta Medica Database, and the Cumulative Index to Nursing and Allied Health Literature to identify articles, abstracts, or dissertations for inclusion in this systematic literature review on the dose utilization of intrathecal morphine in patients undergoing scheduled cesarean delivery. The search was retrospective and not truncated by year to capture the broadest scope of literature on the subject. After implementing inclusion and exclusion criteria the yielded 7 articles.

**Analysis of the Evidence:** The Melnyk and Fineout-Overholt Level of Evidence Pyramid was utilized to assess the level of evidence for the remaining 7 articles. The University of Oxford's Centre for Evidence-Based Medicine appraisal tool was utilized to evaluate the quality of the remaining 7 articles. From the 7 high-quality articles addressing optimal IT morphine dose, there were 6 level II and 1 level I evidence articles.

**Recommendation for Practice:** Optimal intrathecal Duramorph dose to maintain analgesia and decrease the incidence of treatment required pruritus for cesarean delivery is 0.1 mg according to the current state of science.

**Implementing a Computer-Based Education Module on Epidural Technique for SRNAs**

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**Introduction:** A gap in the literature exists for teaching and testing student registered nurse anesthetists' (SRNAs') knowledge and competence at completing technical skills, specifically epidural technique. Research has shown SRNAs prefer combined classroom education. The purpose of this study was to prepare SRNAs to be knowledgeable, competent, and confident in delivering safe epidural anesthesia prior to performing the technique on patients.

**Methods:** The aim was to answer the following question: Among SRNAs, does completing an educational computer module on epidural technique affect knowledge acquisition and performance immediately following completion of the module. All students (n = 28) completed the epidural module including the knowledge and competence components. Knowledge assessment consisted of a premodule test and a postmodule test using the same 10 questions. A comparison of the scores was calculated using a 2-sided paired t test. P-values < 0.05 were considered significant. Student performance was evaluated using a standardized and validated 17-item competency checkoff and 7-item global rating scale. Additionally, students had the option to complete a survey assessing satisfaction and competence.

**Analysis of the Evidence:** The education module improved scores from the premodule test to the postmodule test. The estimated mean difference between premodule test and postmodule test was 32 (95% CI = 25, 38), incurring a p-value < 0.001. Of the 28 students, 4 had unsatisfactory items on the competency checklist. Of the 28 SRNAs, 21 responded to the survey. The survey demonstrated the majority of students (15, 71.4%) felt confident after completing the module and competency. Students were also satisfied (10, 48%) or very satisfied (11, 52%) with the education module.

**Recommendation for Practice:** Implementing a computer module on epidural technique for SRNAs has proven to increase knowledge. SRNAs felt confident and satisfied following completion of the epidural module. Continued research is recommended on effective teaching modalities for SRNAs, specifically on technical skills. Incorporating summative evaluations in the form of competencies ensures each student is clinically competent prior to using these skills on patients.

**Funding Sources:** Funding to work with an information technology vendor for creation of the module was received from the Mayo School of Health Sciences.

### **Implementing a Computer-Based Educational Module on Sterile Technique and Kit Information for Student Registered Nurse Anesthetists**

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Mayo Clinic School of Health Sciences

**Introduction:** Feedback from clinical site preceptors suggest that student registered nurse anesthetists (SRNAs) are not prepared to perform sterile technique. Understanding sterile technique and how to maintain asepsis will help prevent serious infectious complications like paralysis and death. The purpose of this project is to enhance education about sterile technique and kit information for SRNAs through an online educational module and competency.

**Methods:** PICOT question: Among senior SRNAs, does completing a computer-based educational module in sterile technique and kit information effect knowledge or competence in correctly performing the skill immediately following completion of the module and prior to off-site clinical rotation? The literature search comprised of keywords that related to this project, including: regional anesthesia, strict asepsis, sterile technique and flipped classroom. Google Scholar was used for the literature review, and articles were manually selected after reviewing ones relevant to the research question. Randomized controlled trials, systematic literature reviews and case studies were utilized.

**Analysis of the Evidence:** Analysis of the evidence suggest that there is an increase in the frequency of infectious complications associated with regional anesthesia, and that proper education of sterile technique is imperative to prevent serious complications, such as paralysis and death. There is also a growing body of evidence that links learner satisfaction, cost and time effectiveness, along with knowledge competence, with the flipped classroom approach to education. The flipped classroom involves completion of prework by students to enhance skill acquisition. Faculty, administrators and learners find that e-learning enhances both teaching and learning. The predominant level of evidence ranged from I to VI.

**Recommendation for Practice:** Intervention for this project included a knowledge pretest, completion of the online educational module, knowledge posttest, and a competency checkoff. Knowledge scores increased from pretest to posttest by a mean difference of 23 points. All students successfully met competency requirements for sterile technique. The online content was well received by the SRNAs, as the majority were satisfied with the module and would recommend the use of this method of teaching. It is recommended to continue implementation of the sterile technique module and competency checkoff for SRNAs before attending off-site rotations to better prepare students to perform sterile technique procedures.

**Funding Sources:** Funding was obtained from Mayo Clinic School of Health Sciences.

**Improved Maternal Satisfaction With Nitrous Oxide Use During Labor**

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**Introduction:** Maternal satisfaction during childbirth is a multidimensional outcome that poses a challenge to providers. Research on labor analgesia tends to focus exclusively on pain control, which is not the sole predictor of patient satisfaction. The articles included in this review investigate whether women in labor have higher satisfaction ratings when nitrous oxide is used.

**Methods:** The studies were obtained through a comprehensive search of the PubMed, CINAHL, and MEDLINE databases in June 2018. Key terms used for the search included maternal, satisfaction, childbirth, labor, and nitrous oxide. Broad MeSH terms and Boolean operators were selected for each database search. Studies were limited to the English language, human subjects, and published within the last 10 years. Studies were included for review if they used maternal satisfaction as an outcome measure with nitrous oxide utilization during childbirth.

**Analysis of the Evidence:** Two studies investigated the use of nitrous oxide with or without alternative interventions such as neuraxial analgesia, whereas the third study compared nitrous oxide use with no analgesic interventions. All 3 studies showed that nitrous oxide use during labor increased maternal satisfaction, despite varying degrees of analgesic effectiveness.

Measurement of patient satisfaction was not standardized. Further research on this topic should include a reliable and validated tool to assess the varying dimensions of maternal satisfaction.

**Recommendation for Practice:** Women whose labor goals are met are more likely to report higher levels of satisfaction. Therefore, discussion of labor goals and analgesic options should occur routinely. An open and collaborative relationship with the patient helps educate women about analgesic options while factoring in their goals and expectations. Some women may include a higher sense of self-control in their labor goals. Nitrous oxide may be a useful analgesic option for this subset, as it conserves strength and mobility and allows active participation of the birthing process. Providers should demonstrate neutrality while simultaneously providing accurate information in regard to efficacy, risks, and benefits.

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### **Improving Emergency Cricothyroidotomies: Simulation-Based Training for Anesthesia Providers**

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**Introduction:** This study sought to discover whether improvements in provider skill performance and self-efficacy related to emergency cricothyroidotomies (EC) were possible with cadaveric simulation-based training. Current initial success rate is less than 50% with potentially catastrophic consequences.

**Methods:** Pre-design and post-design included a convenience sample of 11 anesthesia providers (6 MDs, 5 CRNAs) in a large university cadaver laboratory. Intervention included 2 distinct attempts at EC on human cadavers separated by standardized educational intervention related to difficult airway algorithm and EC technique. Measurements included EC skill performance including itemized and total score, time to skill completion, and pass/fail rate; provider self-efficacy related to EC and difficult airway algorithm and provider demographics.

**Analysis of the Evidence:** The emergency cricothyroidotomy is a critical skill for anesthesia providers with a poor initial success rate of less than 50%. Improvements are possible with simulation-based training. Difficult airway management can be improved with simulation, especially high-fidelity simulation using human cadavers, with effects lasting up to a year. More frequent training of this lifesaving skill is recommended, perhaps no less than once per year. Further research of rapid, accurate identification methods of the cricothyroid membrane, such as point-of-care ultrasonography, is needed.

**Recommendation for Practice:** Self-efficacy scores improved ( $p = .036$ ) following standardized teaching and 2 attempts at EC. Skill performance total scores improved ( $p = .012$ ) from the first to second attempt as did score per minute ( $p = .006$ ). Time to skill completion was faster ( $p = .155$ ) during second attempt, though not statistically significant. There was an overall improvement in skill pass rate ( $p = .046$ ) from the first to second attempt. Of the individually scored performance items, improvement in the ability to accurately identify the cricothyroid membrane via palpation did not reach statistical significance ( $p = .571$ ).



## **Improving the Care of Cesarean Delivery Patients Through Prevention of Duramorph Associated Side Effects**

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**Introduction:** Neuraxial Duramorph is the gold standard for postcesarean pain relief; however, it is associated with undesirable side effects such as pruritus and postoperative nausea and vomiting (PONV). At the University of Cincinnati Medical Center (UCMC), there is no standardized practice for administering prophylactic drugs to decrease these symptoms.

**Methods:** A literature search was completed to answer the following question: In postcesarean patients, does the administration of ondansetron and dexamethasone prior to receiving Duramorph compared with the current practice decrease the incidence of PONV and pruritus in the first 24 hours postoperatively? A literature search was completed using CINAHL and PubMed databases. The initial search yielded articles from the last 6 years, but the search was expanded to sources within the last 10 years to include to maximum amount of evidence for this topic. Fifty abstracts were evaluated and 11 articles were selected for final analysis. One article published in 2010 was included due to the strength of evidence for this topic. The articles consisted of 8 randomized controlled trials and 2 meta-analyses.

**Analysis of the Evidence:** The literature shows a decrease in the incidence of PONV and a decrease in the incidence and/or severity of pruritus when patients receive ondansetron and dexamethasone prior to Duramorph. A retrospective chart review was completed from January through March 2018 to assess UCMC providers' prophylactic medication administration times as well as the number of patients being treated for pruritus and PONV in the 24 hours postoperatively. Based on the results, a quality improvement project was constructed to educate anesthesia providers on the practice improvement goals for administration times of ondansetron and dexamethasone.

**Recommendation for Practice:** Data from the chart review included 144 patients who had cesarean deliveries and received Duramorph. Forty-eight percent of the patients received ondansetron within 30 minutes prior to Duramorph, and only 22 patients received dexamethasone at any point during the procedure. Fifty-nine percent (85/144) were treated for PONV or pruritus during the first 24 hours postoperatively. Based on these results, recommendations according to the best practice in literature were created and dispersed to anesthesia providers at UCMC. Administering ondansetron prior to Duramorph, ideally within 30 minutes, has shown to decrease PONV and pruritus. Giving dexamethasone in addition to ondansetron showed additional decrease in symptoms.

**A97**

**Interdisciplinary Difficult Airway Simulation**

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**Introduction:** Failure to secure an airway remains a challenging task for healthcare providers outside of anesthesia. Maintaining proficiency of skills is essential, yet can be difficult to achieve for providers who experience a low volume of opportunities. Simulation can help to improve competency and retention of skills for those who perform high-risk, yet low-frequency procedures.

**Methods:** Does the implementation of an interprofessional difficult airway simulation improve knowledge and competency among ICU staff caring for patients with a difficult airway when compared with no standardized training within a 3-month period? Search for evidence was completed through PubMed, CINAHL, and EBSCO databases. MeSH browser was utilized using PubMed to identify appropriate terms. MeSH terms included intubation, intratracheal/methods, airway management/methods, and simulation training. Further search was performed using CINAHL and EBSCO with the MeSH terms, and additional keywords included difficult airway, simulation, “anesthesia, student, knowledge, and intensive care unit. The search strategy of using Boolean operators such as AND/OR narrowed the topic and area of focus.

**Analysis of the Evidence:** A preknowledge and postknowledge assessment was used to analyze the effectiveness of the 30-minute educational session. The Mayo High Performance Teamwork Scale was used to measure team readiness and communication.

**Recommendation for Practice:** Incorporate interdisciplinary difficult airway simulation to improve knowledge of airway anatomy and management, increase staff confidence in their ability to manage airway events, and develop/refine skills of high-risk, yet low-frequency procedures, such as securing an airway.

A98

### **Intraoperative Fluid Administration and Serum Creatinine Level Changes During Intraabdominal Surgeries: A Literature Review**

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**Introduction:** The amount of intravenous fluids administered during abdominal surgeries may lead to an increase in creatinine levels. An increase of 0.3 or greater in creatinine is indicative of acute kidney injury (AKI). Such increase can be managed with a balanced fluid administration. Current monitoring modalities can be used by the anesthesia provider to predict fluid responsiveness.

**Methods:** PICOT: In the intraoperative period, how does fluid administration compared with serum creatinine levels affect patient outcomes undergoing abdominal surgery? Reports from randomized controlled trials, retrospective studies, systematic chart reviews, and literature reviews were utilized to research the creatinine level increase suggesting AKI. Databases such as CINAHL, MEDLINE, PubMed, and Cochrane Database of Systematic Reviews were searched for the most recent articles in the past 10 years (2009-2019). The keywords used for the search include: creatinine level increases, abdominal and laparoscopic surgeries, acute kidney injury, intraoperative fluid administration, fluid management, and FloTrac.

**Analysis of the Evidence:** There have been inconclusive findings about the optimal fluid amount to minimize the incidence of postoperative AKI. Postoperative AKI has been reported in both patients with liberal and restrictive fluids administration. Factors such as the amount of fluids administered and the duration of pneumoperitoneum affect the outcome greatly. Based on the widely accepted KDIGO criteria, increase of serum creatinine level of 0.3 mg/dL and greater within 48 hours is used to diagnose AKI. Liberal fluid administration as well as restrictive administration were both associated with increased morbidity and length of stay. Clinical signs of hypovolemia are undependable and disguised under general anesthesia.

**Recommendation for Practice:** Intraoperative fluid administration during abdominal surgeries should be balanced against the risks of postoperative AKI. Currently, there is no standardized guideline for administering fluids intraoperatively to decrease the incidence of postoperative AKI. In addition, balanced fluid administration technique has been shown to decrease postoperative complications, decrease morbidity, and shorten hospital length of stay. While there are currently no standardized propositions for the type and amount of fluids to administer, therapy should be guided with real time monitoring of fluid responsiveness. This avoids administration of fluids unnecessarily to a patient who may not respond to volume.

A99

### **Intraoperative Lidocaine Infusion During Colorectal Surgery: A Retrospective Comparison of Postoperative Outcomes**

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Mayo Clinic School of Health Sciences

**Introduction:** The use of intravenous lidocaine during colorectal surgery has shown to provide better outcomes. Currently, the Mayo Clinic Division of Colorectal surgery utilizes an enhanced recovery pathway. We wanted to find out if adding IV lidocaine to the current practices brings a benefit to our patients. We compared patients who received IV lidocaine with patients who did not receive IV lidocaine.

**Methods:** Google Scholar, MEDLINE, Embase, and CINAHL were utilized. The search was limited to a human subject, English language, and restricted to years 1980 to 2017. The search was limited to randomized controlled trials, controlled clinical trials, meta-analysis, or systemic reviews. In patients undergoing Colorectal Surgery at Mayo Clinic, Rochester Methodist Hospital how does an IV lidocaine bolus with a continuous IV lidocaine infusion, started at induction, affect postoperative opioid requirement, pain level, return of bowel function, length of hospital stay, postoperative nausea and vomiting, and presence of postoperative ileus as compared to patients that didn't receive the lidocaine bolus and continuous infusion.

**Analysis of the Evidence:** Continuous low-dose IV lidocaine has been tried in different types of surgeries. Significant outcome without major adverse effect is reported in abdominal surgery. McCarthy looked at pain score, duration of postoperative ileus and incidence of postoperative nausea and vomiting (PONV). A systematic review by Khan et al assessed the effective rate and infusion duration of IV lidocaine during bowel surgeries and looked at pain, PONV bowel movement, and length of hospital stay. A randomized, double-blind placebo control study by Ahn et al assessed if IV lidocaine reduces postoperative pain level and PONV.

**Recommendation for Practice:** Adding continuous IV lidocaine to the preexisting multimodal analgesic regimen for patients undergoing colorectal surgery at Mayo Clinic in Rochester did not bring a statistical significance.

**A100**

**Intraoperative Low-Dose Intravenous Ketamine Repeat Boluses Versus Infusion in Postoperative Analgesia**

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**Introduction:** Low-dose ketamine, defined as an intravenous infusion of less than 1.2 mg/kg/h or bolus of less than 1 mg/kg will decrease postoperative opioid use and pain scores if given prior to surgical stimulation. This poster project compares the effects low-dose ketamine repeat boluses versus infusion have on opioid consumption and pain scores following open intra-abdominal procedures.

**Methods:** Databases utilized were PubMed Complete and Cochrane Library. PubMed search terms were intravenous AND ketamine AND low-dose AND postoperative analg\* OR postoperative pain. Randomized, controlled trials pertaining to human, open intra-abdominal studies were examined. Cochrane Library search terms were ketamine AND intravenous, which were filtered to include only Cochrane reviews. The search was limited to English articles, and a date range was not defined since the number of relevant articles were limited. Eleven articles were retained for use in the following case report.

**Analysis of the Evidence:** No studies compared repeat boluses versus infusion of ketamine. Only 1 study assessed ketamine repeat boluses compared with single bolus and saline placebo groups. Opioid use was significantly lower in the first 24 hours, and pain was significantly lower the first 6 hours postoperatively in both ketamine groups versus the placebo group. No significant difference was found between ketamine groups. Single preincision bolus or infusion of ketamine significantly reduced opioid consumption for 24 hours postoperatively, but pain scores were inconsistent. Behavior was calmer and pain at rest was lower, but verbal scores and movement pain were inconsistent. First request for analgesic was significantly delayed.

**Recommendation for Practice:** Low-dose intravenous ketamine reduces opioid consumption more consistently than it reduces pain scores; however, the most effective method is still difficult to determine with the available literature. Administration of ketamine should preferably occur just prior to incision, and the decision to administer repeat bolus or infusion should depend on facility-specific packaging of ketamine (vials or prefilled pharmacy-mixed syringes and bags), length of case, and ease of use. Overall, just the act of implementing low-dose intravenous ketamine into the anesthetic plan, regardless of the regimen, will decrease opioid consumption in open intra-abdominal surgeries

**A101**

**Intraoperative Opioid No More, Home in 24 – Utilizing ERAS in Adolescent Bariatric Surgery**

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Nationwide Children's Hospital

**Introduction:** Bariatric surgery is becoming more prevalent in the adolescent population. Historically, these patients experience high rates of PONV and are at risk for narcotic-related complications. ERAS protocols have been shown to decrease these complications and length of stay in the adult bariatric population. We have implemented an ERAS protocol for adolescent patients to emulate the adult results.

**Methods:** An ERAS protocol has been implemented for adolescent patients undergoing bariatric surgery. Preoperatively, patients receive oral hydration, antiemetics and nonnarcotic pain medications. An intraoperative standardized multimodal, opioid-free anesthetic including TAP blocks is used. Postoperatively, early ambulation and limited use of narcotics with continued utilization of adjuncts is employed. These interventions are used to meet a goal of decreased PONV and early discharge. Outcomes are measured against previous methods of preoperative fasting, standard anesthetic, and opioid delivery. A literature review was done using PubMed and Google Scholar to obtain EBP regarding ERAS protocols and bariatric surgery. The adult ENERGY guidelines were also referenced for protocol development.

**Analysis of the Evidence:** There is limited data on the use of ERAS in pediatrics and in adolescent bariatric surgery. Shinnick et al examined the available data and found 5 studies using pediatric ERAS protocols, which indicate that ERAS may decrease length of stay and narcotic use in pediatrics. The Employing New Enhanced Recovery Goals to Bariatric Surgery (ENERGY) project advises a multimodal approach and specifies preoperative, intraoperative, and postoperative care to improve surgical outcomes. To determine medication dosing, Vaughns et al was referenced, suggesting that obese patients have an increase in total body fat and lean body weight; therefore, dosing on adjusted body weight may be most therapeutic.

**Recommendation for Practice:** Prior to ERAS, patients were admitted to the hospital for preoperative intravenous hydration and kept NPO. Patients now arrive 2 hours before surgical time and hydrate with an oral carbohydrate drink. Patients receive gabapentin, acetaminophen, and aprepitant. The intraoperative protocol includes lidocaine, ketamine, dexmedetomidine, TAP blocks, decadron, ondansetron, metoclopramide, and 2 liters of fluid. Narcotics are avoided throughout the perioperative period and nonopioid adjuncts are scheduled. Since its implementation in the fall of 2018, 9 cases have been completed. As compared with previous patients, there has been a notable decrease in narcotic consumption, PONV, and length of stay.

## **Is Pressure-Controlled Ventilation Preferred Over Volume-Controlled Ventilation as a Lung Protective Strategy?**

*Diana Levy, MBA, BSN, RN, CCRN*

Florida Gulf Coast University

**Introduction:** There is controversy as to whether one method of mechanical ventilation is superior to the other with regard to patient mortality. Would lung injury be reduced if the ventilator controlled the amount of pressure delivered to the patient or the volume delivered (Chacko, Peter, Tharyan, John, and Jeyaseelan, 2015)?

**Methods:** (P) In ventilated adult ICU patients, (I) what is the effect of volume-controlled ventilation (C) compared with pressure-controlled ventilation (O) on morbidity and mortality? The 10 articles chosen for this review include 2 randomized controlled trials (RCTs) (level I evidence), 1 quasi-experimental study (level II evidence), 2 literature reviews (level II evidence), 2 systematic reviews (level I evidence), 2 systematic reviews and meta-analysis combined (level I evidence), and 1 multicenter cross-sectional study (level II evidence). Electronic database searches inclusive of the last 8 years and peer-reviewed articles from the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Google Scholar, and the Cochrane Database provided a myriad of high-level evidence to review.

**Analysis of the Evidence:** A systematic review and meta-analysis performed by Jiang, Li, Kang, Wu, and Yue included 20 studies containing 1,643 patients evaluated for lung injury postmechanical ventilation. They cautiously recommend changing from VCV to PCV in a handful of situations (Jiang, Li, Kang, Wu, and Yue, 2016). Chacko, Peter, Tharyan, John, and Jeyaseelan completed a meta-analysis of 3 RCTs from 1,089 patients across 43 ICUs resulting in nearly equal numbers of deaths for both modes. Rittayaamai et al performed a systematic review and meta-analysis in patients with ARDS and found no evidence of VCV being superior over PCV.

**Recommendation for Practice:** The current available data were insufficient to confirm or refute the benefit of one mode of ventilation over the other. It is not possible for every setting on the ventilator to be equal on each patient, limiting the strength of their conclusions (Perinel-Ragey, Baboi, and Guerin, 2017). The best use of ventilation modes has not been clearly defined through the available research (Burns, 2008). This is not necessarily bad news, as the literature does support vigilance by the anesthetic provider as the most effective method of mechanical ventilation, with adjustments made as the patient's needs evolve and their condition changes (Irwin, 2011).

## A103

### **Is the Use of IV Ibuprofen More Effective Than IV Acetaminophen in Reducing Pain in the Surgical Patient?**

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Columbia University

**Introduction:** Both IV ibuprofen and IV acetaminophen are recognized as beneficial adjuncts for pain management. However, the use of one over the other is not entirely interpreted. The purpose of this literature review is to explore if the use of IV ibuprofen is more effective in pain reduction when compared with IV acetaminophen.

**Methods:** A literature search using 2 search engines, PubMed and CINAHL, were utilized. Mesh terms such as IV ibuprofen, IV acetaminophen, pain management, and surgical procedures were applied. Searches were limited to the English language with full-text articles ranging from the years 2000 to 2019. After exclusion criteria were applied, a total of 31 articles were screened; 5 articles are included in this review of the literature. Nongeneralizable patient populations such as pediatrics and adolescents were excluded. Studies selected included cases in which patients received IV ibuprofen or IV acetaminophen and pain control was evaluated. One systematic review and 4 randomized controlled studies were reviewed.

**Analysis of the Evidence:** Evidence from this literature review supports the use of IV ibuprofen in pain reduction more so than IV acetaminophen. The 4 randomized studies all administered 800 milligrams of IV ibuprofen and 1 gram of IV acetaminophen. Each looked at pain scores at different time intervals within a 2- to 24-hour period. The studies collectively concluded that patients who received IV ibuprofen reported a greater reduction in pain when compared with IV acetaminophen.

**Recommendation for Practice:** Over recent years, efforts to manage perioperative pain has been researched. The primary focus of this literature review was to determine if the use of IV ibuprofen versus IV acetaminophen reduced pain. A consensus of the articles reviewed strongly supports the use of IV ibuprofen in pain reduction in surgical patients. This literature review collectively encourages the use of IV ibuprofen as more efficacious in pain management in the first 12 hours postoperatively. Achieving optimal pain management, steers toward increased patient satisfaction, improved patient outcomes, and lessens healthcare costs.



## A104

### **Mask-Free Induction in the Pediatric Population to Reduce Anxiety and Postoperative Maladaptive Disorders**

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Florida International University

**Introduction:** Perioperative anxiety results in developmental disturbances, adverse behavioral events, nightmares, separation anxiety, enuresis, difficulty eating, temper tantrums, and distrust of medical professionals. Current mask-free techniques reduce the risk of developing disturbances, enhanced recovery, adequate sleep, and increases satisfaction during the postoperative period.

**Methods:** This evidence-based project answered the clinical question: In pediatric patients aged 1 through 7 years presenting for general anesthesia, does mask-free induction versus mask induction reduce the incidence of pediatric anxiety, psychosocial development, and maladaptive disorders? The empirical evidence consisted of 8 RCTs and 16 qualitative studies for this systematic review. Key terms include: effects of intraoperative anxiety on children, pediatric induction methods, and intraoperative techniques to reduce pediatric anxiety. Inclusion criteria included a 19-year search period, male and female, aged 1 through 7 years, and procedures requiring general anesthesia. Exclusion criteria included patients over 7 years old, articles outside the developed world, and procedures not requiring general anesthesia.

**Analysis of the Evidence:** A total of 525 articles were retrieved and appraised. Children excluded were subjects whose parents did not want to participate, children who lacked psychomotor skills to utilize the modalities in question, subjects with chronic illnesses, and those with developmental delay. Subjects were male and female, ASA class I to II, and patients having their first surgery or returning for additional surgeries requiring general anesthesia. Fifty-six RCTs and qualitative studies were retrieved, and 30 were found to contain sufficient evidence. Studies included the postoperative effects of anxiety during the preoperative, intraoperative, and postoperative period.

**Recommendation for Practice:** The utilization of mask-free induction provides an effective means in delivering anesthesia to the pediatric patient. Role playing, distraction, and clowns have been used to reduce the incidence of apprehension and anxiety in the child, leading to psychosocial and maladaptive behaviors in the immediate and long-term postoperative period, all of which require a mask for induction. Using techniques that omit the mask will not only improve the delivery of anesthesia upon induction, it will also increase patient and family satisfaction during the perioperative period. Mask-free induction will increase the efficacy of pediatric anesthesia, leading to safe, cost-effective, and quality of care.

## A105

### **Measuring Endotracheal Tube Cuff Pressures in the Operating Room**

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**Introduction:** Practice guidelines suggest that endotracheal tube (ETT) cuff pressures should range from 20 to 30 cm H<sub>2</sub>O. ETT cuff pressures of 20 to 30 cm H<sub>2</sub>O allow for adequate capillary perfusion while preventing negative consequences from an overinflated or underinflated cuff. CRNAs at Mayo Clinic are not required to measure ETT cuff pressures, putting adult patients at risk for complications.

**Methods:** Will the implementation of a protocol to measure ETT cuff pressure in the operating room improve adherence of ETT cuff pressures in the manufacturer's recommended range (20-30 cm H<sub>2</sub>O)? Articles were reviewed and the primary literature to support monitoring ETT cuff pressures was found to be level II or level III evidence. This search criterion produced 60 articles that were reviewed, and 11 were found to have a high level of evidence and clinical significance. The Stetler model of evidence-based practice was chosen as a way to guide this practice change as it incorporates external and internal evidence when deciding to implement a new process. Preprotocol data were collected by measuring 100 ETT cuff pressures on adult patients in the operating room. A protocol was written and implemented.

**Analysis of the Evidence:** A literature review conducted prior to data collection showed that many hospitals do measure ETT cuff pressures in the operating room and not doing so can cause adverse outcomes for patients. In this study, preprotocol data showed that 15 of the 100 ETT cuff pressures measured were within the 20 to 30 cm H<sub>2</sub>O range and postprotocol data showed that 61 of 100 ETT cuff pressures measured were within the 20 to 30 cm H<sub>2</sub>O range. A p-value of 0.0001 was found indicating that there is a significant difference between preprotocol and postprotocol ETT cuff pressures.

**Recommendation for Practice:** Checking ETT cuff pressures in the operating room is a standard of care at hospitals across the country. Given that there was a significant improvement in the number of patients with ETT cuff pressures within the manufacturers recommended range following the implementation of this protocol and the use of handheld manometers, it would be prudent to implement this protocol in more operating rooms at Mayo Clinic Rochester. Funding will be necessary in order to purchase more handheld manometers as well as continuing education on how to use the handheld manometer and the importance of use.

## A106

### **Music Therapy: A Nonpharmacological Approach to Anxiety Reduction in Surgical Patients**

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**Introduction:** Surgery can cause anxiety that can lead to stress and delay postoperative recovery. Music therapy (MT) is a nonpharmacological approach that has an impact on anxiety and physiological responses. A literature review was conducted to investigate if music therapy can be used as a nonpharmacological approach to reduce perioperative anxiety.

**Methods:** The literature presented in this review was selected from a comprehensive electronic search in the PubMed, MEDLINE, and the Cochrane library database through Albany Medical College's Schaeffer Library. Key terms used for the search included music therapy, anesthesia, anxiety, and surgery. Broad MeSH terms and Boolean operators were selected for each database search. In addition, the same search terms were used to identify further relevant research. All research was completed within the past 10 years, included human subjects, and was limited to the English language. A total of 4 studies were chosen and will be discussed in this literature review.

**Analysis of the Evidence:** Four articles included in the final analysis were Jiménez-Jiménez et al (2013), Palmer et al (2015), Kipnis et al (2016), and Wu et al (2017). Each study utilized different anesthetic techniques and had both an experimental and control group to assess the relation of MT on anxiety level via validated surveys. The results showed that MT lowered anxiety despite various types of surgery and anesthetic techniques. Kipnis et al and Wu et al demonstrated a reduction of blood pressure and heart rate. Palmer et al and Kipnis et al also demonstrated higher participants' satisfaction with the use of MT.

**Recommendation for Practice:** Anxiety can cause increased anesthetic requirements and delay postoperative recovery. Benzodiazepines are currently used to treat perioperative anxiety and have side effects and risk of medication interactions during surgery. MT is a safe and effective nonpharmacological approach to reduce anxiety during surgery. Future studies should include a large, prospective, randomized sample that allows for variations in ethnic and cultural groups, as well as musical preference. These studies will help further our knowledge on the benefits of music in reducing anxiety during surgery.

**A107**

**Music Utilized as an Adjunct to Monitored Anesthesia Care during Cardiac Catheterization to Reduce Patient Anxiety and Improve Patient Satisfaction**

*Melissa Hernandez, BSN, RN, CCRN; Hallie Evans, DNP, CRNA, APRN*

Florida International University

**Introduction:** Preoperative anxiety has been proven to increase myocardial oxygen demand, metabolic rate, and postoperative pain levels. Music has shown to be capable of alleviating pain, elevating patient's mood, calming and sedating, and counteracting apprehension; all of which lessens muscle tension and decreases Autonomic Nervous System (ANS) reaction to stress.

**Methods:** The investigator utilized CINAHL, MEDLINE, Embase, and PubMed databases to answer the PICO (ie, population, intervention, comparison, outcome) question: Does perioperative music therapy during cardiac catheterization improve patient satisfaction and/or reduce anesthetic requirements? Ten RCTs were included in this review and incorporated into the results and recommendations. Inclusion criteria included: English language; published between 2001 and present; patients 18 years and older; patients undergoing cardiac catheterization under MAC anesthesia; patients classified as ASA I, II, or III; and full-text articles.

**Analysis of the Evidence:** The 10 RCTs had a combined sample size of 1,128 patients. The studies played music for the patients by either loud speaker or headphones. Two studies found that music utilized as an adjunct to MAC resulted in a lower anxiety level and patient satisfaction. Two studies reported a lower Stress-Trait Anxiety Inventory (STAI) level when music was added to MAC. Four studies found resulted in lower STAI scores and vital signs when music was played as an adjunct to Monitored Anesthesia Care (MAC). Two studies showed lower anesthetic requirements when music was played as an adjunct to MAC. Overall, the studies had a positive correlation with music and MAC anesthesia. The most dramatic drop in STAI scores, 39%, was reported by Moradinopah et al (2009).

**Recommendation for Practice:** The empirical evidence demonstrated that music therapy utilized as an adjunct to MAC has shown to increase patient satisfaction and decrease STAI scores, heart rate and blood pressure, and anesthetic requirements. The implementation of an evidence-based algorithm utilizing music therapy during MAC anesthesia offers another tool to improve patient satisfaction and decrease anxiety, which is related to negative physiological effects. I would recommend educating anesthesia providers on the benefits of music therapy as an adjunct to standard care. Providing a step-by-step algorithm will assist in implanting music therapy in MAC cardiac catheterization cases

## A108

### **NBCRNA Benchmarking Report: Trends and Summary Findings**

*Karen Plaus, PhD, CRNA, FAAN, CAE; Terry Wicks, DNP, MHS, BSN, CRNA; Dennis Spence, PhD, CRNA; Mary Wojnakowski, PhD, CRNA*

NBCRNA

**Introduction:** The National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA) has used and continuously evaluates the continued certification requirements, practices and trends for nursing, and healthcare and physician credentialing available in benchmarking and related reports. The purpose of this study was to benchmark current continuing certification practices and models in the industry.

**Methods:** In 2018, the NBCRNA partnered with SeaCrest Company to conduct a benchmarking study focused on continuing certification. The benchmarking study included website review for 294 healthcare credentialing organizations' programs accredited by the National Commission for Certifying Agencies (NCCA), the American Board for Specialty Nurse Certification (ABSNC), or the ISO 17024 standards. The audience also included maintenance of certification (MOC) requirements for the 24-member boards of the American Board of Medical Specialties (ABMS).

**Analysis of the Evidence:** This study indicates that continuing education, retesting, and self-assessment tend to be the most common methods for recertification. All 3 anesthesia providers are required to take a recertification examination (Anesthesiologists, CRNAs and AAs) or be enrolled in a longitudinal assessment program (ABA; MOCA Minute). None of the APRN credentialing organizations offer longitudinal assessment programs. Most APRN organizations offer a recertification examination as an option for recertification. None of the APRN certification organizations require completion of simulation for recertification.

**Recommendation for Practice:** NBCRNA will continue to use benchmark data and other sources of evidence to inform decisions and potential changes regarding the CPC Program. The CPC Program requirements are on par with the anesthesia assistants and anesthesiologists. NBCRNA continues to evaluate alternatives to testing including cognitive examinations, peer assessment, and simulation to answer the question "What is the best way to assess knowledge and competence over time in CRNA practice?"

## A109

### **Pectoralis Nerve Block Combined With General Anesthesia to Decrease Postoperative Pain in Patients Undergoing Breast Cancer Surgery**

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**Introduction:** Patients with breast cancer who require surgical treatment often experience chronic postoperative pain. The pectoralis nerve block (types I and II) may decrease postoperative pain following breast cancer surgery. A literature review was performed to investigate the analgesic effects and adverse outcomes of the pectoralis nerve blocks combined with general anesthesia in patients undergoing breast cancer surgery.

**Methods:** The literature presented in this review was selected from a comprehensive electronic search in PubMed through Albany Medical College's Schaeffer Library. This search was conducted from June 1, 2017 through June 10, 2017. Key terms used for the search included Pecs block, Pecs block type I, Pecs block type II, postoperative pain", breast cancer surgery, and mastectomy. Broad MeSH terms and Boolean operators were selected for database search. In addition, the same search terms were used to identify further relevant research. All research had to be completed within the past 10 years and limited to the English language. A total of 4 studies were chosen and will be discussed in this literature review.

**Analysis of the Evidence:** Four articles were included in the final analysis: Bashandy and Abbas (2015), Kulhari et al (2016), Neethu et al (2018), and Kamiya et al (2018). Findings show that patients who received the pectoralis nerve block combined with general anesthesia experienced a decrease in postoperative pain and less postoperative opioid use compared with patients who did not receive the pectoralis nerve block. There were no reports of adverse effects related to the block in all 4 articles.

**Recommendation for Practice:** Patients who undergo breast cancer surgery often have significant acute and chronic postoperative pain. The data support the use of the pectoralis nerve block combined with general anesthesia to decrease postoperative pain in patients undergoing breast cancer surgery. This block may reduce the need for postoperative opioid consumption, optimizing patient outcomes. Nurse anesthetists will better serve their patients by incorporating this safe and effective regional technique into their practice.

## A110

### **Perioperative IV Lidocaine: Research-Informed Practice Protocol**

*Dee Bender, MNNA, CRNA*

Missouri State University School of Anesthesia

**Introduction:** Postoperative pain and concern for opioid hazards is a major, ongoing concern for healthcare providers. Intravenous (IV) lidocaine has demonstrated analgesic, antihyperalgesic, and anti-inflammatory properties. It has been used successfully in the treatment of perioperative pain in numerous studies, yet acceptance and common use is stalled for lack of translating evidence into usage guidelines.

**Methods:** PICO format was used to identify the keywords: intravenous lidocaine and postoperative pain. Systematic literature searches were then conducted via EBSCOhost, CINAHL, and MEDLINE. This search concentrated on studies performed within the last 10 years. Additionally, reference lists from relevant articles were reviewed to find supplemental pertinent articles. A total of 19 articles were chosen, and those articles were then analyzed for their relevancy using rapid critical analysis (RCA) as described by “Critical Appraisal of the Evidence: Part II.” All of the original research articles in this literature review are prospective in nature. Additionally, all randomized controlled trials (RCTs) utilized double-blinded, placebo-controlled methodology.

**Analysis of the Evidence:** Intravenous lidocaine is a safe, effective, inexpensive, and convenient analgesic for patients undergoing abdominal surgery (open, laparoscopic, bariatric), prostate surgery, complex spine surgery, and breast surgery. In addition to decreasing pain, nausea, ileus, opioid requirement, and length of hospital stay, research found the clinical effect of lidocaine exceeded the duration of administration up to 6 months postoperatively. Evidence also found no difference in outcome measures for epidural bupivacaine versus lidocaine in several studies and concluded that IV lidocaine is an effective alternative to thoracic epidural anesthesia.

**Recommendation for Practice:** A strong body of research studies and meta-analyses support the use of perioperative IV lidocaine in select surgical populations. Given the heightened interest in utilizing nonopioid analgesics to diminish adverse effects from opiates along with support for enhanced recovery protocols, administration guidelines should be adopted to move the evidence-based research into common practice. Bolus doses of 1 to 1.5 mg/kg followed by an infusion rate of 1 to 3 mg/kg/h were found to be safe and effective. Since no specialized equipment or training of personnel is needed, it is a practical method to expedite the recovery process, produce desirable clinical outcomes, and improve patient satisfaction.

## A111

### **Pharmacological Approaches to Postoperative Nausea and Vomiting Prevention**

*LT Melissa Richling, RN, NC, USN; LT Mark Sebald, RN, NC, USN; LT Nicole Pendry, RN, NC, USN*

Uniformed Services University

**Introduction:** The nationwide incidence of PONV ranges from 10% to 80%, varying widely due to differences in patient and anesthetic risk factors. The purpose of the project is to implement a PONV practice guideline identifying key risk factors with a suggested algorithm for prophylactic treatment to increase adherence to PONV evidence-based practice among anesthesia providers at Naval Medical Center San Diego (NMCS D).

**Methods:** Does education and implementation of a PONV practice guideline at NMCS D increase adherence to PONV evidence-based practice among anesthesia providers? The general approach to the project was to create an NMCS D evidence-based practice guideline for identifying PONV risk factors with a suggested algorithm for prophylactic treatment. The guideline was developed utilizing the 2014 SAMBA PONV consensus guidelines, relevant literature since that publication, and antiemetics currently on the NMCS D formulary. Our literature search only included meta-analysis and systematic reviews. A literature search was conducted utilizing the US National Library of Medicine National Institutes of Health (PubMed) and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

**Analysis of the Evidence:** In conjunction with the Apfel score, the SAMBA guideline recommends specific medications with the patient's preoperative risk level to help reduce the risk and severity of PONV (Gan et al, 2014). Our literature search supported the SAMBA guidelines with exception of only 2 articles that deviated from the consensus guidelines, which were related to the antiemetic aprepitant. The 2014 SAMBA PONV consensus guidelines recommended 40-mg dose of aprepitant. However, recent literature recommends higher doses of aprepitant.

**Recommendation for Practice:** Results showed 29% of providers were adherent to the guideline postimplementation. Incidence of nausea decreased from 14.9% to 6.5% and the administration of rescue medication by PACU staff decreased from 20.2% to 12%. Low guideline adherence may have resulted from strict adherence evaluation criteria and inadequate education to the anesthesia providers. Future recommendations would focus on readdressing adherence criteria, evaluating an improved education strategy, anticipating formulary changes, and proactive engagement of leadership support.



**A112**

**Postoperative Analgesia After TIVA With Propofol and Remifentanil Compared With Sufentanil or Alfentanil**

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Drexel University

**Introduction:** Remifentanil infusion in combination with propofol is frequently used for total intravenous anesthesia (TIVA). Other TIVA protocols can be used to achieve similar adequate intraoperative conditions. The purpose of this presentation is to explore the best intraoperative modalities to positively influence postoperative pain management and patient outcomes when TIVA is the primary anesthetic.

**Methods:** In major surgery patients (P), how do intraoperative infusions of sufentanil-propofol or alfentanil-propofol TIVA (I) compare with remifentanil-propofol TIVA (C) in terms of pain level (O) during the first hour of the postoperative period (T)? The 4 databases used for relevant evidence search were: CINAHL, PubMed, Web of Science, and Cochrane Library. Keywords from the PICOT question used during database search were: postoperative pain, TIVA, remifentanil, alfentanil, and sufentanil. Four randomized controlled trials were chosen as providing significant evidence to answer the PICOT question.

**Analysis of the Evidence:** The authors of all 3 studies examining remifentanil-based TIVA noted greater incidence of postoperative pain when compared with an alternative sufentanil and alfentanil-based TIVA protocol. This is in agreement with previous authors who explored remifentanil's association with the development of acute opioid tolerance and opioid-induced hyperalgesia. Sufentanil-based TIVA compared with alfentanil-based TIVA revealed pain scores of 0 on VAS during the first postoperative hour revealing sufentanil as a superior drug in TIVA protocols in regard to postoperative pain control.

**Recommendation for Practice:** Significant evidence exists to support the use of sufentanil or alfentanil as superior to remifentanil-based TIVA in regard to postoperative pain control. In addition, it is noted that a patient's experience with pain management is one of the indicators on the Press Ganey survey and Hospital Consumer Assessment of Healthcare Providers and Systems scores tied in with hospital reimbursement. Moreover, remifentanil is a more expensive drug than alfentanil and sufentanil. New TIVA protocols that incorporate the best evidence can be created and implemented after an in-service for all involved care providers.

**A113**

**Postoperative Pain Reduction of Colorectal Surgical Patients Due to ERAS Protocol**

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Florida Gulf Coast University

**Introduction:** Addiction is a lifelong battle that ruins the lives of many. The first encounter, for many, begins with a physician ordered prescription for acute pain. A plan of action is desperately needed in order to turn around this epidemic before opioid overdoses become something looked upon as “normal.”

**Methods:** My PICO research question will focus on the colorectal patient population undergoing surgery with the ERAS protocol as the intervention and evaluating their postoperative pain outcome as compared with patients who did not use the ERAS protocol. Is ERAS beneficial in reducing postoperative pain in the patient undergoing colorectal surgery? Articles will derive from databases such as Google Scholar, UpToDate, and FGCU library database. Conflicting results that do not support the hypothesis will not be omitted but rather used to better guide the overall recommendation for the ERAS protocol.

**Analysis of the Evidence:** The results in every study assures providers that the ERAS protocol is effective and efficient. The Enhanced Recovery After Surgery protocol leads to decreased postoperative ileus formation, length of stay, postoperative opioid requirements, and decreased postoperative pain. With each study that evaluated the different components of ERAS, it was found that each component was beneficial to the overall recovery of the patient such as regional anesthesia decreasing DVT risk and postoperative opioid requirements.

**Recommendation for Practice:** A recommendation that could potentially increase adherence to the ERAS protocol would be to make a universal protocol in all of the hospitals. Having the same protocol for ERAS in all of the hospitals would decrease confusion for those who work in multiple healthcare settings. If the protocol was displayed with easy access this would be another way to limit errors. Evidence-based practice recommendations are to continue using ERAS protocol in colorectal cases to decrease postoperative pain and opioid requirements.

## A114

### **Preventing Perioperative Venous Thromboembolism**

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**Introduction:** Venous thromboembolism (VTE) is a highly prevalent perioperative complication with significant morbidity and mortality. A discrepancy exists between evidence-based VTE prophylaxis guidelines and the prevention methods being delivered to surgical patients. A recommendation to establish a hospital-wide VTE prophylaxis protocol or quality initiative is consistent with recent practice guidelines.

**Methods:** PICOT: Do hospitals with a standardized VTE prevention protocol or quality initiative have significantly reduced VTE incidence among adult surgical patients compared with hospitals that do not? A literature review was completed using the CINAHL, PubMed, and Cochrane databases. The key terms used for the search were VTE, perioperative, surgical, prevention, prophylaxis, and guidelines. Research and evidence-based practice articles published after 2010 and written in the English language were included. After closely screening 110 full-text results related to the PICOT question, 21 articles were selected for final analysis. These articles included systematic reviews, randomized controlled trials, cohort studies, retrospective studies, clinical practice guidelines, and literature reviews.

**Analysis of the Evidence:** VTE prevention protocols and quality initiatives can significantly increase the number of patients who receive appropriate prophylaxis and reduce VTE incidence. Smaller, achievable goals must be prioritized over an extended period of time to successfully implement a VTE prevention protocol. During the perioperative period, mechanical VTE prophylaxis is the most effective when initiated at admission and continued until patients no longer have reduced mobility. Intermittent compression devices have shown to increase venous return and fibrinolytic activity and are the recommended method of mechanical VTE prophylaxis among current guidelines.

**Recommendation for Practice:** A quality initiative focusing on mechanical VTE prophylaxis was implemented to reduce the incidence of VTE among adult surgical patients in the main operating room at a large academic hospital. The initiative predominantly standardized the timing of initiation and continuation of intermittent compression devices throughout the perioperative period. After implementation of the initiative, a 44.44% decrease in quarterly VTE incidence was identified after 6 months, along with an increase in nursing staff knowledge of VTE prophylaxis measures. Based on the results, this initiative was an appropriate first step for establishing a hospital-wide VTE prophylaxis protocol at this facility.

**A115**

**Reduction in Venous Thromboembolic Event (VTE) With Use of Caprini Risk Assessment Model (RAM)**

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**Introduction:** Each year more than 900,000 Americans form DVTs; 50% form pulmonary embolisms; and 33% die. VTE complications are the leading cause of perioperative morbidity and mortality, resulting in a cost burden of 500 million dollars to the healthcare system. The Caprini RAM has been validated to predict a variety of surgical patients for VTE risk and possibly improve patient safety and surgical outcomes.

**Methods:** “In all surgical patients (P), how does the use of the Caprini score (I) compare with not using the Caprini score (C) influence the patient’s risk of developing venous thromboembolic events (VTEs) perioperatively (O)?” An electronic search using MEDLINE (ProQuest), Ovid, PubMed, and Cumulative Index to Nursing and Allied Health Literature (CINAHL), with search parameters: English language, full-text, peer-reviewed, human studies published during the years 2005 to 2018. Keywords used: Caprini, risk assessment model, surgery, prevention, prediction, venous thromboembolic event, pulmonary embolism, and deep vein thrombosis. Search yielded 14 articles: 11 retrospective cohort, 1 medical record review, and 2 prospective cohort observational studies.

**Analysis of the Evidence:** In 11 of the retrospective cohort studies and 2 of the cohort observational studies, all find that patients with calculated scores of 8 and greater (high to highest risk groups) significantly predicted the risk of developing a VTE event when compared with Caprini RAM scores less than 8 (low to moderate risk groups). One retrospective cohort study found that mean Caprini RAM score of 7.2 significantly predicted the risk of developing a VTE event. Caprini RAM identified patients at risk for VTE among a variety of surgeries: plastic and reconstructive, gynecologic oncology, vascular, urologic, otolaryngology-head and neck, oral and maxillofacial, and thoracic surgeries.

**Recommendation for Practice:** Individualized risk stratification scores with Caprini RAM helps identify VTE risk among surgical patients. The Caprini RAM can also implement appropriate mechanical and/or chemical VTE prophylaxis to patients. An evidence-based risk assessment model, such as the Caprini RAM, has the potential to lead to positive patient outcomes, decreased cost, and increase patient satisfaction by reducing VTE among surgical patients. VTEs are a major health concern for patients preoperatively. A change in the current practice is indicated and implementation of Caprini RAM is an effective way to reduce VTE, which is of the utmost importance to ensure safe and quality care to surgical patients.

## A116

### **Reentry to Practice After Substance Use Disorder**

*Stephen M. Taylor, BSN, RN, CCRN; Hallie Evans, DNP, CRNA, APRN; Gigi McHale, MSN, CRNA, APRN*

Florida International University

**Introduction:** Substance use disorder (SUD) affects 10% to 15% of anesthesia providers. Reentry to practice after rehabilitation is a goal for many CRNAs with SUD. Without continued sobriety maintenance, relapse is likely (risk estimates are between 25% and 56%). Relapse endangers providers and patients. Understanding relapse reduction interventions is critical to ensuring continued sobriety for CRNAs reentering practice.

**Methods:** PICOT question: In CRNAs who have been cleared to reenter practice, what are the best methods to maintain sobriety and limit the likelihood of relapse? Literature search utilizing a search phrase resulted in 102 articles; 26 were selected for full-text screening. Studies written in English within the past 15 years with relapse prevention intervention(s) were included. SUD-affected healthcare providers who completed initial detoxification comprised the target sample. Relapse prevention was gauged by negative drug screen or self-reported sobriety. Due to a lack of studies specific to healthcare providers, studies conducted within the general population were used. Eight studies of various relapse prevention interventions were included in the review.

**Analysis of the Evidence:** Eight articles of varying quality (randomized and nonrandomized trials, retrospective studies, and qualitative analysis) were used. Relapse risk reduction requires personalized intervention combinations. Personal characteristics may predispose one to relapse (impulsive personality). Multiple sources credited active 12-step program involvement as the foundation of continued sobriety. Psychological interventions to rethink negative coping mechanisms should be combined with 12-step programs. Injectable naltrexone is important to reduce cravings and decrease compliance issues with oral naltrexone. Other interventions include increased physical activity and therapeutic storytelling.

**Recommendation for Practice:** No single intervention ensures sobriety. SUD-affected CRNAs reentering practice must utilize a combination of evidence-based interventions to reduce relapse risk. Interventions should be included in a reentry contract developed by the employer and CRNA. The AANA includes suggested components of a reentry contract; contract components must reflect CRNA personality traits, work environment, substance abused, and alternative-to-discipline program requirements. Decreasing relapse risk will increase the amount of CRNAs in the workforce and will have a positive impact on patient and provider safety.

**A117**

**Safety Evaluation of Intraoperative Methylene Blue Administration**

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**Introduction:** Methylene blue (MB) is a serotonergic agent that may lead to serotonin syndrome. The dispensing and administration of methylene blue is a multistep process. It is hypothesized that this process may be flawed at Wake Forest Baptist Medical Center and contribute to medication errors leading to development of serotonin syndrome.

**Methods:** Given the risks of serotonin syndrome to surgical patients (P) due to the concomitant use of MB and serotonergic medications, does the current process of MB dispensing and administration (C) increase or decrease medication safety (O), and are there proposed solutions (I) that can be drawn from understanding the dispensing process at Wake Forest Baptist Medical Center? The literature review was conducted using PubMed, Cochrane, Guidelines.gov, and Embase. The keywords searched were: medical error, drug-labeling, serotonin syndrome, methylene blue, anesthesia, and postoperative. Studies identified included clinical practice guidelines, governmental reports, randomized controlled trials, peer reviewed, and full text articles published in the English language.

**Analysis of the Evidence:** MB has been implicated as a contributing factor in the development of serotonin syndrome and is a high-risk drug. The most common cause of adverse drug events among patients undergoing anesthesia is medication error. Four major themes regarding medication errors with high-risk drugs were identified in the literature review: human error, communication, process improvement, and home medication reconciliation. Utilizing the Kaizen PDCA Framework, the supply, dispensing, and administration of MB was mapped to fully detail the current process at Wake Forest Medical Center. The application of the identified themes to the MB dispensing map allowed for safety improvement recommendations.

**Recommendation for Practice:** Flawed errors identified in the current process include: the individual that prepares MB is not the same as the individual that administers it; concentration and ordered dose of MB is not clearly verbalized; MB vials bypass the current safety scanning system in the OR; and the circulating RN that routinely obtains MB does not consistently perform a thorough medication reconciliation. Placing the CRNA responsible for MB dispensing, preparation, and administration allows the patient one final safety check against potential harmful medication interactions. This may decrease the occurrence of medication interactions thus decreasing the incidence of serotonin syndrome.

**A118**

**SBIRT: Screening, Brief Intervention, Referral to Treatment Interprofessional Healthcare Provider Training**

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**Introduction:** The Screening, Brief Intervention, and Referral to Treatment (SBIRT) training program is an effective EBP for clinicians to identify, reduce, and prevent substance use disorder. Utilizing an interprofessional train-the-trainer model, an evidence-based population-specific SBIRT training was supplemented with original practice-specific case scenarios and motivational interviewing cases.

**Methods:** This project was based on the Plan Do Study Act evidence-based practice model. A literature review was conducted to answer the following PICOT question: Will the delivery of an SBIRT training module with an added opioid screening tool and profession specific case studies increase healthcare providers knowledge related to SBIRT and perceived competence in clinical management of substance use disorders (SUDs)? PubMed database was searched using the key terms SBIRT, education, screening, brief intervention, and referral to treatment. The results were limited to publications within 5 years, research articles, English language, and full-text availability. After review, 25 articles were selected.

**Analysis of the Evidence:** The research demonstrated the utilization of SBIRT strategies by all clinicians in any healthcare setting to be an effective method of SUD prevention and management. Preliminary results from interdisciplinary SBIRT training sessions have proven to effectively increase providers implementation into daily practice. Additionally, participants believed that supplementing SBIRT training with original practice-specific case scenarios and motivational interviewing cases was an effective learning method.

**Recommendation for Practice:** Implementation of a training module to an interprofessional healthcare provider target group was found to be an effective SBIRT delivery method. The objective of this project was aimed at increasing providers knowledge related to SBIRT and improving their perceived competence level, resulting in personal practice implementation. Supplementing SBIRT training with original practice-specific case scenarios and motivational interviewing cases during interprofessional training enhances participant learning and subsequent implementation.

**Funding Sources:** This project was funded by Ohio Mental Health and Addiction Services.

**A119**

**Shivering Prevalence with Intrathecal Dexmedetomidine in Parturients Undergoing Elective Cesarean Delivery**

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**Introduction:** Shivering often occurs following neuraxial anesthesia. Shivering can cause patient discomfort, ineffective oxygenation, and metabolic disturbances from lactic acid production. Dexmedetomidine is currently being assessed, as a therapeutic agent for neuraxial anesthesia, to attenuate or prevent shivering in patients undergoing elective cesarean delivery.

**Methods:** A comprehensive search for prospective, double-blind, randomized controlled trials was performed for the years 2008 to 2018. A keyword search was performed using the following databases: PubMed, CINAHL, Cochrane Library, Web of Science, Elsevier's Clinical Key, and Google Scholar. Articles that included shivering, cesarean deliveries, and intrathecal dexmedetomidine met inclusion criteria. A total of 3 randomized controlled trials assessing the prevalence of shivering with the use of dexmedetomidine for neuraxial anesthesia, prior to elective cesarean delivery, met inclusion criteria.

**Analysis of the Evidence:** A total of 258 patients from 3 studies were enrolled into prospective, double-blind, randomized controlled trials in 3 different international locations. Intrathecal use of dexmedetomidine showed a statistically significant decrease in shivering compared with when it was not used.

**Recommendation for Practice:** Further research is required to validate the effect intrathecal dexmedetomidine has on shivering. Replication of these studies will strengthen the growing body of evidence for the use of intrathecal dexmedetomidine as a pharmacologically therapeutic intervention for attenuation of shivering in the obstetric population receiving neuraxial anesthesia.



**A120**

**Simulation Improves Nontechnical Skills of Student Nurse Anesthetists and Anesthesiology Residents**

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Albany Medical College Center for Nurse Anesthesiology

**Introduction:** Student nurse anesthetists and anesthesiology residents are challenged to maintain the same level of safety as experienced providers, while providing adequate surgical conditions for the operative team members. The purpose of this literature review is to examine whether providing simulation experiences improves nontechnical skills (NTS) in student nurse anesthetists and anesthesiology residents.

**Methods:** The literature presented in this review was obtained from a comprehensive search of PubMed and CINAHL databases, through Albany Medical College's Schaffer Library. The search was conducted from June 11, 2018 through July 1, 2018. Research was confined to the last 15 years, in the English language, and human subjects. Studies were included if they were published within 15 years, had either student nurse anesthetists or anesthesiology residents as a population, studied nontechnical skills, used high-fidelity simulation to either train or evaluate the effects of an intervention to improve NTS, and used the Anesthetists Non-Technical Skills (ANTS) scoring system (or a modified version of ANTS). A total of 4 studies were selected for review.

**Analysis of the Evidence:** All 4 studies showed improvement in NTS after an educational intervention, as evaluated by high-fidelity simulation. Three of the 4 studies used high-fidelity simulation as part of the educational intervention. Despite the limitations of these studies, the authors each demonstrated an improvement in NTS scores with education to a targeted population of anesthesia learners. Further studies may evaluate the relationship between improved NTS scores and quality of patient care, patient safety, and costs to the healthcare system. Specific evaluation may include outcomes such as medication errors, adherence to best practices, hospital length of stay, and similar measurable outcomes.

**Recommendation for Practice:** Current data show an improvement in NTS among resident anesthesiologists and student nurse anesthetists when simulation is used as part of a training curriculum. Simulation can be employed to build and enhance NTS in student nurse anesthetists and resident anesthesiologists with the goal of preventing adverse events and improving intraoperative patient safety. However, studies must be done to determine whether these variables are actually improved. Education programs should consider the addition of simulation-based, nontechnical skills education to existing curricula.

**A121**

**Simulation of Computer Charting for New Anesthesia Providers**

*Kristen Southern, BSN; Rachel Smith-Steinert, DNP, CRNA; Matthew Yockey, MSN, CRNA*  
University of Cincinnati

**Introduction:** Incorporation of complex electronic health records with occupational high stress level, as well as increased legal liability for anesthesia providers, has created a need for standardized intraoperative charting training for new anesthesia providers. A needs analysis was performed indicating that on-the-job training can be nonconductive to learning anesthesia and charting simultaneously.

**Methods:** Participants consisted of new anesthesia providers who had not been exposed to electronic charting as an anesthesia provider. A pretest on intraoperative knowledge of charting was administered and demographic information was obtained. Participants then experienced an educational lecture with incorporation of a simulation scenario. Areas of discussion included charting requirements, navigation of intraoperative interface from Anesthesia Start to Anesthesia Stop, and ordering laboratory tests and blood products, as well as troubleshooting. A literature review in Scopus revealed 16 articles from 2010 to 2018, focusing on healthcare personnel introduction to EHR and the use of simulation as a learning tool in the healthcare system.

**Analysis of the Evidence:** Pretest and posttest responses were analyzed using the McNemar chi-square test. Participants also received a qualitative questionnaire.

**Recommendation for Practice:** Four of 9 questions had statistically significant results (p-value <0.001). Qualitatively, participants favored the interactive and hands-on portion of the simulation, stating it was a safe learning environment where they were able to make mistakes and ask questions. Participants stated the education provided gave rationale and importance of intraoperative charting in anesthesia practice. This simulation activity provided statistically significant results, improving participant's knowledge of intraoperative computer charting. Qualitatively, participants felt that the education and simulation improved the learning process of the clinical workload.

**A122**

**South Carolina Anesthesia Provider Knowledge and Utilization of Transversus Abdominal Plane Block for Perioperative Pain Management**

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Medical University of South Carolina

**Introduction:** The opioid crisis facing our nation is detrimental to the personal and economic lives of patients. To combat healthcare devastations, education of healthcare providers remains one of the key factors that can bring about lasting change. This project aimed to educate CRNAs in South Carolina on the use of the transversus abdominis plane (TAP) block to expand opioid free anesthetic techniques.

**Methods:** Through education of South Carolina CRNAs, can we improve the quality of care the state provides for reduced opioid anesthetic methods? A review of the literature published on TAP blocks was conducted in PubMed, Scopus, Cochrane Database of Systematic Reviews, and Google Scholar databases. Key concepts searched in the literature include opioids, analgesia, transversus, abdominal, epidural, regional, and nonregional. The terms “transversus abdominal plane” or “transversus abdominal plane block” were employed on each database, and filters of publication in the last 20 years, human subjects, English language, and full-text availability were added. A variety of studies were identified for utilization including systematic reviews, randomized controlled trials, and case studies.

**Analysis of the Evidence:** Evidence from systematic reviews, randomized controlled trials, and case studies demonstrate that use of the TAP block reduces opioid requirements for patients undergoing multiple types of surgical procedures. Not only does evidence validate that this peripheral nerve block can reduce opioid consumption, studies also show it decreases length of stay in the PACU, maintains better hemodynamic outcomes intraoperatively, and diminishes complications in the postoperative period leading to shorter length of stays and increased patient satisfaction scores.

**Recommendation for Practice:** Incorporate the educational tool into the instruction of CRNAs across the state for peripheral nerve block training. Provide CRNAs with the evidence on the TAP block’s ability to help combat the opioid crisis, increase satisfaction scores, and provide better hemodynamic outcomes for patients. Continue to conduct further studies on how this block can produce favorable outcomes in research. By educating CRNAs about these blocks and how to use them, there exists a likely increase in anesthesia providers across the state of South Carolina who will advocate for these blocks in patients, making their presence more prevalent both in research and practice

A123

## **Sphenopalatine Ganglion Block for Treating Postdural Puncture Headache: A Systematic Review**

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Florida International University

**Introduction:** Postdural puncture headaches are the most common complication following lumbar puncture and epidural/spinal anesthesia. Epidural blood patches have many risks and often cause back pain. A sphenopalatine ganglion block offers a noninvasive, simple, low risk treatment that minimizes complications from an epidural blood patch, lowers healthcare costs, and increases patient satisfaction.

**Methods:** The purpose of this literature search was to answer the following clinical question: In patients with a postdural puncture headache, how does a sphenopalatine ganglion block, compared with traditional treatment interventions, affect the patients pain level after having a dural puncture? Searches of the PubMed, Embase, CINAHL, ProQuest, ScienceDirect, and Google Scholar electronic databases returned 399 records, of which 20 met the inclusion criteria for this review. The Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool was used to assess the level of evidence of each study. Inclusion criteria was within the last 10 years written in English and included participants with postdural puncture headache treated with a sphenopalatine ganglion block.

**Analysis of the Evidence:** The 20 studies obtained were 12 case series, 6 case studies, and 2 RCTs that together involved 289 participants. Sphenopalatine ganglion block provided quick pain relief from postdural puncture headache in 76% of participants, either permanently or temporarily. Sphenopalatine ganglion block prevented 71% of individuals from receiving an EBP. Fifty-eight percent of patients had permanent headache relief after only 1 block. Seventy percent of participants had permanent pain relief after 2 blocks or less. No complications were reported from sphenopalatine ganglion blockade. The block failed to provide pain relief in 24% of participants.

**Recommendation for Practice:** Sphenopalatine ganglion block could be used as first line treatment for postdural puncture headache due to the minimal risks involved. This noninvasive block is safer and cheaper than an epidural blood patch, with minimal skills required for administration. This treatment can prevent many complications that may occur from an epidural blood patch, in addition to lowering healthcare costs. More high level evidence is needed to show the block's benefits and to determine the most beneficial block method to help with dissemination and implementation.

**A124**

**Standardization of Intraoperative Handoffs for Anesthesia Providers**

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University of North Florida

**Introduction:** It was unclear if a standardized handoff report would increase communication and reduce the potential for sentinel events. The purpose of this project was to describe the evidence on the effectiveness of standardized intraoperative handoffs between anesthesia providers at improving communications and reducing sentinel events. Based on this evidence, a change in clinical practice was made.

**Methods:** The literature databases CINAHL, PubMed, Cochrane Library, and the Web of Science literature databases were searched using keywords from the following PICOT question: Do anesthesia providers (P) who use a standard provider-to-provider handoff report (I) compared with anesthesia providers who do not give a standard provider-to-provider handoff report (C) have better communication (O) intraoperatively (T)? One systematic review, 1 retrospective cohort study, and 2 preintervention/postintervention observational studies were critically appraised. Following IRB review and exemption, a change in practice was developed and implemented at Orange Park Medical Center in Orange Park, Florida.

**Analysis of the Evidence:** The results of 1 systematic review, 1 retrospective cohort study, and 2 preintervention/postintervention observational studies consistently found standardized intraoperative handoffs performed between anesthesia providers are less likely to have omissions of pertinent patient information. This evidence demonstrated that the use of a standardized handoff checklist had a positive impact on the quality of communication between anesthesia providers.

**Recommendation for Practice:** At Orange Park Medical Center in Orange Park, Florida, a standardized anesthesia handoff checklist was implemented. Prior to implementation a presentation was given to anesthesia staff discussing the evidence, practice change, and anticipated improved patient outcomes. Based on common items in the evidence, an intraoperative checklist was designed, presented to the anesthesia team, and displayed on every anesthesia machine. A survey was provided asking providers about the completeness of the handoff received in each case and whether it adhered to the intraoperative handoff checklist provided.

**A125**

**Standardizing PONV Risk Assessment and Prophylaxis Utilizing Combination Therapy, a Risk-Stratified Approach to Reducing PONV**

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**Introduction:** At Southpoint Surgery Center (SPSC) in Jacksonville, Florida, PONV prophylaxis is provider specific, without standardized assessment or treatment. It was unclear whether combination therapy would decrease PONV when compared with monotherapy. The purpose was to assess PONV risk preoperatively using the Apfel score and provide a risk tailored approach to prophylaxis utilizing combination therapy.

**Methods:** Four literature databases, which included Cochrane Library, PubMed, CINAHL, and Web of Science, were searched using keywords from the following PICOT question: Do surgical patients undergoing general anesthesia (P) receiving intravenous ondansetron and dexamethasone (I) compared with similar patients receiving either intravenous ondansetron or dexamethasone alone (C) have a lower incidence of PONV (O) postoperatively (T)? Five randomized controlled trials (RCTs) were critically appraised.

**Analysis of the Evidence:** The evidence consistently showed that combination therapy of ondansetron and dexamethasone decreased the incidence of PONV compared with monotherapy with either ondansetron or dexamethasone alone. With this information, the Society for Ambulatory Anesthesia (SAMBA) Consensus Guidelines for the Management of PONV was consulted in selecting the Apfel PONV risk scoring tool. An algorithm for prophylactic management of PONV was included in the electronic medical record (EMR). In addition to the primary literature search, ancillary evidence was sought out to validate the Apfel PONV risk scoring tool and to substantiate that using antiemetic drugs that act on different receptors has an additive effect on risk reduction.

**Recommendation for Practice:** The Apfel PONV risk assessment tool was incorporated into the EMR for use in the preoperative assessment. The accompanying risk stratified algorithm for prophylactic management of PONV was also included into the EMR. Implementation was preceded by stakeholder education through meetings and distribution of written educational material. The importance of an escalation of PONV treatment with increasing risk level by combining another drug that targets a new receptor was emphasized. Patients were stratified by risk preoperatively and PONV prophylaxis guidelines were included in the EMR to ensure providers were exposed to a standardized treatment recommendation.

**A126**

**Stress Management Through Mindfulness Meditation in Student Registered Nurse Anesthetists**

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**Introduction:** Student registered nurse anesthetists (SRNAs) commonly experience stress and anxiety. Balancing academic requirements and personal wellness can be difficult. Program time investment may result in a loss of previously relied upon coping mechanisms, necessitating a time conscious coping strategy. Mindfulness meditation may fill this gap.

**Methods:** Following the Johns Hopkins Nursing Evidence-based Practice Model, a literature review was completed to answer the following question: In student registered nurse anesthetists enrolled in doctorate programs, does the use of the mindfulness meditation application Headspace, for the 10-day trial period, result in decreased overall depression, anxiety, and stress levels compared with levels prior to using the application? The database Scopus was utilized. Key terms included: mindfulness, anxiety, stress, SRNA, RNSA, CRNA student, and graduate student. The results were then limited to publications within the last 5 years, English language, full text available, and research article. Fifteen articles were identified including: 6 randomized controlled trials, 6 quasi-experimental studies, and 3 qualitative studies.

**Analysis of the Evidence:** The research documented evidence of short-term benefits associated with mindfulness training on stress and anxiety reduction in graduate students but was unavailable for SRNAs. We developed a quality improvement project to deliver a mindfulness meditation training program using the application Headspace. It was chosen for its convenience, the availability of a free trial, and its effectiveness in similar populations. SRNAs attended a presentation about mindfulness and were instructed to complete the 10-day free trial of Headspace. Using the DASS-21 questionnaire, a pretest and posttest revealed a statistically significant reduction in anxiety by 32% ( $p < 0.001$ ) and stress by 47% ( $p < 0.001$ ).

**Recommendation for Practice:** The use of mindfulness meditation as a coping mechanism was found to be effective in the reduction of anxiety and stress in SRNAs. The goal for this project was to introduce SRNAs to mindfulness meditation, as it was found to be underutilized by the population during the literature review and beneficial to other similar populations. This QI project suggests the presence of short-term benefits of mindfulness meditation training in SRNAs but does not reveal the long-term effects and was limited by sample size. Continued maintenance of mindfulness practice may be necessary to maintain these benefits. A follow-up survey could be sent to evaluate this gap in knowledge. Further study is recommended.

A127

**Substance Abuse and Misuse Identification and Prevention: An Evidence-Based Protocol for the Prevention of Controlled Substance Abuse and Misuse By CRNAs in the Workplace**

*Leigh Taylor, DNP, MS, CRNA*

Samford University

**Introduction:** Substance abuse is the principal cause of professional impairment for nurse anesthetists; 1 out of 10 CRNAs suffer from addiction to drugs or alcohol. However, no mandated continuing education requirement exists, nor is there a standardized protocol for substance abuse prevention. If substance abuse and misuse could be prevented, the risk for professional impairment by CRNAs might decrease.

**Methods:** The Iowa Model of EBP served as the framework for the development this workplace toolkit. A team was formed to review current practice and connect ideas that could prevent misuse and abuse in CRNAs. The team was composed of 12 clinical and nonclinical members. The author facilitated discussion and collected qualitative data. Current evidence in the literature determined the goals of the toolkit, but the team provided opinions on the practicality to achieve an effective toolkit. Data from the team guided the formation of an evidence-based protocol. To facilitate application, the protocol was transitioned to a toolkit including education materials, a policy template, and supervisor training modules. A second meeting occurred to gather feedback on the toolkit, and revisions were completed.

**Analysis of the Evidence:** Through collaboration with diverse team members, an evidence-based toolkit, with corresponding protocol, was created for workplace prevention of substance abuse. The first component of the toolkit addresses problems associated with substance abuse: accidents and injuries, consequences to practice and patient care, costs, and the culture within an anesthesia group or department. Secondly, the Substance Abuse and Misuse Identification and Prevention (SAMIP) protocol is described. The final section of the toolkit provides supplemental information to aid in the SAMIP protocol implementation

**Recommendation for Practice:** This toolkit was designed to assist anesthesia groups in the implementation of substance abuse prevention for the workplace. The goal of this protocol and toolkit is to prevent substance abuse in nurse anesthetists through early identification. If substance abuse can be identified earlier, then nurse anesthetists might have access to treatment sooner. While the protocol is a novel idea, this toolkit will not be a one-time fix and only reflects a start to improve a growing problem.



A128

**Sustainability Practice Improvement Project: Inhalational Anesthetic Practice in the Operating Room**

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**Introduction:** There is a significant knowledge gap in sustainability practices within the anesthesia community. A “greening” initiative occurring at the University of Cincinnati is providing education to promote practice change to reduce the operating room’s carbon footprint, offer potential cost-saving alternatives to the healthcare system, and become environmental leaders in the facility.

**Methods:** Within 3 months of project implementation of sustainability education and the reduction of desflurane vaporizers, does desflurane usage decrease to <2% for weekday first case usage at University of Cincinnati main operating rooms? A nonexhaustive and comprehensive review of the literature was performed regarding the interventions, risks and prevalence, and strategies over the operating room’s contribution to greenhouse gas emissions with a focus of inhalational anesthetic agents. Mesh Terms used included: anesthetics, inhalation, environmental pollution, greenhouse effect, ozone depletion, and carbon footprint. The search was done through PubMed and CINAHL for peer-reviewed, evidence-based articles; guidelines; and protocols. The research was graded according to Stetler (1998, p. 281) for the strength of evidence.

**Analysis of the Evidence:** Inhalational anesthetics are known greenhouse gases (GHG). The degree to which each anesthetic agent will act as a GHG depends on both its ability to absorb energy and how long it stays in the atmosphere. The atmospheric lifetime of sevoflurane is 1.4 years and desflurane is 14 years. Desflurane has a GWP100 of 2,540 compared with sevoflurane of 130. There is a greater cost to using sevoflurane over desflurane even at lower flows. Desflurane has greater GHG effects due to a high MAC percentage, a high radiative efficiency, and a low rate of metabolism that leads to a greater proportion of gas that escapes unaltered into the atmosphere.

**Recommendation for Practice:** A retrospective chart review of 1,004 patients undergoing general anesthesia at the University of Cincinnati Medical Center shows an average usage of desflurane for weekday first case usage was 9%. After sustainability education, usage decreased to 3%, which then dropped to 0.3% after vaporizer removal. Statistical process control charts were the primary data analysis tools. A chi-square test was completed for statistical significance. Recommendations for practice include using sevoflurane over desflurane, optimizing fresh gas flow settings during maintenance, turn off the fresh gas flow during intubation, and set the vaporizer to deliver a concentration higher than intended

A129

## **The Clot's the Thing: Use of Viscoelastic Assays for Hemostatic Guided Resuscitation in Bleeding Trauma Patients**

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**Introduction:** The bleeding trauma patient requires rapid correction of hypovolemia and repletion of clotting factors to correct coagulopathy. Viscoelastic assays allow for rapid analysis of clot behavior, but a lack of clear data regarding efficacy and practicality limits implementation. This review examines current literature regarding viscoelastic guided hemostatic resuscitation in bleeding trauma patients.

**Methods:** PubMed and Embase were searched for scholarly publications in English from 2014 to present, using the keywords TEG, thromboelastography, ROTEM, rotational thromboelastometry, trauma, and resuscitation. Exclusion criteria included nontrauma, nonhuman, laboratory/blood components, fibrinolysis not related to trauma, crystalloid resuscitation, TEG/ROTEM components, and lack of relevance to the topic. Six studies were included in the final analysis: 1 randomized controlled trial, 2 retrospective studies, 1 systematic review, 1 meta-analysis, and 1 prospective study. The viscoelastic assay used varied: 3 studies examined TEG, 1 examined ROTEM, and 2 included both TEG and ROTEM.

**Analysis of the Evidence:** The literature shows potential advantages of viscoelastic assays in reduced blood product utilization, decreased ICU and hospital length of stay, and decreased mortality, with 5 studies reporting this. One article reported no advantage to TEG use in a small prospective study. The sole RCT reported statistically significant increased survival in the TEG managed group and decreased platelet and plasma use; a retrospective study found increased plasma and platelet utilization in the ROTEM managed group. The meta-analysis found statistically significant decrease in mortality in 6 studies.

**Recommendation for Practice:** Current evidence demonstrates that viscoelastic assays have potential to improve management of bleeding patients, although there is a lack of RCTs to demonstrate reproducibility of these improvements. Given the current available data, viscoelastic assays, when readily available, may reasonably be used to complement current mass transfusion protocols for the bleeding trauma patient, as there are no disadvantages reported to their use. Further study is required to conclusively demonstrate the advantages of viscoelastic managed resuscitation.

## A130

### **The Effectiveness of Early Patient Education on Reducing Anxiety in Cataract Surgical Patients**

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**Introduction:** Anxiety is commonly experienced by cataract surgical patients and results in increased postoperative pain and decreased satisfaction. It was unclear if preoperative education was an effective anxiety reducing strategy. This work describes the evidence on the effectiveness of early preoperative education on reducing anxiety in cataract surgical patients receiving monitored anesthesia care (MAC).

**Methods:** The literature databases Cochrane Library, CINAHL, PubMed, and Web of Science were searched using keywords from the following PICOT question: Do patients who receive monitored anesthesia care (MAC) for cataract surgery (P) who receive preoperative education (I) compared with similar patients who do not receive preoperative education (C) have reduced anxiety and higher satisfaction (O) perioperatively (T)? One meta-analysis and 4 RCTs were critically appraised.

**Analysis of the Evidence:** The results of these studies consistently found improvements in patient outcomes with the use of preoperative education. Patients who received preoperative education had reduced anxiety, pain, and improved patient knowledge and satisfaction. Patients who received preoperative education had improved knowledge about the surgical procedure. One RCT found that patients who had preoperative education had decreases in heart rate, blood pressure, and respirations.

**Recommendation for Practice:** At Southpoint Surgical Center of Jacksonville, Florida, following IRB waiver, a change in practice was implemented. Evidence was disseminated to 3 ophthalmology offices via informal discussion. The offices received preoperative educational material to be given to each patient on the day of surgical booking. To determine if a change in practice was made, patient questionnaires that were routinely done by the surgical center staff were monitored for patient reported outcomes. Patients who completed the follow-up questionnaires (n=39) reported no anxiety and satisfaction with their anesthesia.

**A131**

**The Effectiveness of Lidocaine in Preventing Postoperative Laryngospasm in Pediatric Patients**

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**Introduction:** Pediatric patients undergoing oropharyngeal surgery are at an increased risk for laryngospasm. Currently, there is no gold standard proven to prevent pediatric laryngospasm. A literature review was conducted to investigate the effectiveness of intravenous lidocaine in the prevention of laryngospasm in pediatric patients undergoing oropharyngeal surgery.

**Methods:** A literature review was performed to examine if IV lidocaine is more effective than placebo in the prevention of laryngospasm in pediatric patients undergoing oropharyngeal surgery. Literature presented in this review was selected through a comprehensive electronic search of the PubMed, CINAHL, and Cochrane databases through Albany Medical College's Schaffer Library. Keywords used for the search included laryngospasm, lidocaine, lignocaine, xylocaine, pediatric, tonsillectomy, and oropharyngeal. Articles were included if they were published in the English language between 2008 and 2018 and investigated lidocaine's efficacy in the prevention of laryngospasm in pediatric patients undergoing general anesthesia for elective oropharyngeal surgery. Four articles are included in the analysis.

**Analysis of the Evidence:** Four articles were included in this final analysis: Sanikop et al (2010), Malik et al (2016), Saini et al (2016), and Cristhudas et al (2017). Findings suggest patients who received 1.5 to 2 mg/kg of IV lidocaine 1.5 to 2 minutes prior to extubation demonstrated fewer incidences of laryngospasm when compared with subjects who received placebo. Malik et al found a decrease in laryngospasm severity with IV lidocaine administration. Severity was measured by the subject's response to provider intervention. IV lidocaine was associated with a decreased incidence of coughing and improved postextubation oxygen saturation. Coughing and laryngospasm were evaluated using a modified 4-point scale.

**Recommendation for Practice:** The incidence of pediatric laryngospasm has been reported to be as high as 26% and can result in unanticipated life-threatening hypoxia, hypercapnia, obstructive pulmonary edema, cerebral complications, arrhythmias, and cardiac arrest. Currently, there is no proven gold standard to prevent the incidence of pediatric laryngospasm. Lidocaine (1.5-2 mg/kg) administered 1.5 to 2 minutes prior to extubation may suppress the airway reflex that leads to laryngospasm in this high-risk patient population. The findings should excite the curiosity of anesthesia providers, as the optimal course for managing pediatric laryngospasm is to prevent it.

**A132**

**The Effectiveness of Low-Dose Ketamine on Treatment-Resistant Depression**

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**Introduction:** Ketamine was introduced in the 1960s as an anesthetic and has more recently been shown as beneficial in the treatment of depression, which often becomes chronic. It was unclear if intravenous ketamine provides effective symptom relief in patients with treatment-resistant depression. This work describes the evidence on the effectiveness of low-dose ketamine at improving symptoms in depression.

**Methods:** The following PICO question was used to search 4 literature databases: Do patients with treatment-resistant depression (P) treated with intravenous ketamine (I) compared with similar patients not treated with ketamine (C) experience greater symptom relief (O)? Four randomized controlled trials (RCTs) were critically appraised. The results from these 4 RCTs found that patients and clinicians reported depression scores improved after low-dose ketamine therapy. Based on this evidence, it is recommended that low-dose ketamine infusions be provided to treat patients with resistant depression.

**Analysis of the Evidence:** All 4 of the RCTs found that low-dose ketamine infusions were beneficial to patients with depression. Each study utilized reliable rating tools that were used to measure depressive symptoms. They all concluded that ketamine reduced depressive symptoms and produced a rapid antidepressant effect after the initial treatment.

**Recommendation for Practice:** It is recommended that ketamine be used for treatment-resistant depression. Many general and mental health providers do not know about ketamine and its indications for depression, and they are unaware of local resources where they may refer their patients for this adjunctive therapy. This project received an IRB waiver and involves educating these practitioners about the benefits of ketamine and provides information regarding local clinics in their area. A list of all educated providers will then be compared with the referral list from the partnering ketamine clinics in hopes that there will be evidence of referrals from some of the newly educated providers.

**A133**

**The Effectiveness of Paravertebral Blocks to Reduce Acute and Chronic Pain for Breast Surgery Patients**

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**Introduction:** Sixty percent of breast cancer patients experience chronic pain after surgery. It was unclear whether paravertebral blocks (PVBs) decreased acute and chronic pain after breast surgery. The purpose of this work was to describe the evidence on the effectiveness of PVBs in reducing acute and chronic pain and based on this evidence a change in clinical practice was made.

**Methods:** Four literature databases were searched using keywords from the following PICOT question: Do breast cancer surgery patients (P) who receive paravertebral blocks (I) compared with similar patients who do not receive a block (C) have a lower incidence of acute and chronic pain syndrome (O) following surgery (T)? One randomized controlled trial, 2 meta-analyses, and 1 systematic review were critically appraised.

**Analysis of the Evidence:** Results of these studies consistently found a statistically significant decrease in chronic pain, acute postoperative pain, length of hospital stay, and postoperative nausea and vomiting.

**Recommendation for Practice:** At the University of Florida Health Hospital in Jacksonville, Florida, and in conjunction with the breast oncology surgeon, an educational flyer on PVBs was provided to patients during their preoperative visit in the breast care clinic. Prior to implementation, evidence was disseminated to hospital stakeholders including the surgeon and the anesthesia team to discuss the evidence on how this change will improve patient outcomes. The frequency of use of preoperative PVBs was obtained prior to implementation. After implementation, the frequency of use of preoperative PVBs will be monitored to determine if education on the effectiveness of PVBs increased the use of PVBs.

**A134**

**The Effectiveness of Preoperative Gabapentin in Reducing Postoperative Pain and Opioid Consumption**

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**Introduction:** Gabapentin, an FDA approved anticonvulsant, may be effective at reducing postoperative pain and opioid use in patients undergoing general anesthesia. CRNAs are using nonopioid analgesic techniques as adjuvants for perioperative pain reduction. This work aims to describe evidence from the literature on the effectiveness of preoperative gabapentin in reducing postoperative pain.

**Methods:** The following PICOT question was used to search the Cochrane Library of Systematic Reviews, the Cumulative Index to Nursing and Allied Health Literature, the Web of Science database, and PubMed: Do surgical patients undergoing general anesthesia (P) who are given oral gabapentin preoperatively (I) compared with similar patients who do not receive preoperative oral gabapentin (C) have less pain (O) postoperatively (T)? Five systematic reviews and 1 randomized controlled trial were critically appraised. Following IRB review and exemption, a practice change was developed and implemented at a Northeast Florida Medical Center.

**Analysis of the Evidence:** Results showed that preoperative oral gabapentin (300-1,500 mg) administered 1 to 24 hours before surgery reduced postoperative pain and opioid requirements in surgical patients following general anesthesia.

**Recommendation for Practice:** Implementing change began with meeting with key stakeholders at a Northeast Florida Medical Center to discuss the need and feasibility of this project. The stakeholders and anesthesia providers were educated on the evidence of the effectiveness of preoperative gabapentin in reducing postoperative pain and opioid use. A request was made to the pharmacy department that gabapentin be stocked in the anesthesia automated medication dispensing system. Educational handouts were posted about gabapentin with encouragement toward its utilization. The use of gabapentin increased by 61.5% in 1 month following implementation.

**A135**

**The Effectiveness of Preoperative Oral Acetaminophen in Reducing Postoperative Pain**

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University of North Florida

**Introduction:** Acetaminophen is used as a preemptive analgesic drug. It was unclear if oral acetaminophen was as effective as IV acetaminophen at reducing postoperative pain. The purpose of this paper is to describe the evidence on the effectiveness of preoperative oral compared with IV acetaminophen at reducing postoperative pain in surgical patients. Based on this evidence, a change in clinical practice was made.

**Methods:** Four literature databases (Cochrane, PubMed, CINAHL, ProQuest Health) were searched using the keywords from the following PICOT question: Do surgical patients (P) who receive oral acetaminophen preoperatively (I) compared with similar patients who receive intravenous acetaminophen perioperatively (C) have less pain (O) postoperatively (T)? Four randomized controlled trials and 1 retrospective study were critically appraised. Following IRB review and exemption, a change in practice was developed and implemented at Halifax Medical Center in Daytona Beach, Florida.

**Analysis of the Evidence:** The results of these studies found that there was no difference between oral and IV acetaminophen in preventing postoperative pain, time to first dose of postoperative pain medication, time to ambulation, postoperative pain scores or total opiate consumption at 6 hours and at 24 hours. It is recommended from this evidence that patients receive oral acetaminophen preoperatively for postoperative pain to reduce cost and increase accessibility.

**Recommendation for Practice:** The evidence was disseminated to the anesthesia staff via a breakfast discussing the evidence, implementation plan, and why the change is necessary to reduce hospital costs and improve accessibility. Educational fliers were posted in the preoperative holding area, at 3 main Omnicells that anesthesia providers use, and other locations in the operating room. The frequency of preoperative oral acetaminophen administration was monitored and evaluated based on Omnicell removal records of oral acetaminophen provided by the pharmacy management.



**A136**

**The Efficacy of Intravenous Esmolol in Reducing Postoperative Pain Scores and Opioid Consumption**

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**Introduction:** The rampant use of opioids has brought with it a burden of adverse effects. Increasing knowledge of the mechanisms and components of pain transmission reveals opportunities to improve pain management in novel ways. Esmolol has been proposed as a nonopioid modality for perioperative pain management.

**Methods:** Our analysis endeavored to review the efficacy of intravenous esmolol administration in decreasing postoperative pain scores and opioid consumption compared with no esmolol administration in surgical patients. A comprehensive systematic review of the literature examining the use of esmolol as a treatment for perioperative pain was conducted utilizing PubMed, Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Embase. Keyword search terms included “esmolol” in conjunction with “perioperative pain” or “postoperative pain,” and the search was limited to full-text randomized controlled trials, case control studies, systematic reviews, or meta-analyses available in English published between 1988 and 2018.

**Analysis of the Evidence:** Analysis of the available evidence suggests that esmolol administered by intravenous bolus and infusion intraoperatively can be utilized as an effective adjunct for multimodal pain management. Currently, evidence to support esmolol as a sole agent for pain management is lacking. However, the efficacy of esmolol is well demonstrated when given in conjunction with more conventional analgesic agents such as opioids, ketamine, and lidocaine. Opioid-sparing utility is demonstrated by decreased postoperative pain scores and opioid consumption when esmolol was administered intraoperatively.

**Recommendation for Practice:** There is variability in dosing regimens in the literature with a usual bolus dose of 0.5 to 1 mg/kg followed by an infusion of 10 to 50 mcg/kg/min intraoperatively. The administration of esmolol during laparoscopic procedures has the strongest base of evidence. Further research is needed to elucidate the most effective dosing strategy and address efficacy in various populations and procedures. Meta-analyses targeting specific surgical procedures or populations could support generalizability of results and strengthen recommendations for implementation.

A137

## **The Efficacy of Preoperative Educational Interventions in Reducing Anxiety in Pediatrics Undergoing General Anesthesia**

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**Introduction:** Induction of anesthesia is the most stressful medical procedure a child can undergo. Despite an increasing number of pediatric anesthetics, there has been a decrease in preoperative preparation. Preoperative educational interventions are researched as a means of decreasing anxiety. This review aimed to determine which interventions would be most effective in reducing perioperative anxiety.

**Methods:** The PICO question was: In pediatric surgical patients who are scheduled to undergo general anesthesia (population), what preoperative educational interventions (intervention) would be most effective in reducing perioperative anxiety (outcome)? The implied comparison was patients receiving the standard of care. The search utilized PubMed, CINAHL, and Embase, resulting in 96 potential sources. Five articles (3 randomized controlled trials, 1 cohort study, 1 prospective randomized study) were included for review (457 subjects aged 2-18 years). All studies utilized a validated tool for measuring pediatric anxiety. Interventions included different formats (paper, online, in-person) at different preoperative points (the night before up to 2 weeks prior).

**Analysis of the Evidence:** The overall evidence showed conflicting results – while some of the studies showed a significant decrease in anxiety, this effect did not prevail overall. Due to the variety of formats and timing of the various interventions, as well as the wide range of ages in each study, comparison between all articles was difficult. However, we concluded that there may be a benefit in implementing a preoperative educational intervention for pediatric patients undergoing general anesthesia. Further research into the characteristics of an ideal intervention, as well as the financial feasibility and cost of implementing the intervention, would need to be conducted.

**Recommendation for Practice:** The findings from this review will be used to explore implementing a pediatric educational intervention for patients undergoing general anesthesia at a large, tertiary care children's hospital. The findings can also be used to guide further research, such as identifying the best format for the intervention, as well as the ideal timing of the intervention prior to surgery. Issues that will need to be further addressed include modifying interventions to suit the developmental and cognitive needs of a particular age group, as well as the financial cost that could result from implementing the intervention at a facility.

A138

**The Feasibility and Acceptability of a Low-Tech Simulation Utilizing Local Resources in a Rural, Community Hospital**

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**Introduction:** Simulation is an effective tool to learn or refresh skills and knowledge. Unfortunately, numerous barriers prevent the routine use of simulation. The purpose of this quality improvement project was to assess the feasibility of a low-tech simulation kit conducted by local personnel to overcome the barriers and assess the acceptability of the simulation modality by participants and facilitator.

**Methods:** PICOT: In anesthesia providers at a rural, community hospital, after participating in a low-tech, in situ simulation course, what is the participant and facilitator's perception about the feasibility and acceptability of the program and do they have a self-reported increase in confidence? A systematic search of Embase, CINAHL, and PubMed was conducted identifying 342 abstracts for review, with 66 fulltext articles reviewed and 16 articles included for project. Level III and IV evidence identified according to the Ackley Level of Evidence. Search terms included: high tech, high fidelity, low tech, low fidelity, simulation, simulation training, and simulator. Both keyword search and search terms were conducted. Exclusions included languages other than English.

**Analysis of the Evidence:** The large amount of research on simulation especially being an effective learning tool was the greatest strength. The weaknesses of the literature include varied outcomes measured, mostly student focused, and the inconsistencies of how fidelity is defined. The themes that emerged included significant gains made by simulation using low fidelity and slightly bigger gains for high fidelity. There was a preference by participants for high-tech simulation. The mental strain was similar between low-tech and high-tech simulation, but the facilitator had to intervene more in the low-tech simulation. The last theme was that latent errors were detected with in situ simulation.

**Recommendation for Practice:** A low-tech simulation kit was developed and conducted using the local resources of a rural, community healthcare facility. The kit included curriculum and simulation supplies centered around a local anesthetic systemic toxicity (LAST) emergency. Fidelity was enhanced using innovative methods such as a video of the patient status and an anesthesia monitor flipbook. The feasibility and acceptability of this method was assessed with qualitative interviews of the participants and facilitator. A pre- and post-Likert scale assessed confidence change. Qualitative data were analyzed for themes by 2 individuals with 6 themes emerging.

**Funding Sources:** Mayo Clinic Department of Anesthesiology and Perioperative Medicine

A139

**The Impact of Patient Simulation on New Graduate Critical Care Nurses' Perceived Self-confidence: A Quality Improvement Project**

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**Introduction:** Intensive care unit nurses are expected to incorporate critical thinking and advanced skill sets when caring for critically ill patients. A common concern among new graduate nurses is whether or not they are adequately prepared to transition into their new role. Simulation has proven to be an effective means of improving clinical decision making, which may ultimately boost self-confidence.

**Methods:** PICOT – In new graduate critical care nurses, how does the incorporation of simulation training during unit orientation affect perceived self-confidence during the first month of independent practice? Searches via PubMed and CINAHL identified 34 peer-reviewed articles published between 2007 and 2017 focusing on the preparation and experience level of new graduate critical care nurses. Of the articles identified for evaluation, 19 were eliminated as they did not satisfy the inclusion criteria. Fifteen articles were included in the final analysis. Tenets identified in the literature review as being essential to the successful incorporation of simulation training were incorporated in the development of a simulation curriculum for new graduate nurses orienting in an intensive care unit

**Analysis of the Evidence:** A literature review indicated a gap in the preparation and experience level of new graduate critical care nurses. Most new graduates lack confidence and clinical knowledge. The aim of this project was to provide a safe and supportive learning environment to improve perceived self-confidence of new graduate critical care nurse participants through the addition of a high-fidelity patient simulation scenario. Following the simulation scenario, participants indicated an improvement in perceived self-confidence, and qualitative feedback from the 1-month follow-up survey was positive.

**Recommendation for Practice:** Simulation affords new graduate nurses the opportunity to optimize their clinical decision-making and advanced skill sets. Not only does this promote the transfer of knowledge to clinical practice, it also has the potential to foster higher levels of self-confidence. This assertion is supported by our preliminary data, as those participating in the simulation training designed for new graduate nurses entering into practice in the intensive care unit fared better on postsimulation exams and reported higher levels of self-confidence. Improving self-confidence in new graduate nurses has the potential to improve patient safety and optimize patient outcomes.

**A140**

**The Implementation of End-Tidal Carbon Dioxide Monitoring in the Postanesthesia Care Unit in Nonventilated Adult Patients**

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**Introduction:** Postoperative hypoxemia is a well-documented event after general anesthesia and is a contributing factor to the incidence of adverse respiratory events (AREs). AREs are the leading cause of morbidity and mortality associated with anesthesia. The absence of capnography monitoring in PACU patients at risk of airway compromise presents an area of improvement in patient care, safety, and outcomes.

**Methods:** The purpose of this literature search was to answer the PICO question: In adult patients aged 21 years and older receiving general or MAC anesthesia, does the utilization of end-tidal carbon dioxide monitoring in the PACU compared with using pulse oximetry provide rapid detection and/or prevention of respiratory compromise for improved patient safety and postoperative recovery? The search was conducted using CINAHL, Embase, MEDLINE, and Google Scholar. Inclusion criteria were English language, adult patients over 21 years, general or MAC anesthesia, nonventilated in the PACU, ASA I to III, obesity, OSA, use of opioids and neuromuscular agents, and publications between 1990 and 2018. Fifteen articles were retrieved, consisting of RCTs, observational studies, case reports, and clinical surveys.

**Analysis of the Evidence:** Results showed that AREs are the leading causes of postoperative morbidity and mortality and are frequent after high-risk procedures, in ASA I to II patients undergoing major surgery, those receiving general anesthesia, and in patients administered intraoperative muscle relaxants and neostigmine. Obesity and OSA were also identified as high-risk factors for the development of AREs in the PACU. Findings showed that hypoxemic events were frequent in the PACU, and that the use of pulse oximetry was insufficient in preventing AREs, even with the use of supplemental oxygen therapy. The use of capnography provided rapid identification of respiratory compromise and prevention of AREs.

**Recommendation for Practice:** Implementing capnography in the PACU to monitor patient's ventilatory efforts provides an invaluable measure of respiratory status and serves as an adjunct tool in the rapid identification of early signs of respiratory compromise and in the prevention of adverse respiratory events. The use of capnography can produce significant positive patient safety outcomes, not only in high-risk patients for the development of adverse respiratory events. There is merit in its use with the rising incidence of obesity in the United States and its associated obstructive sleep disorders. Education of PACU nurses on the benefits and impact of adverse events can promote its clinical adoption.

**A141**

**The Incidence of Bradycardia Following Sugammadex Administration in Children With Congenital Heart Disease: A Prospective Study**

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**Introduction:** Sugammadex is a fast-acting agent used to reverse neuromuscular blockade. Case reports suggested a link between sugammadex and profound bradycardia. Larger studies have found no supporting evidence in children, and the mechanism is unknown. This study sought to determine the prevalence of bradycardia following sugammadex administration in the congenital cardiac population.

**Methods:** This observational, prospective study examined patients with a known congenital cardiac anomaly following administration of sugammadex. Heart rate (HR) was recorded every minute for the first 15 minutes after administration, then at 20, 25, and 30 minutes. The primary outcome was the development of new bradycardia (definition based on HR less than 95th percentile for age). Secondary outcomes were the percentage reduction in heart rate from baseline to nadir and the requirement for clinical intervention. Data were analyzed for the rate of the primary outcome, and individual characteristics of affected children is reported.

**Analysis of the Evidence:** This study supports the hypothesis that bradycardia following sugammadex administration is observed in a minority of children with cardiac disease. These events involved a variety of cases, including cardiopulmonary bypass cases, "off-pump" cardiac cases, and cardiac catheterizations, as well as a wide range of ages. However, the percentage of heart rate changes were typically small, and no patient required intervention during the study period.

**Recommendation for Practice:** Although not yet FDA approved for use in the pediatric population, this study finds sugammadex a safe reversal agent to use in the pediatric patient with congenital cardiac disease. Of 99 patients, 12% developed new bradycardia with none needing clinical intervention.

**A142**

**The Use of Critical Events Checklists in Pediatric Anesthesia**

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**Introduction:** Critical events in anesthesia are rare. Cognitive aids support management of perioperative critical events and help users overcome human factors. The utility of critical events checklists in pediatric anesthesia is described in quality improvement literature. This presentation describes pediatric critical events and modes of critical events checklists.

**Methods:** A system review of 1 pediatric institution and a literature search were conducted specific to the use of pediatric critical events checklists in anesthesia. PubMed and CINAHL database searches were narrowed to those published in the English language between 2015 and 2020. Four articles describe the use of critical events checklists in pediatric anesthesia, 1 of which was a prospective randomized controlled trial; 3 were descriptive studies. A broader search of cognitive aids for anesthesia critical events resulted in 1 literature review. A survey sent to 7 pediatric anesthesia departments, with 98 respondents, revealed 55% of CRNAs, student registered nurse anesthetists (SRNAs), residents, and fellow respondents use critical events checklists in their pediatric anesthesia practice.

**Analysis of the Evidence:** An analysis of evidence revealed cognitive aids improve performance, compared with relying solely on memory, by helping users overcome human factors that may prohibit sound thinking during crises. A majority of study participants conflictingly responded they would likely not use a critical events checklist if given a choice but would use them if presented with a real-life operative emergency. While 55% of survey respondents revealed they have used a critical events checklist in their anesthesia practice, further research is needed to support the usability of electronic and paper checklists in real-time crises, as a majority of evidence is anecdotal and applied from nonemergent adult studies.

**Recommendation for Practice:** Usability testing revealed an ease of use with critical events checklists, with users able to find information quickly, improving performance during pediatric perioperative critical events. Anesthesia providers commonly and rarely providing care to pediatric patients may feel better prepared to manage through pediatric perioperative critical events with the use of critical events checklists. The Society for Pediatric Anesthesia Pediatric Critical Events Checklists for 28 perioperative crises are available in electronic and paper formats, in patient electronic records, attached to anesthesia machines, and via a smartphone app.

**A143**

**Transversus Abdominis Plane Blocks Versus Caudal Epidural Blocks for Perioperative Analgesia in Pediatric Patients Undergoing Lower Abdominal Surgery**

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**Introduction:** Pain management for the pediatric population is challenging because they lack complete communication skills and are often assessed subjectively. This literature review compared a gold-standard caudal epidural block (CEB) with a relatively new ultrasound-guided transversus abdominis plane (TAP) block for analgesic efficacy in children that underwent lower abdominal surgery.

**Methods:** The literature presented in this review was selected from a comprehensive electronic search of PubMed, CINAHL, and Google Scholar databases through Albany Medical College's Schaffer Library. Key terms used for the search included transversus abdominis plane block, TAP block, peripheral nerve block, caudal, epidural, pediatric, pain, and surgery. Studies were included for review if they were published within the last 5 years, examined pediatric subjects less than 10 years old, and compared ultrasound-guided TAP blocks with single-shot CEBs. Studies were excluded if ultrasound guidance was not used for TAP blocks, if opioids were added to the technique, or if the operation was performed above the level of T7. Three articles were included in the final analysis.

**Analysis of the Evidence:** Three articles were included in the final analysis: Bryskin et al (2015), Sethi et al (2016), and El Fawy and El Gendy (2014). Findings demonstrated variable pain scores in the first 6 hours postoperatively and in the time to first rescue analgesic. In the cumulative 24-hour postoperative period, the ultrasound-guided TAP block group demonstrated lower pain scores and analgesic consumption when compared with those who received a single-shot CEB. Additionally, Bryskin et al results demonstrated fewer episodes of emesis among the children within the TAP groups, attributing this to reduced opioid consumption.

**Recommendation for Practice:** Pediatric pain leads to acute and chronic physiological consequences. Additionally, it is difficult to assess pain levels in children, because their communication skills are underdeveloped. Utilizing pain management strategies that offer lasting and effective analgesia to this population will result in lesser occurrence of mismanaged pain. While both CEB and TAP block techniques provided effective analgesia, TAP blocks demonstrated a superior analgesic efficacy and duration of action in comparison with CEBs over the cumulative 24-hour postoperative period. Further studies are warranted to compare CEB and TAP block analgesic efficacy in the immediate postoperative period.



**A144**

**Treatment of Angiotensin-Converting Enzyme Inhibitor Induced Angioedema With Transfusion of Fresh Frozen Plasma**

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**Introduction:** Angioedema is a well-documented side effect of angiotensin-converting enzyme inhibitors (ACEI) due to bradykinin accumulation. Off-label use of fresh frozen plasma (FFP) was successful in reversing the effects of ACEI-induced angioedema in several cases, especially in patients who have not responded to standard therapies. FFP contains proteins that alleviate bradykinin accumulation.

**Methods:** Studies and relevant information were obtained from a literature search using PubMed, CINAHL, and Clinical Key databases through Albany Medical College's Schaeffer Library of Health Sciences in June and July 2018. Boolean search MeSH terms included angioedema, angiotensin-converting enzyme inhibitors, fresh frozen plasma, ACE inhibitors, and FFP. Research had to be completed within the last 10 years and limited to the English language. All subjects within the studies were human adults who presented with acute airway angioedema. Studies were included for review if patients who had taken angiotensin-converting enzyme inhibitor medications were examined and considered for treatment with fresh frozen plasma transfusion. Two articles were selected in the final analysis.

**Analysis of the Evidence:** Riha et al (2017) performed a systematic review of current evidence that included 9 publications detailing 16 cases. Case reports revealed treatment with FFP may be beneficial when conventional methods have been exhausted with no amelioration of ACEI-IA, showing reduction of symptoms in 6 hours or fewer. One patient was treated with FFP beyond 48 hours and required a tracheostomy. Saeb et al (2016) conducted a retrospective cohort study and reported shorter intensive care unit (ICU) stays, shorter duration of intubation, and lower incidence of intubation in patients who received FFP after presenting for ACEI-IA when compared with patients who did not.

**Recommendation for Practice:** All angioedema attacks without a diagnosis should be treated with antihistamines and epinephrine, then icatibant or plasma-derived C1 esterase inhibitor concentrate, then FFP. The judgment of effective treatment during each step should be made within 1 hour of administration. Should therapy be ineffective, providers are to switch to the next treatment option rather than redosing the same medications. With the evidence provided, it is worth considering conducting randomized controlled trials for the efficacy of FFP in ACEI-IA. Until further studies are conducted, the efficacy of initial therapies, availability, off-label use restrictions, cost, and side effects should guide the use of FFP.

**A145**

**Using Alveolar Recruitment Mechanisms Intraoperatively to Reduce the Severity of Postlaparoscopic Shoulder Pain**

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**Introduction:** Shoulder pain is the most frequently cited complaint following laparoscopy. This phenomenon results from acidotic damage to the phrenic nerve by residual carbon dioxide. Currently there is no standard for CO<sub>2</sub> removal. This literature review examines the ability of alveolar recruitment maneuvers during desufflation to reduce the frequency and severity of postlaparoscopic shoulder pain.

**Methods:** A comprehensive electronic search was performed using the PubMed database between May 26, 2018 and June 9, 2018. The following Boolean phrase was applied: pain AND laparoscopy AND recruitment maneuver OR pain AND laparoscopy AND recruitment manoeuvre. Results were limited to studies published within the past 10 years. Thirteen articles were retrieved. Studies that investigated multiple independent variables, were not randomized controlled clinical trials, or were not specific to postlaparoscopic shoulder pain were excluded. Four articles remained for inclusion in this literature review.

**Analysis of the Evidence:** Each study employed a double-blind, randomized, controlled, clinical trial design to compare the effect of recruitment maneuvers during desufflation against a control on the frequency and severity of shoulder pain. A statistically significant decrease in pain was established in intervention groups of all studies. Additionally, Phelps et al and Ryu et al investigated secondary objectives that are theoretically associated with residual CO<sub>2</sub>. Using imaging, Ryu et al quantified residual CO<sub>2</sub>. Phelps et al analyzed reports of nausea, vomiting, and positional pain. All values were significantly reduced in interventional groups, further supporting the theoretical framework of this literature review.

**Recommendation for Practice:** This literature review provides powerful evidence that recruitment maneuvers during desufflation reduce residual CO<sub>2</sub> and, thereby, the frequency and severity of shoulder pain. Though desufflation has traditionally been viewed as a surgical concern, the pain caused by incomplete CO<sub>2</sub> removal as well as the use of ventilatory maneuvers to prevent this pain demand involvement from anesthesia providers. Anesthesia providers should work collaboratively with surgical teams to prioritize maximal removal of CO<sub>2</sub>. Recruitment maneuvers during desufflation are fast, safe, and efficacious. It is recommended that these maneuvers be performed after all laparoscopic procedures, as patient appropriate.

## A146

### **Utilization of Regional Anesthesia in the Emergency Department Setting to Reduce the Administration of Opioid Medications**

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**Introduction:** Regional anesthesia has been proven safe and effective for surgical procedures and postoperative pain control. With advancements in ultrasound technology, regional anesthesia is now safer and more effective. Millions of patients present to emergency departments (EDs) each year with traumatic injuries. The use of opioids to treat pain presents many risks and side effects, including addiction.

**Methods:** CINAHL and PubMed databases were searched using the phrases “regional anesthesia” and “emergency.” Articles older than 10 years or completed outside of the ED setting were eliminated. Results yielded 6 articles utilizing 3-in-1 femoral or fascia iliaca nerve blocks, 2 articles utilizing brachial plexus nerve blocks, and 2 case series looking at transversus abdominus plane blocks and sciatic, femoral, and axillary nerve blocks.

**Analysis of the Evidence:** Femoral and fascial iliaca nerve blocks for hip fractures consistently showed a significant reduction in pain scores greater than with opioid analgesics. Inconsistent results were seen with brachial plexus nerve blocks for shoulder reduction. Significant pain reduction was obtained with transversus abdominus plane blocks and sciatic, femoral, and axillary nerve blocks.

**Recommendation for Practice:** Current research supports the development of evidence-based practice protocols for the use of femoral 3-in-1 or fascia iliaca nerve blocks for patients presenting with hip fractures in the ED. However, more research is needed to determine if brachial plexus blocks in the ED are a viable option for shoulder reductions.

**A147**

**Video Augmentation of Labor Analgesia Informed Consent Patient Education**

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The University of Alabama at Birmingham

**Introduction:** The purpose of this scholarly project is to improve health literacy and patient satisfaction of obstetrical patients by augmenting traditional labor analgesia informed consent practices with a multimedia presentation.

**Methods:** In (P) primiparous parturients, aged 18 to 45 years, undergoing elective induction of term labor, does (I) an intervention to add a multimedia presentation to traditional informed consent (IC) practices compared with (C) traditional IC alone, (O) improve patient satisfaction (PS) and health literacy (HL) regarding labor anesthetic risk and benefits (T) over a 3-month period. Extensive literature search (PubMed and CINAHL) has shown many literature syntheses as well as randomized controlled trials that have demonstrated that multimedia augmentation of the traditional IC patient education process is effective to increase PS and HL. Although there is evidence of pamphlets being utilized for obstetric patients, no studies were identified specific to video utilization in the obstetric population.

**Analysis of the Evidence:** Studies show women in labor report problems related to the IC process and feel they are not sufficiently informed in advance. Women in labor experience negative effects from their perception of the pressure of labor, after receiving neuraxial analgesia. This deficiency is related to the inadequacy of IC for labor analgesia. Ideally, IC discussion would be without any constraints of time, educational barriers, or communication barriers. For most patients, the IC and anesthetic education discussion occur in the labor room and in a great deal of pain. Educational videos and multimedia programs were found to improve PS in vascular, trauma, pediatric endoscopy, and dentistry.

**Recommendation for Practice:** It is anticipated that the results found in other specialties will be replicable in the obstetric anesthesia patient population. By adding a brief video presentation with a paper handout to the admission process in the the labor and delivery unit, we believe CRNAs can empower women to make an understood decision rather than simply checking the box of informed consent.

## A148

### **Where's the Zofran? Preventing Nausea and Vomiting Without the Familiar Favorites**

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*LCDR Chad Moore, DNP, CRNA, NC, USN*

Uniformed Services University of the Health Sciences

**Introduction:** Postoperative nausea and vomiting (PONV) negatively affects the patient experience and increases healthcare costs. The Apfel simplified score can be used to calculate individual risk for developing PONV. Calculating an Apfel score for each patient can accurately identify individuals at low to high risk, which enables practitioners to match treatment strategies with expected risk.

**Methods:** PICO. Will preoperative risk scoring and a clinical practice guide improve local provider adherence to guidelines for prevention of PONV at a midsized military hospital? Preimplementation antiemetic interventions were assessed by retrospective review from a representative sample of surgeries (n = 115). An Apfel score was integrated into the electronic medical record (EMR) and an educational session was conducted for practitioners. Treatment cards were distributed to guide prophylaxis. Early postimplementation data were collected (n = 125), results were shared with stakeholders, and input was solicited before the final data collection period (n = 157).

**Analysis of the Evidence:** The Apfel simplified score is a valid instrument for determining individual risk for PONV. Preoperative scoring is a powerful strategy that providers can use to identify and also reduce risk for PONV by 50% or more. Real-time implementation of such electronic decision support has been shown to improve provider adherence to practice guidelines. Preimplementation data suggest that when PONV risk was not calculated automatically, prophylaxis was often administered for patients at lowest risk for PONV.

Intravenous (IV) ondansetron and dexamethasone were the sole antiemetics observed preimplementation.

**Recommendation for Practice:** With automatic risk calculation, practitioners matched calculated risk with recommendations such as no prophylaxis for patients at lowest risk. PONV rates remained similar at baseline (34.7%) and in the early postimplementation phase (38.8%); however, in the final phase the PONV rate was 26.5%. Ondansetron IV, the most common antiemetic in the preimplementation phase, was unavailable throughout the early postimplementation period, resulting in the slight increase in PONV rate. Practices changed when ondansetron was unavailable, adding 3 other antiemetics, a pattern that persisted even when ondansetron IV returned.

**Funding Sources:** This project was awarded an extramural grant from the TriService Nursing Research Program, HU0001-18-2-TS01.

# Case Reports

A149

## **Anesthesia for Rigid Bronchoscopy During a Life-Threatening Asthma Exacerbation**

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Nationwide Children's Hospital

**Introduction:** Critical Asthma is rarely encountered in the operating room due to effective preoperative assessments. Yet, in emergent circumstances, anesthesia providers have many clinical and pharmacological tools to manage these situations. This case report aims to illustrate how to effectively utilize these tools to manage a patient with life-threatening asthma presenting to the OR for rigid bronchoscopy.

**Literature Review:** The National Heart, Lung, and Blood Institute has published extensive guidelines for severe asthma exacerbations outlining the use of oxygen, short acting B-agonist therapy, ipratropium, systemic corticosteroids, and magnesium or heliox for management of the most critical cases. Though sedation and intubation are not first line treatment, Shein et al and Miyagi suggest that there may be benefit from IV or inhalation anesthesia in cases where advanced airway management is required.

**Description of the Case:** A 7-year-old female was admitted for shortness of breath and asthma exacerbation related to recent history of rhino/enterovirus. She had diffuse subcutaneous emphysema and a pneumomediastinum on imaging and was admitted to the ICU requiring oxygen, continuous albuterol aerosols, steroids, atrovent, and a magnesium infusion. She presented to the OR for rigid bronchoscopy due to concern for a laryngeal tear from excessive coughing. Her anesthetic included continuous albuterol via an Aerogen nebulizer into the anesthetic circuit, continuing the magnesium infusion, and adding sevoflurane, propofol, dexamethasone, and lidocaine. The surgical team noted a healing mucosal defect in the posterior pharynx and no intervention was required. No adverse outcomes were noted though emergence was prolonged.

**Discussion and Conclusions:** Asthma is the most common chronic disease of childhood, affecting 7.1 million (9.6%) children in the United States. Though life-threatening asthma is rarely encountered in the OR, the principles applied to this severe case are broadly applicable to the management of asthma and bronchospasm under anesthesia. Careful titration of medications is essential to maintain the delicate balance of adequate anesthetic depth in the spontaneously ventilating critical asthmatic. Utilization of continuous nebulized albuterol and IV magnesium can be particularly beneficial in this situation though logistically challenging. A thorough understanding of all asthma treatments and their interaction with anesthesia is essential to successful management of this dynamic condition.

**A150**

## **Anesthetic Implications of Red-Haired Patients**

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Texas Christian University

**Introduction:** Anesthetists have often been concerned when caring for redheads due to their supposed susceptibility to bleeding and their difficulty to anesthetize. Red hair is caused by a mutation of the melanocortin-1 receptor, MC1R. Over 75% of redheads carry 2 or more mutations for MC1R. MC1R mutations have been associated with differing requirements of opioids and volatile anesthetics.

**Literature Review:** Red-haired women required 20% more desflurane in one study. Volatile anesthetic dose requirement was not increased in redheads in another study, but end-tidal anesthetic concentration was increased compared with bispectral index. Researchers suggest opioid and melanocortin antagonism due to distribution in the locus coeruleus and opposing effects on the stress response. Red-haired subjects received more analgesia from pentazocine and morphine despite similar levels of morphine-6-glucuronide.

**Description of the Case:** I had the pleasure of anesthetizing a red-haired patient. She was a healthy 57-year-old female scheduled for a robotic ventral herniorrhaphy. She had an uncompelling medical and surgical history; however, her husband stated “She is meaner than a rattlesnake when she wakes up from anesthesia.” In transport to the OR, I noticed she had red hair. I induced general anesthesia and maintained with dexmedetomidine infusion and sevoflurane 2.3% end-tidal concentration. At the conclusion of the surgery, I extubated her and she denied pain. Upon transferring her to the stretcher, she became increasingly agitated, disoriented, and combative. I gave her a dexmedetomidine bolus which calmed her, but she became agitated again in recovery. I pondered what I could have done differently.

**Discussion and Conclusions:** My patient could have been treated with an anesthetic more specific to phenotype. One of the researchers I mentioned earlier has said “There is no other phenotype for anesthesia. If you are walking down the street, there is nothing that you can see in somebody that will tell you how much anesthesia they need, except red hair. And it is a relative amount.” Redheads have demonstrated increased opioid analgesia and increased volatile anesthetic requirement. With an easily distinguishable phenotype, anesthetists can better anticipate red-haired patients’ responses to volatile anesthetics and opioid agonists, and they can augment dosing accordingly.

## A151

### **Anesthetic Management of a Parturient With a Mitral Mechanical Valve**

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**Introduction:** Mechanical prosthetic heart valve (MPHV) is associated with complications such as thromboembolism and bleeding. Physiologic changes of pregnancy, therapeutic anticoagulation, and the presence of a MPHV places the parturient at risk for maternal cardiovascular events such as an embolic event, hemorrhage, miscarriage, preterm birth, and fetal complications.

**Literature Review:** Severe valve dysfunction is repaired with a mechanical or biological prosthesis. MPHV replacement requires anticoagulation and is associated with complications such as thromboembolism and bleeding. Pregnancy induces a thrombotic state. A parturient with an MPHV requires lifelong anticoagulation.

**Description of the Case:** A 37-week parturient with a past medical history of a mechanical mitral valve replacement and nonsustained ventricular tachycardia (NSVT) presented for induction of labor for a vaginal delivery. Medications prior to admission involved enoxaparin subcutaneously. Upon admission, enoxaparin was stopped, and heparin infusion was started. Enoxaparin was stopped 24 hours prior, and a normal coagulation profile was obtained 2 hours after discontinuation of heparin. An early epidural placement was safely placed. Heparin was restarted 1 hour after placement of the epidural; the PTT was within protocol range. When in active labor, heparin was stopped. Epidural catheter was removed given normal PTT. Postpartum neurologic and cardiac monitoring was performed. Transition to warfarin was initiated. Patient was discharged stable.

**Discussion and Conclusions:** When caring for a parturient with an MPHV it is imperative to monitor the patient coagulation profiles to prevent maternal and fetal morbidity and mortality. A multidisciplinary approach is crucial for improving patient and fetal outcomes. In our case an early labor epidural was considered important given her history of NSVT. Anticoagulation places the patient at high risk for spinal epidural hematoma and hemorrhage. Strict adherence to ASRA guidelines for neuraxial blocks is imperative.



**A152**

**Anesthetic Management of Carinal Resection With Tracheobronchial Reconstruction**

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**Introduction:** Carinal resections involve dissecting the trachea and mainstem bronchi with tracheobronchial anastomosis. The critical nature of the surgery poses any surgical and anesthetic challenges and is associated with high postoperative morbidity and mortality rates. This implores anesthesia providers utilize evidence-based management of these patients to improve outcomes.

**Literature Review:** In order to improve patient outcomes in carinal resections, careful patient selection should be considered. Safe perioperative management with a thorough preoperative assessment, intraoperative airway management during airway resection, and appropriate postoperative care is recommended.

**Description of the Case:** A 64-year-old female with a low grade mucoepidermoid carinal tumor with no signs of systemic metastases presents for carinal resection with reconstruction. She is currently asymptomatic and her laboratory results and diagnostic tests were unremarkable. Standard anesthesia induction was performed and a uniblocker bronchial blocker was placed under fiberoptic bronchoscopy. After airway resection, cross-field ventilation was done with a 6.0 millimeter reinforced tube placed through the left bronchus and intermittent apnea for surgery exposure. A neocarina was created by approximating the left and right mainstem bronchi. The trachea was then anastomosed with the neocarina. A supraglottic airway was used to bridge to emergence device. Patient was extubated and discharged on postoperative day 4.

**Discussion and Conclusions:** Careful patient selection, thorough preanesthetic evaluation, and appropriate intraoperative and postoperative management can mitigate risks and improve patient outcomes in carinal resections.

A153

## **Anesthetic Management of Orthotopic Heart Transplant With Vasoplegia**

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Cizik School of Nursing at UTHealth

**Introduction:** Vasoplegia occurs when cardiopulmonary bypass (CPB) circuits activate systemic inflammatory mediators and neurohumoral factors. Vasoplegia complicates 15% of CPB and leads to refractory hypotension, coagulopathy, and multisystem organ dysfunction. Vasoplegia can increase hospital stay and mortality risk. We will discuss the intraoperative management of vasoplegia seen during heart transplantation.

**Literature Review:** Vasoplegia risk factors include heparin infusion, poor LV function, heart transplantation, LV assist device implantation, blood transfusion, and prolonged CPB. Early detection is critical, and a high index of suspicion for vasoplegia is considered in the presence of severe hypotension refractory to fluid resuscitation and vasoactive support. Best practice recommendations for managing vasoplegia include methylene blue, vasopressin infusion, and mechanical circulatory support for severe cases.

**Description of the Case:** A 62-year-old male with severe congestive heart failure is scheduled for heart transplantation. Preoperatively, he was supported on an intra-aortic balloon pump and inotropic infusions. Arterial line and standard ASA monitors were placed before induction. A triple lumen and pulmonary artery catheter were placed after intubation. Aortic cannulation and CPB were initiated without complications. The intraoperative course was complicated by hypotension refractory to vasopressor support and fluid resuscitation. A consensus was made by the team to start a vasopressin infusion and methylene blue. Due to the prolonged period of hypotension, the patient also exhibited right ventricular failure. Intratracheal milrinone and nitric oxide were initiated. ECMO and IABP were initiated and CPB was discontinued.

**Discussion and Conclusions:** Vasoplegia syndrome can lead to severe morbidity and mortality in CPB surgeries. An in-depth preanesthetic risk assessment and evidence-based management of vasoplegia syndrome can be lifesaving for patients who present with refractory hypotension during high-risk CPB surgeries.

**A154**

**Anesthetic Management of Perioperative Analgesia for a Patient With Chronic Polysubstance Abuse**

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**Introduction:** The Substance Abuse and Mental Health Services Administration conducted a survey in 2014 that reported 21.5 million Americans had substance abuse or dependence. The number of Americans abusing substances continues to increase and impact anesthesia. Patients presenting for surgery with a history of polysubstance abuse raise concern for adequate pain management perioperatively.

**Literature Review:** Chronic alcohol abuse requires an increased amount of anesthetic sedatives, but there is no evidence to support an increased tolerance of opioids. Chronic amphetamine use does not increase the tolerance to anesthetic sedatives or opioids. Chronic cannabis use requires an increased dose of sedatives and opioids to maintain adequate anesthesia. Multimodal analgesia is recommended for the management of perioperative analgesia for patients with chronic polysubstance abuse.

**Description of the Case:** A 46-year-old, 63.8-kg, 161-cm female diagnosed with metastatic papillary thyroid carcinoma presented for a total thyroidectomy with bilateral and central compartment neck dissections. The patient had a history of polysubstance abuse and stated she drank 5 alcoholic beverages and smoked marijuana daily. General anesthesia was induced with fentanyl, 100 mcg; lidocaine, 60 mg; propofol, 140 mg; rocuronium, 10 mg; and succinylcholine, 140 mg IV. Anesthesia was maintained with sevoflurane, air, oxygen, and continuous IV infusions of dexmedetomidine and remifentanyl. Ketamine, hydromorphone, and acetaminophen were administered IV as analgesia adjuncts. The procedure was successfully completed after approximately 10 hours, and the patient required no additional medications for pain control in PACU.

**Discussion and Conclusions:** Patients with chronic polysubstance abuse increase the risk of developing a tolerance to medications used to manage perioperative analgesia. Chronic alcohol abuse increases the tolerance to sedatives but does not increase the tolerance to opioids. Two studies revealed the effect chronic use of amphetamines on anesthetic sedation and analgesia is insignificant. Chronic cannabis use increases the anesthetic requirements for sedation and analgesia. The recommended anesthetic approach to managing patients with polysubstance abuse is multimodal analgesia because it reduces the use of opioids and targets multiple pain receptors along the pain pathway. The utilization of multimodal analgesia effectively managed the patient's pain in the case report despite her history of chronic polysubstance abuse.

## A155

### **Carnitine Palmitoyltransferase, Type 1A Arctic Variant (CPT1A Arctic Variant)**

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Texas Christian University

**Introduction:** Carnitine palmitoyltransferase 1A (CPT1A) is the rate-limiting enzyme needed for fatty acid oxidation. Under normal conditions, the human body guarantees an energy supply by metabolizing glucose in the short term and by oxidizing fatty acids into ketones during fasting or starvation. CPT1A deficiency is an autosomal recessive trait that results in an 80% reduction in CPT1A activity.

**Literature Review:** CPT1A deficiency is also known as the “arctic variant” as it is found in high frequency in circum-arctic populations. Once thought of as a rare disorder, the introduction of tandem mass spectrometry and DNA testing into Alaska newborn screenings revealed that the CPT1A deficiency has an incidence rate as high as 80% in specific populations of Alaska, such as the Inupiaq and Yupik tribes. In 2011, it was estimated that around 700 babies are born in Alaska each year with this deadly deficiency.

**Description of the Case:** A 5-year-old male was scheduled for dental restoration. Past medical history included only CPT1A deficiency, and surgical history included an uneventful circumcision. Vital signs were unremarkable, and no preoperative laboratory tests were needed. The patient had last consumed apple juice around midnight, and he received oral midazolam and acetaminophen followed by apple juice in the preoperative area. In the operating room, his case was uncomplicated, easy induction and nasal intubation followed by stable hemodynamics. During the procedure, a blood glucose was checked; the result was 112 mg/dL and no other intervention was needed. At the end of the case, the patient was given dexmedetomidine and when appropriate was successfully extubated and transferred to PACU. In PACU, he was alert and began crying for his parents.

**Discussion and Conclusions:** The arctic variant affects the liver’s ability to provide an alternative energy source by oxidizing fatty acids during periods of prolonged fasting, stress, or illness. Patients with CPT1A may present with vomiting, lethargy, hypoglycemia, seizures, and even sudden infant death. Interventions include, but are not limited to, parent education and prevention techniques, recognition of symptoms, prompt treatment with glucose, and even surgery cancellation. With the growing population of CPT1A patients, it is important for CRNAs in Alaska to understand what the arctic variant is, who it affects, how to prevent or treat symptoms, and how to care for these patients throughout the perioperative period.

## A156

### Emergency Use of Sugammadex to Reverse Vecuronium in a 3-Month-Old Child

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Texas Christian University

**Introduction:** Difficult airway algorithms involve a variety of anesthetic techniques.

Sugammadex, a neuromuscular blockade reversing agent, can act as a pharmacologic agent in a “cannot intubate, cannot ventilate” scenario due to its rapid action and safe drug profile.

**Literature Review:** Sugammadex is an antagonizing agent for neuromuscular blockade produced by rocuronium and vecuronium that has been shown to be more effective than placebo or neostigmine. Although extensive data exists for rocuronium, there is limited data available on the use of sugammadex antagonizing a standard vecuronium dose of 0.1 mg/kg. While sugammadex has not been studied in patients under 17 years old, there is less than a 1% incidence of adverse events in 18 clinical trials involving the drug.

**Description of the Case:** A 3-month-old male presented for diagnostic laryngoscopy and VP shunt placement. The patient was kept spontaneously breathing on induction for the diagnostic laryngoscopy and the vocal cords were easily identified. Vecuronium was administered and, shortly afterward, ventilation became difficult. Endotracheal intubation was attempted, but an endotracheal tube could not be advanced. Neither an oral airway nor LMA helped with ventilation efforts. Sugammadex (16 mg/kg) was administered, and the infant had a return of spontaneous ventilation within 1 minute of administration.

**Discussion and Conclusions:** Sugammadex is a safe and rapid pharmacologic agent used to antagonize rocuronium and vecuronium. Systematic reviews have shown that sugammadex is more effective than placebo or neostigmine in antagonizing muscle relaxation induced by rocuronium; however, there is little data available regarding its use when antagonizing vecuronium. Sugammadex should be readily available in all institutions performing general anesthetics, if only for emergency use in a “cannot intubate, cannot ventilate” scenario. The infant in this scenario may have had a poor outcome had the drug not been immediately available.

**A157**

**Fluid Management During Spinal Surgery in the Prone Position**

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**Introduction:** Optimal fluid management that avoids hypervolemia and hypovolemia remains elusive despite ongoing research. The prone position increases risk of blood loss and fluid shifts particularly during extensive spinal surgeries. Various monitoring modalities are available to monitor fluid status and evaluate fluid responsiveness of patients during surgical procedures.

**Literature Review:** Traditional fluid management is based on weight, phase of surgery, estimated fluid losses, central venous pressure (CVP), mean arterial pressure (MAP), heart rate, and urine output. Goal-directed therapy (GDT) uses physiologic variables such as pulse pressure variation (PPV), stroke volume variation (SVV), and plethysmography variability index (PVI). Patients in the prone position for extensive surgeries should receive vigilant monitoring of fluid status using the most reliable techniques.

**Description of the Case:** A 68-year-old male presented for an extensive T4 to S1 spinal procedure. After induction of anesthesia, an arterial line and a triple-lumen central line catheter were placed. The patient was then placed in the prone position for the remainder of the procedure. CVP, urine output, MAP, estimated blood loss, and base deficit levels from arterial blood gases were used to guide fluid resuscitation intraoperatively. A total of 2.4 L of crystalloids, 1.75 L of colloids, and 2 units of packed red blood cells were given as part of fluid management intraoperatively. At the end of the procedure, the patient was returned to the supine position, extubated, and taken to the intensive care unit (ICU) for close continuous monitoring. No complications were noted postoperatively.

**Discussion and Conclusions:** The goals of fluid management are to avoid dehydration, maintain an effective circulating volume to support cellular oxygen delivery, prevent inadequate tissue perfusion, and prevent fluid overload. CVP is commonly used to guide fluid resuscitation. However, CVP is a poor predictor of fluid responsiveness and should not be used to assess fluid status. Dynamic indices such as PPV, SVV, and PVI are better indicators of fluid volume status. Studies that assessed the reliability of these dynamic indices in the prone position report that they are reliable and valid, intraoperative fluid administration is reduced, and there are fewer complications postoperatively. Anesthesia professionals should use dynamic indices to guide fluid resuscitation in appropriate cases.

**A158**

**Intravenous Magnesium Sulfate for Multimodal Analgesia**

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Texas Christian University

**Introduction:** The use of intraoperative opioids for analgesia is associated with postoperative side effects such as respiratory depression, ileus, nausea, and vomiting. The side effects from opioids can prolong hospital stay and cause patient dissatisfaction. Magnesium acts as a NMDA receptor antagonist resulting in an analgesic effect, which can be used as an alternative or adjunct to opioids for pain control.

**Literature Review:** Magnesium sulfate may be beneficial for multimodal pain management as it reduces opioid requirements and postoperative pain. Targeting various receptors in the pain pathway can optimize analgesia and reduce side effects. Magnesium antagonizes the NMDA receptor and blocks calcium channels to modulate pain and inflammatory responses. Perioperative magnesium administration should be considered as a strategy to reduce postoperative pain in patients undergoing surgical procedures.

**Description of the Case:** A 67-year-old female presented for a bilateral breast revision, bilateral blepharoplasty of upper lids, neck rhytidectomy, and fat graft injection surgery. The patient had a history of postoperative nausea and vomiting. During the maintenance phase of anesthesia, fentanyl, 50 mcg, was given as needed for signs of pain, rocuronium was redosed to maintain paralysis, and ephedrine and phenylephrine were administered to maintain blood pressure. Intravenous magnesium sulfate, 2 g, was administered as a multimodal approach to analgesia to decrease postoperative opioid consumption to prevent postoperative nausea and vomiting. The following day the patient tolerated a regular diet, pain was well controlled, and was hemodynamically stable. The patient was discharged home without complications.

**Discussion and Conclusions:** Magnesium sulfate may be beneficial for multimodal pain management as it reduces opioid requirements and postoperative pain. Magnesium antagonizes the NMDA receptor and blocks calcium channels to modulate pain and inflammatory responses. It is unclear which mode of magnesium administration provides an advantage to the analgesic effects. The differences in age and gender-related responses to magnesium for analgesia is undetermined. Further research is necessary to examine the use of IV magnesium sulfate for postoperative pain in different patient populations, safe and effective dosing ranges, and the effects of analgesia in various surgeries. Intravenous magnesium sulfate should be considered in multimodal analgesic treatment as an adjunct for postoperative analgesia.

**A159**

**Liposomal Bupivacaine Interscalene Blocks for Postoperative Pain Control After Total Shoulder Arthroplasty**

*Raven Hicks, BSN, RN*

Texas Christian University

**Introduction:** The focus of my case study is the use of liposomal bupivacaine interscalene blocks for postoperative pain control after total surgery arthroplasty. The following is a discussion about the efficacy of liposomal bupivacaine interscalene blocks compared with standard local anesthetics.

**Literature Review:** Currently, there is little research of the efficacy of liposomal bupivacaine interscalene blocks. Its use was only recently approved in 2018. The majority of research relates to local infiltration during shoulder surgery.

**Description of the Case:** The case is a 64-year-old female, presenting for total surgery arthroplasty due to chronic pain and immobility. An interscalene block was performed with 10 mL of 0.25% bupivacaine and 10 mL of liposomal bupivacaine. The patient received minimal narcotics during the case and reported pain as 0/10 in the postanesthesia care unit.

**Discussion and Conclusions:** Based on my research and case study, there is still more research needed regarding the efficacy of liposomal bupivacaine local anesthetics and its cost effectiveness compared with standard local anesthetics.



## A160

### **Lower Extremity Injury While Undergoing Urology Procedures in the Trendelenburg With Lithotomy Position: Report of 3 Cases**

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**Introduction:** These cases of lower extremities injuries occurred in a large academic institution and are associated with patient comorbidities, positioning, and procedure length. Root cause analysis revealed that these patients were in the lithotomy position for at least 4 hours in Allen stirrups. Perioperative staff should be aware of the potentially devastating complications and effective strategies to prevent it.

**Literature Review:** Records from 3 patients who underwent robotic assisted laparoscopic urology procedures were evaluated after postoperative lower extremities injuries. Chart review included analysis of the anesthesia preoperative documentation (morphometric data, history, medications), anesthesia records (vital signs, intraoperative events), and surgical records (duration of surgery, positioning, stirrups), intraoperative record, and postoperative multidisciplinary documentation regarding associated injuries.

**Description of the Case:** Provider mediated attributes included procedure length >4 hours, lithotomy in Allen stirrups in 32 Trendelenburg, and MAP <20% of baseline. Three male patients, aged 55 to 62 years, underwent robotic assisted laparoscopic urology procedures in the Trendelenburg with lithotomy position and complained of lower extremity pain. All patients were smokers and overweight (BMI >25). All 3 patients experienced > 20% drop from baseline BP throughout surgery. Two patients had a preoperative diagnosis of PVD and HTN. One patient had a history of lower extremity arterial aneurysm. These patients suffered lower extremities injuries (neuropraxia, compartment syndrome) necessitating surgical interventions.

**Discussion and Conclusions:** A history to stratify high risk patients and preoperative screening for alterations that require additional precautions are crucial interventions to decrease lower extremity injuries in patients undergoing urology procedures. Further investigation must be done for patients with a history of interventions for leg pain or PVD. Maintain proper positioning and MAP >20% of patient's baseline MAP. Documenting length of time the legs are in the lithotomy position serves as a reminder for the surgical team when nearing the 4-hour mark. Finally, beginning procedures that allow the patient to remain supine initially, followed by repositioning into the lithotomy position, can decrease the risk of lower extremity injuries.

## A161

### **Neuromuscular Blockade Monitoring in Patients Receiving Botulinum Toxin Injections**

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**Introduction:** The use of botulinum toxin for medical and aesthetic procedures is rapidly gaining popularity. Botulinum toxin exerts its effect at the neuromuscular junction, resulting in interference with neuromuscular blockade monitoring. Anesthesia practitioners need to be knowledgeable about the mechanism of action of botulinum toxin and special measures that need to be taken in this patient population.

**Literature Review:** After injection, botulinum toxin A is taken up locally into the nerve terminal and cleaves SNAP-25 SNARE proteins. These proteins move and fuse acetylcholine vesicles with the nerve terminal to release acetylcholine into the synaptic cleft. Cleaving of the SNAP-25 SNARE proteins results in local muscle paralysis secondary to local blockade of acetylcholine release at the neuromuscular junction. Local muscle paralysis results in inaccurate neuromuscular blockade monitoring.

**Description of the Case:** A 35-year-old female presented for a robotic hysterectomy due to adenomyosis. The patient received general anesthesia and was intubated. The patient was placed in steep Trendelenburg position with arms tucked. Neuromuscular blockade monitoring was completed using a peripheral nerve stimulator at the facial nerve. The patient had 0/4 twitches throughout the entire procedure. However, the surgeon complained of muscle tightness and the patient began breathing spontaneously. After emergence and recovery from the general anesthesia, she stated that she had received botulinum toxin injections in her forehead 5 weeks prior to surgery.

**Discussion and Conclusions:** Botulinum toxin A exerts its effect at the neuromuscular junction by cleaving SNAP-25 SNARE proteins, resulting in local muscle paralysis. If a patient receives botulinum toxin A injections in his/her forehead and the facial nerve is used to assess neuromuscular blockade with a peripheral nerve stimulator, results will be inaccurate. Anesthesia practitioners must take special measures in these patients. These include questioning all patients about receiving botulinum toxin injections, obtaining baseline train-of-four stimulation before administering paralytics, and using the ulnar nerve as the primary site for neuromuscular blockade monitoring.

**A162**

## **Neuromuscular Blockade Reversal in Myasthenia Gravis Patients**

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**Introduction:** Neuromuscular disorders such as myasthenia gravis are often associated with an increased risk of perioperative respiratory complications due to muscle weakness. The risk for postoperative muscle weakness is compounded with the use of nondepolarizing neuromuscular blocking agents; therefore, quick return of neuromuscular function is necessary to enhance patient safety.

**Literature Review:** The effectiveness of sugammadex versus neostigmine for neuromuscular blockade reversal in myasthenia gravis patients was compared. Current evidence suggests that the use of sugammadex for neuromuscular blockade reversal may be superior to cholinesterase inhibitors. Administration of neostigmine can result in extremely variable recovery time to spontaneous respiration. With proper dosing, sugammadex can reliably restore full neuromuscular function within 3 minutes of administration.

**Description of the Case:** A 67-year-old, 94-kg, 180-cm male presented with a malignant gastric stromal tumor scheduled for laparoscopic resection of gastric stromal tumor. Past medical history included myasthenia gravis, hypertension, and anemia. General anesthesia was induced with 100 mg fentanyl, 80 mg lidocaine, 200 mg propofol, and 20 mg rocuronium intravenously. Anesthesia was maintained on sevoflurane 2.0% end-tidal concentration. Rocuronium was administered to maintain adequate muscle relaxation. Train of four measured 4/4 at surgical wound closure, and 200 mg sugammadex was administered intravenously. After return of adequate spontaneous respirations, the patient was extubated awake. Anesthesia followup revealed no signs of respiratory failure or complications.

**Discussion and Conclusions:** Incomplete recovery of neuromuscular blockade can cause significant and potentially detrimental postoperative outcomes, respiratory complications being the primary concern of anesthesia providers. Patients with myasthenia gravis are at an increased risk for residual neuromuscular blockade due to preexisting neuromuscular dysfunction. There is great variability in the number of actual functioning acetylcholine receptors making it difficult to determine optimal doses of NMBAs and, therefore, optimal neuromuscular blockade reversal. In conclusion, sugammadex is an effective medication for the reversal of neuromuscular blockade in myasthenia gravis patients and results in improved outcomes when compared with the use of neostigmine.

**A163**

**Opioid Free Anesthesia: A Gender Reassignment Case Report**

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**Introduction:** An opioid free technique was selected for this gender reassignment case report to ensure a shorter surgical recovery while avoiding the undesirable side effects of opioids.

**Literature Review:** The incidence of chronic opioid abuse after surgery was roughly 6%, and this did not differ between major and minor surgical procedures in a retrospective study of over 36,000 opioid-naive patients undergoing elective surgery in the United States between 2013 and 2014.

**Description of the Case:** The patient received celecoxib, acetaminophen, and gabapentin in the preoperative holding area. Anesthesia maintenance was maintained with volatile anesthetic and infusions of lidocaine, magnesium, and dexmedetomidine. At the end of the case, ketoralac was administered.

**Discussion and Conclusions:** Opioid free anesthesia technique was selected for this gender reassignment case report in a patient with risk factors for opioid misuse, abuse, and side effects due to the possibility of the patient experiencing poor social support, psychological minority stress, vulnerability, and societal discrimination.

**A164**

**Opioid Sparing Anesthesia for Open Heart Surgery in a Recovering Addict**

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**Introduction:** Opioid dependence and abuse is a significant problem in today's society. Patients in substance abuse recovery are at risk for relapse after surgery. Open heart surgery is painful and often uses a high narcotic technique during surgery. Taking these things into consideration, an opioid sparing technique would be beneficial to patients and their continuing recovery.

**Literature Review:** According to Leighton et al, patients on buprenorphine maintenance therapy often have induced hyperalgesia and limited opioid efficacy. Multimodal pain management techniques are strongly preferred due to this. Guay et al discusses the benefits of epidural anesthesia for cardiac surgery, stating "compared with systemic analgesia, epidural analgesia may reduce the risk of [morbidity], as well as the duration of tracheal intubation and pain." Both reviews support multimodal approaches to surgery.

**Description of the Case:** A 26-year-old male with history of Tetralogy of Fallot presented with severe pulmonary regurgitation and right ventricular failure, requiring a valve replacement. The patient also had a history of opioid, heroin, and cocaine abuse and had been in recovery for 9 months at the time of surgery. He refused to stop his Suboxone regimen and was requesting no opioids to be given during surgery or recovery. The request was fulfilled, as the patient was admitted preoperatively to receive an epidural and the case was managed with ketamine, Precedex, and esmolol IV infusions; ropivacaine infusion through the epidural; along with other adjunct medications. Such infusions were continued into the postoperative period and pain was managed. He was discharged 8 days postoperatively without receiving a single opioid dose.

**Discussion and Conclusions:** This was a fairly unique situation, where a patient with a history of substance abuse was being treated at a pediatric hospital due to his congenital heart disease. Admitting patients 24 hours preoperatively to place an epidural due to the chance of bleeding or hematoma may not be feasible in all institutions but could be considered in unique situations. While the OR case management was beneficial to this patient to avoid narcotics in the recovery period, the prolonged ketamine and Precedex infusions coupled with obstructive sleep apnea led to airway obstruction and more sedation than needed. In addition, the patient required an increased Suboxone dose during recovery, and he was taking additional Xanax for his anxiety each day. Throughout the hospital stay, pain was always rated tolerable.

**A165**

**Perioperative use of ROTEM in a Patient With Bernard-Soulier Syndrome**

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**Introduction:** Bernard-Soulier syndrome is a rare disorder characterized by excessive and prolonged bleeding due to thrombocytopenia and platelet dysfunction with increased platelet size and deformability. We present a 17-year-old female with Bernard-Soulier syndrome for posterior spinal fusion for idiopathic scoliosis. The surgery had previously been cancelled for low platelet value despite several transfusions.

**Literature Review:** Rodseth presents an article on the anesthetic management of a patient with Bernard-Soulier syndrome. He describes how the early use of recombinant factor VIIa may be a first-line treatment, when given with platelet transfusions, at reducing the use of blood products. Abdelfattah et al describe the use of rotational thromboelastometry to guide resuscitation therapy. He discusses how this testing can identify coagulopathy in real time leading a decrease in the blood products being administered.

**Description of the Case:** The patient was a 17-year-old, 70.9-kg, girl who presented for posterior spinal fusion to treat adolescent idiopathic scoliosis. Her medical history was positive for Bernard-Soulier syndrome, diagnosed at 3 years old on platelet function. She had been previously canceled due to inadequate response to 2 transfusions. It was decided on the day of surgery to monitor in vivo coagulation function using rotational thromboelastography. All values were normal except for clot formation time. Prior to surgery, 2 units of platelets were infused with 1 dose of recombinant factor VIIa. During the case, tranexamic acid was given. Rotational thromboelastography was followed during the case and remained at baseline. Surgery was accomplished with no red blood cells given. She was discharged after 5 days.

**Discussion and Conclusions:** To date, there are limited reports in the literature about the preoperative care of pediatric patients with Bernard-Soulier syndrome. While the administration of platelets has been the mainstay of therapy, adjunctive strategies have included the administration of antifibrinolytic agents, recombinant factor VIIa and desmopressin acetate. Given our patient's inadequate response to platelet transfusions, we chose to use adjunctive agents to augment platelet and coagulation function. We used rotational thromboelastometry to evaluate platelet and coagulation function perioperatively. Our experience adds to the literature suggesting the utilization of rotational thromboelastometry. With such care, invasive surgery can be accomplished with minimal sequelae due to bleeding.

**A166**

**Postoperative Vision Loss Following Spinal Surgery**

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**Introduction:** Though infrequent, postoperative vision loss (POVL) is a devastating, life-altering, and often irreversible complication associated with spinal surgery with an incidence of 0.013% to 1% of cases. The purpose of this case report is to discuss the pathophysiology of the various causes of POVL following spine surgery, explore predisposing patient factors, and highlight practice goals that might aid in the prevention of POVL.

**Literature Review:** Ischemic Optic Neuritis (ION) accounts for 89% of all POVL cases after spine surgery. The mechanisms behind ION seem to be more complex. ION is linked to 6 independent risk factors including the male gender, obesity, Wilson frame use, longer operative times, greater blood loss, and a lower colloid to crystalloid ratio when blood is not administered. Despite the identification of these risk factors, much of the pathophysiology is unknown, but it ultimately results in an irreversible ischemic injury to the optic nerve.

**Description of the Case:** A 70-year-old obese male that was presented for a L5-S1 posterior right lumbar laminectomy and microdiscectomy revision. Two weeks prior, the patient had presented for the same surgery, after induction, upon prone placement on a Wilson frame, the patient experienced a change in skin color to a bluish/purple from the chest up. Despite multiple attempts at repositioning, the discoloration persisted and the surgery was cancelled. This time, after induction, the patient was placed on a Jackson frame vs a Wilson frame with a reverse T slant and did not result in any discoloration. A phenylephrine infusion was initiated to maintain a target MAP of 80 mm Hg. Emergence was uneventful and the patient did not experience any postoperative vision changes despite having multiple risk factors.

**Discussion and Conclusions:** While there are many possible neurological complications of general anesthesia, waking up from an elective surgery with significant vision changes is one of great significance. While the incidence of POVL is very low, the consequences of the condition are devastating, life-altering, and often permanently incurable. Without a definitive treatment option, prevention strategies are of utmost importance. Anesthesia professionals must remain vigilant in recognizing patients that are at risk, adjusting modifiable risk factors such as positioning and colloid administration, and closely monitoring and intervening during the case to minimize exposure to potential hazards to aid in the prevention of POVL.

**A167**

## **Preventing Atelectasis in Obese Patients**

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**Introduction:** Atelectasis impairs gas exchange, and it leads to postoperative pulmonary complications such as pneumonia and hypoxemia if untreated. Obese patients are more prone to atelectasis due to a decreased functional residual capacity. Thus, adequate perioperative management of obese patients is essential in order to prevent postoperative complications like atelectasis and improve health outcomes.

**Literature Review:** General anesthesia causes the most dependent part of the lungs to collapse in nearly all patients, and this may continue for hours or several days after surgery. Literature suggests several therapeutic interventions to prevent atelectasis during the perioperative period such as recruitment maneuvers, positive end expiratory pressure (PEEP), continuous positive airway pressure (CPAP)/bilevel positive airway pressure (BiPAP), and reduced fraction of inspired oxygen (FiO<sub>2</sub>).

**Description of the Case:** A 49-year-old female presented for a sleeve gastrectomy and hiatal hernia repair due to super obesity with a 50.2 kg/m<sup>2</sup> BMI. Anesthetic plan was general anesthesia with endotracheal tube. Patient was preoxygenated with 100% FiO<sub>2</sub> and, after induction, she was placed on the mechanical ventilator in the pressure control mode.

Oxygenation was maintained with a mixture of medical air 1 L/min, oxygen 1 L/min, and 8 cm H<sub>2</sub>O PEEP. Prior to extubation, patient was given several recruitment breaths to prevent atelectasis. In the recovery unit, the patient had a 92% SpO<sub>2</sub>, which improved to 100% after some deep breath exercises.

**Discussion and Conclusions:** Based on the literature review, none of these interventions are 100% effective when used alone; they are more effective and have a synergistic effect when applied together. Proper pain management without compromising the patient's respiratory status helps prevent postoperative atelectasis. Maintaining a balance between blood oxygen levels and pulmonary function may be challenging, because too much oxygen results in absorption atelectasis, while inadequate oxygen results in hypoxemia. There were conflicting recommendations on whether to use 100% FiO<sub>2</sub> or less during induction of anesthesia. More research is required with a large sample size to come to a consensus regarding FiO<sub>2</sub> levels during induction while keeping the patient's safety as a priority.



**A168**

## **Prevention of Remifentanil-Induced Postoperative Hyperalgesia: A Case Report**

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**Introduction:** Remifentanil has been reliably associated with the development of opioid-induced hyperalgesia (OIH). This provides unique challenges for anesthesia professionals because opioid-induced hyperalgesia may cause increased opioid consumption. This case report discusses the use of magnesium sulfate, dexmedetomidine, ketamine, and GABA analogs as strategies to prevent postoperative hyperalgesia.

**Literature Review:** Remifentanil is reliably associated with the development of OIH. OIH is a paradoxical increase in pain intensity, distribution, or sensitivity in patients receiving high doses or long durations of opioids. OIH is rare and no single approach has been validated as the definitive standard in prevention of hyperalgesia. It is important to be aware of the potential for hyperalgesia following a remifentanil infusion due to its ability to delay recovery after surgery.

**Description of the Case:** A 62-year-old, 79.6-kg, 167.6-cm female presented for a total thyroidectomy. The patient's medical history included malignant neoplasm of the thyroid gland, breast cancer, and seasonal allergies. The patient denied any previous anesthetic complications. Anesthesia was maintained with sevoflurane, 1.5% end-tidal concentration, and a continuous infusion of remifentanil, 0.1 mcg/kg/min. Intraoperatively, ondansetron, 4 mg, magnesium sulfate, 2 g, and hydromorphone, 0.6 mg, was administered intravenously. The patient reported 0/10 on VAS pain scale upon arrival to the PACU and 7/10 1 hour postoperatively. Hyperalgesia was suspected. However, the patient was discharged home 2 hours later with appropriate parameters of respiratory and cardiovascular function, mental status, and pain level.

**Discussion and Conclusions:** Remifentanil offers several advantages intraoperatively. However, remifentanil has been reliably associated with the development of OIH. Hyperalgesia is a state of nociceptive sensitization and it is defined as having an increased pain response from stimuli that usually provokes pain. OIH, specifically, cannot be overcome by increasing the opioid dose as this will intensify the issue. This provides unique challenges for anesthesia professionals because opioid-induced hyperalgesia may cause increased opioid consumption. No single approach has been validated as the definitive standard in prevention of hyperalgesia. However, magnesium sulfate, dexmedetomidine, ketamine, and GABA analogs should be used as strategies to prevent postoperative hyperalgesia.

**A169**

**Quadratus Lumborum Block Versus Transversus Abdominus Plane Block for Postoperative Pain Management**

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**Introduction:** Adequate pain control is important because it is associated with increased patient satisfaction, earlier mobilization, and decreased opioid use. TAP block, although effective at providing somatic pain relief, is ineffective at addressing visceral pain. The quadratus lumborum block (QL) provides both somatic and visceral pain relief after lower abdominal surgery.

**Literature Review:** The TAP block provides somatic pain relief to the anterolateral wall of the abdomen but lacks the ability to provide visceral pain relief. The quadratus lumborum (QL) block was developed to address the need for visceral pain relief postoperatively and is currently reported effective at providing both somatic and visceral pain relief.

**Description of the Case:** A 60-year-old female with a history of right colon adenocarcinoma was admitted for a right hemicolectomy. A midline laparotomy incision was performed to remove the right colon. In the recovery unit, the patient received bilateral QL blocks using 0.25% bupivacaine, 20 mL. The patient had 16 hours of postoperative pain relief.

**Discussion and Conclusions:** QL blocks provide wider dermatome coverage (T4-T12-L1) versus TAP blocks (T10-T12-L1). A single shot QL block provided analgesia for up to 24 to 48 hours compared with a TAP block that provided 8 to 24 hours of analgesia. Time to breakthrough analgesia was extended, and overall opioid consumption was decreased with a QL block versus a TAP block. Patients who received TAP block had higher blood concentrations of LA compared with patients who had received a QL block. Complications are rare. Patients who receive a QL block as part of a multimodal pain regimen have less adverse effects, prolonged analgesia, and reduced opioid consumption postoperatively. The QL block thus can lead to higher patient satisfaction, earlier mobilization, decreased length of hospital stay, and increased patient safety.

**A170**

## **Sickle Cell Disease and Delayed Hemolytic Transfusion Reaction in the Perioperative Setting**

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**Introduction:** Delayed hemolytic transfusion reaction is the development of antibodies to transfused red blood cells resulting in delayed onset hemolysis. Hemolysis can lead to anemia, multisystem organ failure, and death. Sickle cell patients are at risk for the development of delayed hemolytic transfusion reaction because they have a history of multiple blood transfusions.

**Literature Review:** Jasinski and Glasser (2018) present a case of a sickle cell patient who died from complications related to delayed hemolytic transfusion reaction after receiving a preoperative red blood cell transfusion. Pirenne and Yazdanbakhsh (2018) describe a case in which a sickle cell patient with a history of delayed hemolytic transfusion received rituximab, an immunosuppressant, before cardiac surgery. The patient received a red blood cell transfusion intraoperatively and did not develop the reaction.

**Description of the Case:** A 15-year-old female patient presented for robotic splenectomy and cholecystectomy to treat splenic sequestration and biliary colic. She had a past medical history of sickle cell disease and delayed hemolytic transfusion reaction. The patient was admitted preoperatively for intravenous hydration, immunoglobulin, and stress dose steroids. Her hemoglobin and hematocrit were 7.6 g/dL and 23.5 g/dL, respectively. Hematology recommended avoiding a blood transfusion before surgery and transfusing intraoperatively for a hemoglobin less than 6.5 g/dL. The anesthetic was unremarkable, and the surgery was completed with minimal blood loss resulting in the avoidance of a blood transfusion. The patient's postoperative course was uneventful, and she was discharged home 2 days later.

**Discussion and Conclusions:** There are few case reports in the literature of a sickle cell patient with a history of delayed hemolytic transfusion reaction undergoing surgery. There are also no controlled studies with perioperative management guidelines. The patient was optimized for surgery after receiving immunoglobulin, stress dose steroids, and extensive blood antigen matching. Hematology avoided prophylactic rituximab preoperatively but planned to give the drug postoperatively if the patient developed signs of delayed hemolytic transfusion reaction. Literature review revealed case controlled studies are necessary to develop guidelines on how to decrease the risk of delayed hemolytic transfusion reaction, especially in high blood loss surgeries.

**A171**

**The Use of Dexmedetomidine to Facilitate Awake Fiberoptic Intubation in the Patient With Known Previous Difficult Airway**

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**Introduction:** Elective fiberoptic intubation in the awake, spontaneously breathing patient is a valuable technique for management of the anticipated difficult airway. Adequate sedation is critical in order to improve tolerance, alleviate patient discomfort, and achieve successful endotracheal intubation during awake fiberoptic intubation.

**Literature Review:** Dexmedetomidine and sufentanil are effective agents for awake fiberoptic intubation (AFOI) when combined with midazolam, but sufentanil is associated with respiratory depression. Dexmedetomidine was associated with fewer and less severe coughing episodes, fewer oxygen desaturations, and more favorable hemodynamics compared with patients receiving fentanyl and midazolam for AFOI. Additionally, dexmedetomidine produced fewer and less severe coughing episodes, hemodynamic stability, and less oxygen desaturations than fentanyl.

**Description of the Case:** A 64-year-old male presented for a left shoulder arthroscopy with rotator cuff repair. The patient had a previous surgery canceled due to the inability to secure intubation. Airway examination revealed decreased cervical range of motion, decreased mouth opening, decreased thyromental distance, thick neck circumference, and a Mallampati class IV view. The anesthesia team decided to do an elective fiberoptic intubation with dexmedetomidine. A loading dose of dexmedetomidine, 1 mcg/kg over 10 minutes, was initiated, followed by a maintenance dose of 0.7 mcg/kg/h until endotracheal tube placement was confirmed. The patient was moderately sedated and cooperative and endotracheal tube placement was achieved. The patient maintained spontaneous respirations and vital signs throughout.

**Discussion and Conclusions:** The ideal sedative technique should provide patient comfort, amnesia, hemodynamic stability, blunt airway reflexes, and maintain a patent airway with spontaneous respirations. Commonly used agents like opioids, benzodiazepines, and other sedatives may be used alone or in combination to facilitate AFOI; however, these agents can precipitate negative consequences like apnea, hypoxia, or airway obstruction during AFOI. Additionally, when AFOI is attempted without any sedative agents, patients tend to experience severe discomfort and exaggerated hemodynamic responses. Dexmedetomidine is an alternative pharmacologic agent that produces sedation, analgesia, and sympatholysis; reduces salivary secretions; and preserves respiratory function, making it ideal for use during AFOI.

**A172**

## **Ultrasound-Guided Supraclavicular Block for Arthroscopic Shoulder Surgery**

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**Introduction:** Ultrasound (US)-guided supraclavicular block (SCB) decreases the chance of pneumothorax and vascular puncture. Its use for shoulder surgery is limited due to opinions about unsuccessfully blocking the suprascapular nerve. The chimney effect visualized with SCB has challenged this concern. Also, SCB using the corner pocket technique decreases the risk of hemidiaphragmatic paresis (HDP).

**Literature Review:** SCB is regaining popularity for shoulder surgery due to the advent of ultrasound. The chimney effect describes visualizing local anesthetic spread cephalad between the anterior and middle scalene muscles to block the suprascapular nerve. SCB naturally blocks this nerve if it arises from the poster division of the brachial plexus. US-guided SCB using the corner pocket technique offers a successful shoulder block with reduced complications and side effects, like HDP, hoarseness, and Horner syndrome.

**Description of the Case:** A 36-year-old female presented for shoulder arthroscopy. Right US-guided SCB using the cornerpocket technique was chosen. The US probe was placed in the supraclavicular fossa. The neural cluster was bundled at the junction of the first rib and subclavian artery, named the corner pocket. The needle was inserted, in-plane, laterally to medially, until the tip reached the corner pocket. Anesthetic solution was injected. Visualization of the local anesthetic spread showed the subclavian artery lifting off the first rib and the neural cluster floating superiorly. Posterolateral to the neural cluster was injected with anesthetic solution. General anesthesia with laryngeal mask airway followed. Patient received no narcotics, experienced no pain in recovery, and was discharged in 60 minutes.

**Discussion and Conclusions:** SCB should be expanded to shoulder surgery instead of restricted for elbow, forearm, wrist, and hand surgery. US-guided SCB using the corner pocket technique provides effective anesthesia for the shoulder, similar to ISB, with a low risk of HDP. Also, SCB is associated with fewer side effects compared with ISB, like hoarseness and Horner syndrome. On the basis of my data, US-guided SCB using the corner pocket technique achieved efficacy as a feasible technique for surgical anesthesia and postoperative analgesia for an arthroscopic shoulder surgery.

A173

## **Vasopressin for the Treatment of Vasoplegia in an Off-Pump CABG**

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**Introduction:** Hypotension is a common complication of coronary artery bypass grafting surgery. Knowing how to treat hypotension improves morbidity and mortality. My poster educates on an alternative treatment for hypotension.

**Literature Review:** A comprehensive search of the database Embase resulted in 8 articles. Of those 8 articles, 6 were deemed applicable to the case study. The search topics were: vasopressin, cardiac surgery, vasoplegic syndrome, and coronary artery bypass grafting.

**Description of the Case:** A 63-year-old, 73-kg, 173-cm male presented for coronary artery bypass grafting of 4 vessels due to acute coronary syndrome and recent myocardial ischemia. The presenting ejection fraction (EF) was 15%. The induction medications were etomidate, fentanyl, succinylcholine, lidocaine, and propofol. The patient was maintained with sevoflurane, dexmedetomidine, fentanyl, and Versed. The vasoactive drips utilized to manage hemodynamics were norepinephrine, epinephrine, milrinone, epoprostenol sodium, and vasopressin.

Postoperatively, the patient was transferred to the intensive care unit where he was weaned off vasoactive drips of milrinone, epinephrine, and vasopressin to eventually be discharged home.

**Discussion and Conclusions:** Vasopressin is a first line treatment of vasoplegia. Its mechanism of action is completely independent of the sympathetic nervous system. Vasopressin stimulates the V1 receptor causing peripheral vasoconstriction. An infusion reduces morbidity, as well as acute renal failure and atrial fibrillation. It also decreases thromboembolic events, right heart failure, and hepatic insufficiency. Vasopressin also reduces the dosing of subsequent vasoactive infusions. The superior profile of vasopressin improves patient outcomes. Vasopressin should be considered as a first line treatment for low systemic vascular resistance hypotension with elevated cardiac output during off-pump coronary artery bypass grafting.

# Innovation/Invention

A174

## **A Model for Sustainable Anesthesia Care in a Middle-Income Country: The Health Volunteer Overseas Nurse Anesthesia Program at Angkor Hospital for Children in Siem Reap, Cambodia**

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**Introduction:** Although there have been significant improvements in global health, an estimated 5 billion people in low-income and middle-income countries do not have access to surgical care. The anesthesia program at Angkor Hospital for Children (AHC) in Siem Reap, Cambodia, provides a successful model for delivery and sustainability of anesthesia care in low-income and middle-income countries.

**Literature Review:** The civil war in Cambodia from 1975 to 1979 led to the loss of 2 million victims. One of the groups targeted during that time were educated Cambodians. The result has been the loss of an entire generation of physicians and nurses in Cambodia. There are 3.53 anesthesia providers per 100,000 of the population in Cambodia compared with 37.0/100,000 anesthesia providers in the United States.

**Proof of Concept:** As a result of the HVO program, 5 nurse anesthetists and a physician anesthetist provide anesthetics in the operating theater (OT), minor procedure room, and ophthalmology OT. In 2018, regional anesthesia was provided in 956 of 1,299 cases in the OT and 285 of 532 cases in the ophthalmology OT. In addition, AHC has been a training site for the University Health Services in Phnom Penh, Lao Friends Hospital for Children, and other hospitals in Cambodia.

**Developmental Design:** In 2004, the Health Volunteers Overseas (HVO) nurse anesthesia program initially provided professional development for 3 nurse anesthetists at AHC. In 2013, 3 nurses and 1 pediatrician progressed through a curriculum to become anesthesia providers. This program has advanced to have the current AHC nurse anesthetists provide anesthesia education for the development and continuing education of anesthetists in the region using simulation methods, clinical instruction, and didactic teaching.

**Discussions and Conclusions:** The HVO nurse anesthesia program at AHC initially provided professional development and evolved into an education program for additional anesthetists at AHC. This program has progressed to provide not only clinical instruction but also simulation education and didactic teaching. The teaching by the nurse anesthetists at AHC has continued to expand to include healthcare providers from Lao Friends Hospital for Children, University Health Sciences in Phnom Penh, and anesthetists throughout Cambodia.

**Funding Sources:** Support for education of nurse anesthetists has been provided by Suzanne Brown through Friends without a Border and Warfield Scholarships through Health Volunteers Overseas.

**A175**

**Education and Service: A New Paradigm for CRNA Volunteers in Honduras**

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**Introduction:** Surgical conditions are responsible for 30% of global disease; 5 billion people in low-income and lower-middle income countries (LMIC) lack access to surgery. Honduras is the second poorest country in the western hemisphere; with a shortage of doctors and nurses, especially anesthesia providers, it is increasingly dependent upon healthcare volunteers, especially CRNAs, for provision of surgical care.

**Literature Review:** Honduras has 150 anesthesiologists and no nurse anesthetists; 250 anesthesia technicians (AT) are the main anesthesia providers. Surgical procedures on volunteer brigades are dependent on volunteer specialty. Anesthesia is the hardest specialty to recruit. Volunteers focus is on direct provision of care and not transfer of knowledge/skills that can influence long-term surgical outcomes.

**Proof of Concept:** From July 2017 to January 2019, NorthShore presented 6 formal workshops and simulations at the Holy Family Surgery Center (HFSC) Moscatti Convention Center for 20 HFSC surgical staff and 241 ATs, AT students, and faculty. Topics included BCLS and ACLS review, USG peripheral nerve blocks, anaphylaxis, surgical fires, malignant hyperthermia, multimodal analgesia, intraoperative embolisms, positioning complications, local anesthetic toxicity, residual neuromuscular blockade, and postoperative pulmonary complications.

**Developmental Design:** In 2012, NorthShore became affiliated with HFSC in Honduras; it sends 2 to 3 CRNA and student registered nurse anesthetist teams each year to HFSC. Between brigades, ATs provide anesthesia at HFSC. ATs have a baccalaureate degree in anesthesia, no certification requirements, and limited access to continuing education. Following a needs assessment, an AT education program was developed that focused on the AANA Standards for Nurse Anesthesia Practice while recognizing limited healthcare resources in Honduras.

**Discussions and Conclusions:** NorthShore CRNA brigades in Honduras provide both clinical care and educational programs that support sustainable changes in practice and surgical outcomes. Through a committed partnership with HFSC, NorthShore fulfills its mission of excellence in teaching and professional practice that includes vulnerable populations. The NorthShore educational program increases access to quality anesthesia care at HFSC and hospitals throughout Honduras and complements the formal education of AT students.



A176

## **Implementation of a Flexibility-Based Compensation Structure in a Large Multihospital Healthcare System Creates Sustained Value**

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**Introduction:** In an era where healthcare dollars are in short supply and patients who require anesthesia care are living longer (and requiring more), innovate strategies are needed to achieve value and access to anesthesiology services.

**Literature Review:** While the Health Resources and Services Administration (HRSA) produced workforce projections in 2016 suggesting a surplus of 10,070 CRNAs by 2025, RAND Health projects a shortage of 1,282 CRNAs by 2020 with 60% of states reporting a current shortage of CRNAs. Schubert described the continued increase of case mix index, a measure of case complexity, among Medicare recipients.

**Proof of Concept:** As the pace of anesthesia demand continued to grow, nearly 175 additional full-time equivalent (FTE) CRNAs were added to the enterprise over the course of 4 years. In the same time period, overtime expenses were reduced by 28%. The program, which has been in place for 10 years, allows a continued cost avoidance to the health system of approximately \$2.5 million annually.

**Developmental Design:** Through guided discussion at CRNA leadership meetings, current staffing challenges were analyzed. Both employee professional needs as well as health system delivery needs were considered in order to arrive at a solution that best satisfied all interested parties. In an attempt to improve employee relations, promote recruitment and retention, and initiate a culture change toward an integrated complex healthcare delivery system, a new adjunct to compensation was initiated.

**Discussions and Conclusions:** The ability to leverage professional talent and service delivery is paramount in today's healthcare environment. Whenever possible, the ability to avoid "local only" planning for staffing utilization will create a more cost-efficient system. The creation of a flexible workforce that allows appropriate distribution of resources according to a moving actual demand for anesthesia services can maximize service delivery and optimize costs.

**A177**

**International Consensus Meeting Recommendations for Lung Protective Ventilation**

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**Introduction:** Conventional intraoperative mechanical ventilation is associated with a high risk of postoperative pulmonary complications (PPCs). There are ventilation strategies that can reduce the likelihood of lung injury; however, there is no consensus on the best method of lung protective ventilation (LPV). The purpose of this report is to disseminate the findings of the first consensus meeting on LPV.

**Literature Review:** The literature suggests the use of an LPV strategy that includes a low tidal volume (VT), low fraction inspired oxygen (FiO<sub>2</sub>), positive end-expiratory pressure (PEEP), and alveolar recruitment maneuvers (ARMs) reduces the risk of PPCs. However, there are conflicting reports as to optimal application of each of these individual maneuvers and the best combination to reduce or eliminate PPCs.

**Proof of Concept:** The consensus meeting resulted in 26 recommendations and statements concerning the use of LPV in the operating theater. The recommendations included initial ventilator settings of VT 6 to 8 mL/kg IBW, PEEP 5 cm H<sub>2</sub>O, an FiO<sub>2</sub> ≤ 40%, ARMS when appropriate, continuous use of PEEP adjusted to meet the individual patient needs, and monitoring of compliance, driving pressure, and plateau pressure.

**Developmental Design:** A list of 24 LPV related questions was formulated by an expert panel. A systematic review resulted in the selection of 221 articles for which the complete text was examined and evaluated using the Oxford grading system. A modified Delphi process was used to reach consensus for each of the questions based on the literature and expert opinion at a meeting in October 2018 in Frankfurt, Germany.

**Discussions and Conclusions:** The panel recognized that most of the literature focused on surrogate endpoints such as oxygenation or lung mechanics, and that relatively little data applied to improvements in morbidity or mortality. As the research focused on the application of mechanical ventilation in the surgical setting continues to emerge, it is likely that best practices to reduce or eliminate PPCs will likewise evolve.

**Funding Sources:** The meeting was sponsored by GE Healthcare.

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## **Pranayama and Asana for Healthcare Providers May Impact Overall Patient Care and Provider Wellness**

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**Introduction:** There is a common theme in healthcare institutions to establish healthy work environments. Healthy environments lead to better patient care and safety. Documented observations of desirable attributes among facilities still leaves the question of how institutions help staff reach the goal of healthy work environments. Can free yoga classes shift a healthcare provider into a state of wellness?

**Literature Review:** Literature states wellness programs are priority for hospitals. Programs have shown to increase employee morale and improve sleep quality while decreasing stress and depression. Recruitment of participants is sometimes difficult due to convenience of the location and time. Sustainability of a program requires data to show improvement in employee productivity, health, morale, and patient outcomes.

**Proof of Concept:** Nurse anesthetists administer millions of anesthetics each year in highly stressful environments, which can lead to burnout and unhealthy coping mechanisms. CRNAs, as respected professionals in the operating room, hospital, and community, should be on the forefront of initiating health and wellness programs. CRNAs are encouraged by their association to embark on new endeavors and integrate mindfulness-based stress reduction. Mental and physical benefits of yoga practice can attenuate life stress.

**Developmental Design:** Interest in onsite yoga class led by 2 certified instructors, CRNAs with >10 years' yoga practice, assessed via REDCAP survey. A survey was sent to participants evaluating stress levels preclass and postclass. Essential properties of yoga questionnaire (EPYQ) designed by researchers and funded by the National Institutes of Health was also sent to yoga participants. The class was held in a building where employees work. Online signup including class description was utilized. Invitations to class via flyers, emails, and calendar were sent to participants.

**Discussions and Conclusions:** Establishing a yoga class at our facility was a self-driven goal of 2 CRNAs. Bimonthly classes began February 21, 2019. The feedback received from participants has been positive. Staff continuously ask for more classes and class size continues to grow. Participants encourage colleagues to attend and explore the mind-body connection experienced during class. We continue to gather data for the EPYQ. In the future, we plan to gather prepractice and postpractice blood pressure.

**Funding Sources:** Funding was not applicable for the yoga classes. EPYQ is a free download with user agreement from <https://epyqview.ucsd.edu/>, which was funded by the National Institutes of Health.

**A179**

**Ultrasound Simulation for Regional Anesthesia**

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**Introduction:** Regional anesthesia is an essential skill in the profession of nurse anesthesia, and future employment demands expertise. The purpose of this project was to develop a course focused on anatomical visualization with ultrasound. The aim was to improve student proficiency with ultrasound by providing simulation training in addition to existing didactic education and clinical apprenticeship.

**Literature Review:** The bulk of trials in this review found improvements in clinical performance with the addition of simulation training to either didactic and/or apprenticeship training. Notably, a study by the National Council of State Boards of Nursing found that 50% of clinical experiences can be substituted for simulation without differences in clinical competency, comprehensive knowledge, or exam pass rates.

**Proof of Concept:** Student performance improved in both accuracy and time necessary for visualization with ultrasound after implementation of expert-led ultrasound training and simulation practice. Posttesting also revealed statistically significant improvements in written anatomy identification.

**Developmental Design:** Participants included 9 nurse anesthesia students from Gonzaga University. Testing consisted of hands-on demonstration of ultrasound visualization for an axillary block. Accuracy and time necessary were recorded. A printed image for an axillary block was provided and 9 structures were to be labeled. Simulation training included review of common blocks and individual practice with ultrasound imaging. An expert CRNA was present to assist. Following simulation training, testing was repeated.

**Discussions and Conclusions:** Inclusion of an expert CRNA to guide learning, was a major strength. Rigorous pretesting and posttesting allowed for assessment of effectiveness. Small sample size improved feasibility and provided for individually focused training. Significant improvements were demonstrated in both hands-on and written testing portions. Results align with current literature evidence. This project provides compelling evidence to the University to incorporate supplementary simulation training into existing curriculum.