

# 2017 Poster Abstracts



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## 2017 Poster Abstracts

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### A1

#### **Adverse Events During Cosmetic Surgery: A Thematic Analysis of Closed Claims**

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**Introduction:** Qualitative research methodology can be an effective approach to providing clarity and an understanding of anesthesia adverse events. Using thematic analysis, cosmetic anesthesia closed claim files were reviewed. The purpose of this research is to answer 2 questions: 1) what themes emerged that appeared to contribute to an adverse event during anesthesia for cosmetic surgery, and 2) of those themes, did any emerge specifically related to human behaviors? Findings may lead to changes in the standard of care and possibly prevent further adverse events.

**Methods:** In 2015, the insurer, CNA, made available to the AANA Foundation Closed Claim Research Team 245 closed claim files. Of the 245 claims, 25 were identified as cosmetic in nature; one of the most frequently represented surgical categories within the total sample. Applying a qualitative thematic framework approach, data from each file was extracted and entered onto a previously validated closed claim instrument. Prior to data entry, all researchers participated in a protocol session and interrater reliability was established.

**Results:** All claims were analyzed adhering to the described approach. Two major themes emerged: 1) normalization of deviance, and 2) ineffective communication patterns. Normalization of deviance was defined as the gradual process through which unacceptable practices or standards become acceptable. Communication patterns were identified as ineffective when they were noted to be in stark contrast to patterns that are commonly accepted as effective. Excerpts demonstrating evidence of the major themes were drawn from the claims. Lastly, a subtheme emerged: deviations from the AANA Standards of Nurse Anesthesia Practice.

**Conclusions:** Examples of normalization of deviance potentially contributing to a negative outcome included events involving drug selection, dosing, patient monitoring, anesthetic management, use of equipment, and patient selection/match for facility. Ineffective communication patterns included lack of disclosure, dishonesty, lack of transparency, failure to advocate, and intimidation. The most commonly breached AANA Standards included Standard I: preanesthetic evaluation, Standard IV: adjusting the care plan according to status, Standard VII: safe transfer of care, and Standard VIII: safety precautions.

**Source of Funding:** The Closed Claim Research Project is fully supported by the AANA Foundation.

A2

## **Bispectral Index Monitoring's Impact on Anesthetic Agent Use in Ambulatory Surgery: A Retrospective Analysis**

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Mayo Clinic

**Introduction:** Bispectral index (BIS) monitoring guided anesthesia has been shown to reduce intraoperative awareness and may help speed anesthesia recovery by reducing anesthetic consumption. Because BIS monitoring guided titration parameters were found to vary between studies, expectedly, with parameters varying between studies, one can infer that anesthetic consumption would vary as well. BIS monitoring guided anesthesia delivery has been a common practice in outpatient surgery; however, no assessment has been completed to assess its efficacy. Therefore, without establishing parameters of titration, the goal of this study was to retrospectively assess the efficacy of BIS monitoring guided anesthesia.

**Methods:** A retrospective chart review was completed on 1,572 patients receiving a general anesthetic for outpatient knee arthroscopies. Data were gathered and analyzed on patients who received BIS monitoring guided anesthesia (n=1,179) and patients that did not (n=393). Analyzed data included intraoperative propofol consumption, mean BIS values, perioperative narcotic use, time between surgical closure to postanesthesia care unit (PACU) phase II entrance, and PACU length of stay. The data were gathered using electronic data abstraction and analyzed using JMP statistical software.

**Results:** Compared to the numerous studies that showed a decrease in anesthetic consumption, with BIS values often titrated between 45 and 65. This study demonstrated that the patients who received BIS monitoring guided anesthetic technique had a mean titrated BIS value of 39, which is dramatically below recommended values to show a decrease in anesthetic consumption. The BIS group when compared with the non-BIS group, showed that propofol consumption was greater (17%,  $p < 0.001$ ) and increased time from surgical end time to PACU entrance ( $p = 0.01$ ). There was no difference found between PACU LOS or intraoperative narcotic delivery.

**Conclusions:** This research concluded that in the absence of explicit recommended parameters of BIS titration, anesthesia providers used an increase in anesthetic consumption compared with the group that did not use BIS monitoring. Speculation on why can be difficult to define, but a couple theories emerge. First, there may be a lack of education or purpose of the BIS monitoring guided anesthetic technique. Additionally, anesthesiologists may perceive the device as a means to reduce awareness versus reduce anesthetic consumption, so naturally would titrate the BIS value below 60 to reduce awareness.



### **Certified Registered Nurse Anesthetist Organizational Climate Questionnaire: Refinement Through Psychometric Testing**

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**Introduction:** CRNA organizational climate is the shared perception of CRNAs regarding structures within their organizations that affect CRNA behaviors and outcomes. The newly adapted 35-item Certified Registered Nurse Anesthetist Organizational Climate Questionnaire (CRNA-OCQ) is the first tool capable of measuring CRNA organizational climate via 6 subscales: CRNA-administration relations, CRNA-physician relations, independent practice, professional visibility, CRNA-anesthesiologist relations, and support for CRNA practice. The objective of this study was to conduct psychometric testing on the CRNA-OCQ to further refine its subscales.

**Methods:** Texas Association of Nurse Anesthetists (TxANA) members were emailed to participate in this web-based survey. Eligibility included being a clinically practicing TxANA CRNA. Participants indicated the degree to which items on the CRNA-OCQ were present in their primary practice setting with 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. Exploratory factor analysis (EFA) was conducted. Items were removed if inter-item correlations were out of the .3 to .7 range or if items cross-loaded on more than 1 factor. Adequacy of the EFA was assessed, factors were named, and subscale Cronbach's alphas were computed.

**Results:** A total of 279 TxANA CRNAs participated. Three items were removed for inadequate inter-item correlation; 3 items were removed for item cross-loadings on 2 or more factors. The 4-factor solution's Keiser-Meyer-Olkin measure of sampling adequacy was .939. Bartlett's test of sphericity was significant: approximate chi-square 4836.05, DF 406, Sig .000. Percent total cumulative variance explained was 60.04, and the factor matrix goodness-of-fit test was nonsignificant: Chi-square 537.02, DF 296, Sig. 000, supporting the 4-factor solution. The 4 factors (with respective Cronbach's alphas) were named: CRNA-administration relations (.925), CRNA-physician relations (.882), independent practice and support (.875), and professional visibility (.760).

**Conclusions:** We determined through EFA that the 29-item CRNA-OCQ's 4-factor structure adequately represents CRNA organizational climate. Internal consistency reliability of the subscales was strong. Thus, the 29-item CRNA-OCQ is a valid tool capable of measuring CRNA organizational climate. The CRNA-OCQ should be used in future research to measure CRNA climate at the organizational level and across institutions. This evidence may help to improve patient and provider outcomes and maximize CRNA contributions to care, which may impact cost, quality, and access to care.

## A4

### **Closing the Gap: Improving Simulated Experiences**

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**Introduction:** Healthcare simulation research has identified best practice principles for maximal educational benefits. Evidence-based aspects of the environment, the student, the educator, and the curriculum can be structured to provide the most comprehensive and effective learning outcomes for students. In education, simulation has been shown to shape behaviors, develop skills, and facilitate team communication. However, simulation training is expensive and time consuming. Therefore, the use of best-practice educational methods achieves the most effective learning with available resources.

**Methods:** The primary researcher conducted a programmatic gap analysis to determine the difference between the program's existing practice model as compared with a best practice simulation model. Subsequently, the investigator designed a central line scenario filling the noted gaps discovered during the programmatic evaluation. The 2016 Master's cohort completed a voluntary, anonymous survey using the Simulation Design Scale (SDS) to evaluate their experience. This instrument assessed the effective inclusion of best practice features in an instructor-developed scenario. In addition, this tool determined the importance of those features to the simulation participant.

**Results:** Results of 103 surveys showed good variability. Design element scores ranged from 72 to 100 with a median score of 94; importance scores ranged from 62 to 100 with a median score of 89. A 1-sample t-test compared the mean design ( $M = 92.78$  [ $SD = 6.98$ ]) and importance scores ( $M = 89.05$  [ $SD = 7.984$ ]) with the neutral score of 60. The students' mean design score and importance scores were significantly higher than the 60 benchmark [ $t(97) = 46.49$ ,  $p < .001$ ] and [ $t(100) = 36.75$ ,  $p < .001$ ]. Additionally, each mean total score was significantly greater than 80. The significance test for mean design element score yielded  $t(97) = 18.13$ ,  $p < .001$ , and the significance test for mean importance score yielded  $t(97) = 11.45$ ,  $p < .001$ .

**Conclusions:** A programmatic gap analysis can pinpoint shortcomings and offer solutions for program improvements. Nurse anesthesia students can identify the inclusion of best practice design features within scenarios. Additionally, these student learners value and desire the presence of these design features in their simulated experiences. Student assessment data regarding instructional practices, educational design, and curricula provide institutions with the ability to gauge the effectiveness of teaching and learning.

**Source of Funding:** Texas Wesleyan University.

## A5

### **CRNA and NP Practice Environment: What's the Difference? What's the Big Deal?**

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**Introduction:** Nursing practice environments can have a profound impact on care delivery. Studies investigating advanced practice registered nurses' (APRN) environments have primarily focused on nurse practitioners (NP), with limited attention to Certified Registered Nurse Anesthetists (CRNAs). No studies directly compare the environments of the 2 APRN types. The primary purpose of this study is to investigate how practice environments relate to APRN job ownership. Follow-up analyses reveal significant differences in perceptions of practice environment between CRNAs and NPs.

**Methods:** APRNs were sent an electronic survey to Florida Board of Nursing-provided email addresses or through their manager. Inclusion criteria included working as an APRN in a Florida hospital. Of 542 (7%) surveys, 126/225 hospitals were represented. Measures were APRN-Organizational Climate Questionnaire (subscales: practice visibility, physician relations, administration relations, and independent practice), and Psychological Ownership Questionnaire (subscales: control, intimate knowledge, investment of self, and psychological ownership). IRB approval was obtained from University of Miami.

**Results:** Respondents were primarily Caucasian females, mean age = 48 years. Thirty percent were CRNAs, 61% NPs, 7% nurse midwives, and 2% other/mixed. CRNAs scored significantly lower than NPs in overall organizational climate ( $t=6.88$ ,  $p<.001$ ,  $d=.67$ ) and in all organizational climate subscales with the most profound effects in subscales of physician relations ( $t=8.40$ ,  $p<.001$ ,  $d=.81$ ), and independent practice ( $t=7.33$ ,  $p<.001$ ,  $d=.71$ ). CRNAs scored significantly lower in psychological ownership ( $t=2.81$ ,  $p=.005$ ,  $d=.28$ ) and the control subscale of the Psychological Ownership Questionnaire ( $t=7.12$ ,  $p<.001$ ,  $d=.69$ ). No significant differences were detected in the subscales of intimate knowledge or investment of self.

**Conclusions:** CRNAs report significantly worse relationships with physicians and less independent practice and control than NP counterparts. NPs are the largest APRN provider type, and numerous current healthcare reform efforts have focused on them. APRN practice environment research has also featured NP practice, thus it is conceivable that interventions designed to improve APRN practice may have concentrated on NP issues. However, substantial differences exist between NP and CRNA practice environments, and these differences must be accounted for in practice improvement efforts.

**Source of Funding:** This research was funded by a grant from the American Association of Nurse Anesthetists Foundation #2015-FS-10.

## A6

### **CRNA Perceptions of Factors Impacting Patient Safety**

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**Introduction:** Certified registered nurse anesthetists (CRNAs) provide over 40 million anesthetics each year in the United States. This study investigates relationships among CRNA organizational structures (CRNA practice models, work setting, workload, level of education, work experience), CRNA ratings of patient safety culture, and CRNA-reported adverse anesthesia-related events (AER).

**Methods:** This is a cross-sectional survey study. A total of 336 CRNAs participated following random selection from American Association of Nurse Anesthetists (AANA) database. Workload was measured using NASA Task-Load Index (NASA-TLX) and Revised Individual Workload Perception Scale (IWPS-R). AHRQ Hospital Survey on Patient Safety (HSOPS) Overall Perceptions of Safety Scale (OPSS) and HSOPS Patient Safety Grade Scale (PSG) measured safety culture. Dependent variables (AER) were difficult intubation/extubation, inadequate ventilation/oxygenation, and pulmonary aspiration.

**Results:** IWPS-R workload was significantly associated with AER. Years' experience and PSG were inversely associated with AER. OPSS was significantly and inversely associated with AER. Practice model, education, and work setting were not associated with AER.

**Conclusions:** Based on findings, CRNA workload, years' experience, and patient safety culture may be important markers for AER. Administrative interventions designed to upgrade patient safety culture and ensure manageable CRNA workload may foster quality patient care.

**Source of Funding:** AANA Foundation Doctoral Fellowship.

## A7

### **Effects of Continuous Bilateral Transversus Abdominis Plane Blocks on Opioid Consumption After Laparoscopic Colorectal Surgery**

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Webster University

**Introduction:** Pain management and attenuation of sympathetic outflow is important in achieving positive patient outcomes. Opioids have been the mainstay of analgesia plans, but side effects lead anesthesiologists to alternative analgesia methods such as multimodal pain management, NSAIDs, and regional nerve blockade. While single injection transversus abdominis plane (TAP) blocks prove efficacious in pain management and opioid reduction, there is little evidence on the use of continuous TAP blocks. This study explored effects of continuous bilateral TAP blocks on opioid use after laparoscopic colorectal surgery.

**Methods:** IRB approval was obtained for a retrospective chart analysis of elective laparoscopic colorectal procedures in a single medical center. All cases received intrathecal narcotics preoperatively. The experimental group (n=17) received continuous bilateral TAP blocks placed before emergence and continued through postoperative day (POD) 2; the control group (n=17) received single injection TAP blocks. Data on demographics, opioid consumption, length of stay, readmission, and complications (ileus and respiratory depression), were collected and analyzed.

**Results:** An unpaired t-test was applied to data. No statistical significance was found between the control and experimental groups when analyzing demographics, opioid consumption during POD 1 or POD 2, length of stay, readmission rate, or rate of complications. There was significantly less opioid consumption in the experimental group in the postanesthesia care unit ( $p = 0.049$ ), during POD 0 ( $p = 0.006$ ), and when comparing total opioid use from surgery through POD 2 ( $p = 0.031$ ).

**Conclusions:** Continuous bilateral TAP blocks demonstrated to be an opioid reducing analgesic tool. When added to an enhanced recovery after surgery protocol, we believe it will serve as an opioid sparing technique, providing analgesia while allowing patients to return to normal physiological function more quickly. We project this will translate to fewer complications, a shorter length of stay, and fewer readmissions. Several theories warrant exploration as to why this study failed to show a significant decrease in opioid use during POD 1 and POD 2 despite the overall decrease in opioid consumption.

**Effects of Humerus IO Versus IV Amiodarone Administration in a Hypovolemic Cardiac Arrest Porcine Model**

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**Introduction:** In cardiac arrest, it is imperative to quickly obtain vascular access to allow the administration of medications. It can be difficult to obtain IV access in the arresting patient. Intraosseous (IO) access has been shown to be effective for administration of some Advanced Cardiac Life Support medications. There are no studies investigating the pharmacokinetics (PK) of amiodarone administered via the IO route in a hypovolemic model. The aim of this study is to investigate the effects of amiodarone via humeral IO versus IV, focusing on PK and return of spontaneous circulation (595/max 600).

**Methods:** This study was a prospective, within and between subjects, randomized experimental design with 7 animals per group (IV, HIO, CPR and defibrillation, CPR only). Swine were placed into ventricular fibrillation for 2 minutes followed by CPR. At 4 minutes post-arrest, a single dose of vasopressin (40 u) was administered followed by defibrillation. At 6 minutes, 300 mg of amiodarone was administered via the IV or HIO route. Serial blood samples were drawn over 5 minutes. A chi-square, Fisher exact test, analysis of variance (ANOVA), and multivariate ANOVA (MANOVA) were used to evaluate results (599/max 600).

**Results:** Chi-square showed no difference in ROSC between IV and HIO amiodarone ( $p=1.0$ ) but a significant difference between either route and CPR only ( $p=0.005$ ). Time to maximum concentration ( $T_{max}$ ) was evaluated using a MANOVA with no statistically significant difference between groups ( $p=0.501$ ). The mean  $T_{max}$  was 94 seconds in the IV group ( $SD\pm 78$  seconds), whereas it was 116 seconds for HIO ( $SD\pm 87$ ).  $C_{max}$  was evaluated with a MANOVA. Results showed a maximum concentration ( $C_{max}$ ) of 49,041 picograms ( $SD\pm 21,107$ ) for the HIO group. The IV group had a  $C_{max}$  of 74,258 picograms ( $SD\pm 33,176$ ). There was no statistical significance ( $p=0.232$ ). Repeated measures ANOVA found no significant difference at any time point between HIO and IV groups ( $p=0.416$  to  $0.983$ ), (750/750 max).

**Conclusions:** This study supports the use of HIO for vascular access in hypovolemic states. The lack of a significant difference between HIO and IV groups in terms of  $T_{max}$ ,  $C_{max}$ , ROSC, or time to ROSC in conjunction with previous studies suggests the use of IO devices is equally effective in cardiac arrest (306/600 max).

**Source of Funding:** TriService Nursing Research Program.

## A9

### **Evaluation of an Animal Model to Train Nursing Students in Ultrasound-Guided Central Line Insertion**

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**Introduction:** Ultrasound-guided central venous catheter insertion (UGCVC) is a commonly performed procedure taught through simulation that allows teachers to provide student centered learning in a safe environment with the opportunity for repetitive practice to ultimately foster improved patient safety.

**Methods:** Utilizing a randomized crossover study, 46 advanced practice nursing students were assessed using a task specific performance tool in their performance of UGCVC insertion on both the animal model and the high-tech simulation model. Number of insertion attempts and time to performance was recorded. A preprocedure survey was used to ascertain their presimulation workshop experience, followed by a postprocedure feedback survey of the simulator utilized. A cost comparison was completed as secondary outcomes.

**Results:** Differences in the task-specific checklist survey tool (TSCST) performance scores were observed between the animal model and the Blue Phantom models. A paired-samples t-test was run on the number of venous access attempts between the animal model and the Blue Phantom Gen I model,  $p=.389$ , and the animal model and the Blue Phantom IJ model,  $p=.700$ , and showed no significant differences. Results of the postprocedure survey showed no significant differences between the student's impression, experience, comfort, and value for either the animal model or the Blue Phantom models.

**Conclusions:** The present study supports the animal model as a means to closely mimic clinical performance and may serve to guide both clinicians and educators who are seeking alternative simulation models to provide both skill transfer and skill acquisition.

## A10

### **Investigation of the Anxiolytic and Antidepressant Effects of Eucalyptol (1,8 cineole), a Compound From Eucalyptus, in the Adult Male Sprague-Dawley Rat**

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**Introduction:** Anxiety and depression are debilitating and costly psychological disorders. Patients with anxiety and depression often seek complementary and alternative medication, including herbal supplements like eucalyptol (1,8 cineole), a compound found in eucalyptus. Little is known about the pharmacologic effects of eucalyptol or its potential interaction with other medications. The purposes of this study were to determine the anxiolytic and/or antidepressant effects of eucalyptol and its possible activity at the benzodiazepine site on the  $\gamma$ -aminobutyric acid (GABAA) receptor.

**Methods:** Utilizing a prospective, between subjects group design, 55 male Sprague-Dawley rats were randomly assigned to 1 of 5 groups: dimethyl sulfoxide (DMSO) vehicle, eucalyptol, midazolam; flumazenil and eucalyptol, or midazolam and eucalyptol. Thirty minutes after intraperitoneal injections, neurobehavior experiments were performed using the elevated plus maze (EPM) for anxiety, followed by the forced swim test (FST) for behavioral despair. Data analyses were performed using a 2-tailed multivariate analysis of variance and least significant difference (LSD) post hoc tests.

**Results:** In the EPM when comparing mean speed and mean time mobile, the eucalyptol group was significantly increased compared with the midazolam group ( $p < 0.05$ ), and the midazolam group exhibited a significantly decreased mean speed compared with all groups ( $p < 0.05$ ). Comparing open arm time ratio (OATR), there was no significant difference between the eucalyptol group and any other group. The midazolam group showed a significant increase compared with the vehicle and the flumazenil + eucalyptol group ( $p < 0.05$ ). There was also a significant increase in OATR in the midazolam + eucalyptol group compared to the vehicle and the flumazenil + eucalyptol group ( $p < 0.05$ ). There was no significant difference in mean time mobile between any groups in the FST.

**Conclusions:** The results of this study suggest that eucalyptol may produce anxiolytic effects by acting at the benzodiazepine site on the GABAA receptor, while sparing psychomotor activity. No effects on behavioral despair were demonstrated in the FST. In order to better understand the potential of eucalyptol (1,8-cineole) as an anxiolytic or antidepressant, future studies should continue to investigate eucalyptol's effect at the benzodiazepine site on the GABAA receptor and at other receptor sites.

**Source of Funding:** This study was funded by the American Association of Nurse Anesthetists (AANA) Foundation and supported by the US Army Institute of Surgical Research (USAISR).



**Negative Intraoperative Behaviors: Reporting to Management and Satisfaction With Management's Response**

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**Introduction:** Disruptive behavior is interpersonal behavior that shows disrespect and causes those exposed to feel threatened. Disruptive behavior occurs in the operating room. This behavior has detrimental effects on workers, students, institutions, and even patients, affecting patient safety. Victims and witnesses must report this behavior in order for management to deal with it effectively. While smaller studies exist, large multinational studies are needed to examine how often clinicians report disruptive behavior and whether they are satisfied with management's response to the issue.

**Methods:** After obtaining IRB approval, 23 perioperative organizations in 7 countries distributed a survey to measure exposure and responses to disruptive behavior. Respondents were asked how often they reported disruptive behavior and whether they were satisfied with management's response. Predictors of such behavior were identified using ordinal regression and included 3 groups of predictors: respondent sociodemographics, exposure to disruptive behavior, and behavioral responses to such behavior. Scores ranged from 0 to 100%. Confidence intervals were calculated using Clopper-Pearson method.

**Results:** A total of 4,844 responses were analyzed with 74% of respondents (CI= 72.8%-75.3%) reporting < 20% of the disruptive behavior observed and 31% (CI= 30.1%-32.8%) never reporting the behavior. Only 22% (CI= 21.3%-23.7%) reported satisfaction with management's response. Similar results were seen for a subanalysis of nurse anesthetists. Country of workplace, respondent age, sex, profession, and management responsibilities predicted reporting ( $p < 0.01$ ). Exposure to disruptive behavior increased reporting (all  $p < 0.01$ ), though not when the behavior was directed toward patients. Clinicians who adopt assertive response strategies reported disruptive behavior more often, while those who adopt passive response strategies reported less often (both  $p < 0.001$ ).

**Conclusions:** Disruptive behavior in the OR often goes unreported. Reporting depends on one's sociodemographics, types of disruptive behavior exposed to, and the response to such behavior. Lack of satisfaction with management's response could be that no remediating actions were taken, actions were insufficient, or the clinician was not informed of actions taken due to privacy regulations. Victims must be encouraged to report transgressions. Future research is needed to identify why it is not reported, why management's response is not satisfactory, and how it can be stopped so patient safety is not affected.

A12

## **Patient Satisfaction with Anesthesia: What Do Patients Really Want?**

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**Introduction:** By 2018, 90% of Medicare payments will be tied to value-based reimbursement which will include patient satisfaction and experience with anesthesia services (Burwell, 2015). Despite the nationwide trend to measure patient satisfaction through Hospital Consumer Assessment of Healthcare Providers and Systems, current surveys do not adequately measure anesthesia patient satisfaction. By implementing a validated anesthesia patient satisfaction questionnaire and comparing the results to what is documented in the literature, a continuous quality improvement project can be developed to improve overall patient satisfaction.

**Methods:** Permission was granted by Dr Capuzzo to utilize her validated questionnaire that included 10 questions with a Likert scale from 0 to 10. All data collection was performed by the same anesthesia provider. Two hundred ambulatory patients that fit the inclusion criteria were called and completed the questionnaire within 1 week of discharge. The data was collected in a SurveyMonkey questionnaire and then analyzed by Statistical Package for Social Science. Both quantitative and qualitative data were analyzed.

**Results:** The results from the questionnaire were overwhelmingly high, despite the negative comments. The lowest mean satisfaction scores were complaints of postoperative nausea and vomiting, pain, and anxiety. Patients with higher satisfaction scores included females, patients with a lower education, and shorter surgeries. The qualitative data also proved to be significant in identifying trends to improve patient satisfaction. Patients want a relationship with their anesthesia provider. Attention needs to be focused on spending more time with our patients, developing a relationship, and supplying information verbally and through educational literature. Increasing the number of postoperative visits may also increase patient satisfaction. Both quantitative and qualitative results were similar to what is documented in the literature.

**Conclusions:** Through public disclosure, hospitals are being rewarded or penalized based on their patient's experience. Medical centers should stay ahead of the trend and start a continuous quality improvement project to improve patient satisfaction with anesthesia. Phase II of this project will implement a patient satisfaction quality improvement project within the same institution. In phase III, the feasibility of a new questionnaire will be defined to utilize for a continuous improvement of anesthesia patient satisfaction to reflect the current needs of the patients.

## A13

### **Periarticular Infiltration Decreases Length of Stay After Total Knee Arthroplasty**

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**Introduction:** Surgeon-administered periarticular injection (PAI) of a local anesthetic admixture is a popular analgesic technique for total knee arthroplasty (TKA). It is unclear if PAI provides similar pain relief as a continuous femoral nerve block (CFNB) or a shorter length of stay (LOS). The purpose of this study was to examine differences in pain, opioid consumption, sleep quality, and length of stay in TKA patients who received either a CFNB or PAI.

**Methods:** We used a prospective, comparative design to analyze differences in outcomes in patients who received a CFNB (initiated with 5-10 mL 0.25% bupivacaine, then 0.125% bupivacaine 6-8 mL/h on the AM of postoperative day (POD) 1 and discontinued in the AM on POD 2) from February 2014 to October 2015, or a surgeon-administered PAI (60 mL solution of 200 mg ropivacaine, 40 mg Depo-Medrol, 0.4 mg epinephrine, and 30 mg ketorolac) from November 2015 to October 2016. Patients received a standardized multimodal pain protocol (neuraxial anesthesia [epidural overnight POD 0] + scheduled and prn opioids/nonopioids). Descriptive and inferential statistics were used to analyze results.

**Results:** Fifty patients were included (CFNB, n = 26; PAI, n = 24). Groups were similar on demographics, anesthesia type, and surgical duration ( $P > .50$ ). PACU LOS (mean difference = -46 minutes,  $P = .01$ ) and hospital LOS (mean difference = -1 day,  $P < .001$ ) were shorter in the PAI group. Average and maximum pain scores, respectively, were similar on PODs 0-1 ( $P > .05$ ), but significantly higher on POD 2 in the PAI group (average pain =  $3.88 \pm 2.03$  vs.  $1.66 \pm 1.20$ ,  $P < .001$ ; maximum pain =  $5.78 \pm 2.99$  vs  $3.60 \pm 2.48$ ,  $P = .019$ ). Opioid consumption was similar ( $P > .05$ ). Sleep duration and sleep quality were similar on all 3 nights ( $P > .05$ ). Two falls occurred in the CFNB group.

**Conclusions:** Both CFNB and PAI techniques provided effective postoperative analgesia for TKA. A CFNB was associated with improved pain control on POD 2 but with an increased PACU and hospital LOS. Anesthesia providers should consider whether administration of a CFNB is worth the additional cost associated with a prolonged LOS.

**Source of Funding:** Funded by the TriService Nursing Research Program (HT9404-13-1-TS12).

## A14

### **The Effect of Intraoperative Esmolol Administration on Opioid Requirements in the Postanesthesia Care Unit in Patients With a Continuous Low Volume Interscalene Brachial Plexus Nerve Block**

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**Introduction:** Opioids are associated with complications including opioid induced hyperalgesia, respiratory depression, and postoperative nausea and vomiting (PONV). Despite the prevalence of these problems, opioids remain a mainstay treatment in the perioperative phase due to their efficacy in managing acute pain. The purpose of the study is to investigate the effect of the intraoperative administration of esmolol on patients undergoing arthroscopic shoulder surgery with a continuous low volume brachial plexus nerve block on opioid requirements in the postanesthesia care unit (PACU).

**Methods:** A retrospective chart review of 314 medical records was conducted on patients who underwent arthroscopic shoulder surgery at Phelps County Regional Medical Center (PCRMC) from November 2015 through December 2016. Patients who met the inclusion criteria were divided into 2 groups. Group A participants received esmolol 0.5 mg/kg prior to induction and did not receive opioids intraoperatively. Group B participants did not receive opioids perioperatively but were not given esmolol. Opioid consumption for each patient was measured in the PACU and converted into morphine equivalents (ME) allowing for comparisons between groups.

**Results:** Data from 176 patient charts were analyzed. Morphine equivalent dosing in the PACU group A (n=88) was 7.57 mg compared with 9.59 mg in the group B (n=88). There was no significant decrease in ME consumption in the PACU ( $P > 0.05$ ) between the 2 groups. However, secondary findings include significant differences in the square root of the intraoperative ME, total perioperative ME, and unanticipated admissions after the p-value adjustment. Additionally, while not significant at 0.05, the 30 day emergency department visit rate is borderline.

**Conclusions:** A decrease in PACU opioid requirements was noted between groups A and B; however, the result was not statistically significant.

**A Comparison of Novice Student Registered Nurse Anesthetist (SRNA) Performance in Simulation and the Clinical Setting Using the Creighton Simulation Evaluation Instrument (CSEI)**

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**Introduction:** Simulation allows students an opportunity to practice clinical skills outside the operating room. There is limited information on how simulation training transfers to the clinical environment. The purpose of this study was to investigate the CSEI form and its ability to correlate SRNAs' performance during high fidelity simulation to clinical setting. The CSEI is proven to be a reliable, valid, and widely used instrument to evaluate students in a simulation environment. Comparing this tool in both simulation and clinical environment has not been studied in the student nurse anesthesia population.

**Methods:** After IRB approval, this prospective study compared the CSEI tool in 2 environments for 15 participants. All participants were SRNAs at the end of their first year in a front loaded program. The CSEI was utilized during each participant's end of semester high fidelity simulation skill evaluation and their first clinical case involving general anesthesia with endotracheal tube intubation. Depending on environment, the CSEI tool was completed by either program faculty or a CRNA clinical preceptor. CRNAs received instructions on how to complete the form via email.

**Results:** Fifteen participants were in the study, and 3 participants were excluded from this study due to incomplete CSEI forms. The CSEI evaluation consists of 4 subscales: assessment, communication, critical thinking, and technical skills. Each subscale was scored in both environments. The Spearman Rho correlation analysis showed that there is not a strong relationship between the CSEI scores in the simulation and the clinical environment. Assessment and communication subscale scores showed a negative relationship. Both the critical thinking and technical skills subscale scores showed a positive correlation. The results exhibit a p-value of <0.05; therefore, the results are not statistically significant.

**Conclusions:** This study did not show significance in the CSEI scores between the simulation and the clinical environment. Limitations include a small sample size, secondary variances such as misinterpretation of scoring, different simulation scenarios, and clinical cases. More studies with a larger population size need to be completed before a firm conclusion can be drawn.

## A16

### **A National Survey of Certified Registered Nurse Anesthetists to Evaluate the Demand for a Nurse Anesthesia Postgraduate Cardiothoracic Fellowship**

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**Introduction:** The Institute of Medicine issued a major recommendation in 2011 to implement nurse residency programs after completion of an advanced practice degree program to better deliver safe, high quality, and effective healthcare services. Cardiothoracic anesthesia is a subspecialty practice that requires an advanced body of knowledge and skills to adequately care for this medically complex patient population. The purpose of this project was to measure the demand (perceived, need, and value) by Certified Registered Nurse Anesthetists (CRNAs) for a nurse anesthesia postgraduate cardiothoracic fellowship.

**Methods:** This exploratory, descriptive study utilized a national electronic web based investigator-developed survey to measure the demand by CRNAs for a nurse anesthesia postgraduate cardiothoracic fellowship. The American Association of Nurse Anesthetists' survey service deployed the survey to 1,500 randomly selected CRNAs. The survey included 25 multiple choice and open-ended questions. Univariate analysis on all items and Pearson's chi-square tests were conducted. Content analysis identified themes for open-ended questions.

**Results:** Forty-eight questionnaires were completed and used in the analysis. Fifty percent of participants responded feeling either minimally or not at all prepared to enter a cardiothoracic practice at the time of graduation. Sixty-three percent of participants felt that extended cardiothoracic anesthesia training was needed to acquire the required competencies and skills to enter the subspecialty practice. Seventy-nine percent of participants reported that they would have been at least somewhat likely to extremely likely to consider participation in a fellowship at graduation. However, no association was found between how prepared one felt to enter a cardiothoracic practice to how likely one was to have considered a fellowship upon graduation.

**Conclusions:** This study reveals that there is an interest and need for extended clinical training in cardiothoracic anesthesia among CRNAs. The results of the study also support existing literature that reports on other advanced practice nurses' interest for extended clinical training in subspecialty practices like cardiothoracic anesthesia. The small sample size is a major limitation of the study, and further studies with larger sample sizes will need to be conducted to determine if an actual demand exists for a nurse anesthesia postgraduate cardiothoracic fellowship.

A17

**A Retrospective Survey to Identify Causes of Preoperative Anxiety and Methods to Reduce Preoperative Anxiety in Surgical Patients Receiving General Anesthesia**

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**Introduction:** Previous research has assessed preoperative anxiety among surgical patients; however, no research to date has specifically assessed anxiety related to anesthesia. Preoperative anxiety has been shown to increase intraoperative anesthetic requirements, increase postoperative pain, affect postoperative outcomes, reduce patient satisfaction, and extend hospitalization. The purpose of this study was to elucidate the patient perspective on preoperative anxiety related to anesthesia by conducting a retrospective survey. We hypothesized that patient responses will help to identify sources and potential interventions for preoperative anxiety reduction.

**Methods:** Eighty retrospective surveys were sent to patients who met inclusion criteria that included: age >18 years, patients who had a moderate risk surgery, general anesthesia, and endotracheal intubation. Surgical risk was classified by MUSC's Surgical Risk Classification System. Exclusion criteria included: age <18 years, patients who received only regional anesthesia, pregnancy, cancer diagnosis, emergency classification, and/or minor/major risk surgery. Participants were identified utilizing a convenience sampling. Participants were contacted via their electronic MyChart record to participate in the study.

**Results:** A total of 80 REDCap surveys were sent to participants via their MyChart record. A total of 38 participants returned completed surveys. A Fisher exact test and Wilcoxon rank sum test were used to analyze data. The demographic variables of age, gender, level of education, and procedure had no statistically significant (<0.05) association with preoperative anxiety. A history of previous general anesthesia revealed decreased levels of anxiety in 95% of participants. The principal cause of anxiety (58%) was found to be fear of not waking up from surgery. Thirty-nine percent of participants considered 5 to 10 minutes of allotted time with the anesthesia provider to be adequate. No relationship was found between the time spent with the anesthesia and the patient anxiety level prior to surgery.

**Conclusions:** The majority of patients did not experience anxiety specifically related to anesthesia in the perioperative period and felt that they spent an adequate amount of time with their anesthesia provider. The demographic and medical factors were not significantly associated with the level of anxiety in the preoperative period. Future studies in this area are warranted to clarify limitations that were encountered throughout the course of this research: small sample size, limited time frame, and decreased ability to contact the target population.

## A18

### **Active Versus Passive Airway Warming in Spine Surgery: A Randomized Clinical Trial**

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**Introduction:** Surgical patients are prone to hypothermia, with spine surgery being potentially more challenging as active warming practices are delayed because of repositioning. Our primary outcome was patient temperature 4 hours after induction (or last recorded temperature) in adult patients having lumbar/sacral spine surgery of at least 3 hours duration using either a heated anesthesia circuit (treatment) or a standard anesthesia circuit with a heat-moisture exchanger (control). We hypothesized that the treatment group would have higher statistically significant temperatures at this outcome.

**Methods:** We conducted a randomized clinical trial at a large teaching hospital with 70 ASA I-III patients,  $\geq 18$  years of age, having lumbar/sacral spine surgery for at least 3 hours in duration with general anesthesia. Patients were randomized in blocks of 4 by the Division of Clinical Statistics prior to enrollment to receive either active airway warming (n=35) using a heated anesthesia circuit or passive airway warming (n=35) using a standard anesthesia circuit with a heat-moisture exchanger. Esophageal temperatures were considered core temperature intraoperative.

**Results:** Seventy patients were enrolled during the study with 1 patient in the control group excluded from analysis as intraoperative temperature was unavailable. One patient in the treatment group was changed to the standard anesthesia circuit due to loss of end-tidal CO<sub>2</sub> with the treatment circuit but was analyzed with intention-to-treat. No significant differences were observed for presurgical patient and surgical characteristics between groups. No statistical differences were observed for the primary outcome between groups (estimate [95% C.I.] 0.076 [-0.085, +0.237], p=0.358). Similar results were observed with the addition of covariates (preoperative temperature and/or 4-hour OR temperature).

**Conclusions:** Patient core temperature was observed to not be affected using an electrically heated and humidified anesthesia circuit compared with a standard anesthesia circuit with a heat-moisture exchanger in patients having lower spine surgery with general anesthesia. Future research should validate these results through meta-analyses or systematic reviews specific to airway warming measures.

**Source of Funding:** Funding was provided by Westmed Inc., Mayo Clinic Center for Clinical and Translational Science, and Mayo Clinic Hospital Department of Anesthesiology and Perioperative Medicine.



**Anesthesia Indicated Gastric Tube Intubation: A Literature Review**

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**Introduction:** Anesthesia providers routinely perform blind gastric tube intubations and cite surgical and anesthetic indications as rationales for placement during general endotracheal anesthesia (GETA). However, given the blind nature of this technique, patients are subject to adverse sequelae from a commonly performed and familiar treatment option. This literature review establishes complications and risk factors that are associated with blind tube insertion, evaluates the validity of correct placement verification methods, establishes the rationales supporting its employment by anesthesia providers, and describes various deployment facilitators described in current literature.

**Methods:** An exhaustive literature review of the databases MEDLINE, CINAHL, Cochrane Collaboration, Scopus, and Google Scholar was performed applying the following search terms in various ordered sequences: gastric tube, complications, decompression, blind insertion, perioperative, and intraoperative. A 5-year limit was applied to limit the number and timeliness of articles selected.

**Results:** Patients are exposed to potentially serious morbidity and mortality from blindly inserted gastric tubes. Risk factors associated with malposition include blind insertion, the presence of endotracheal tubes, altered sensorium, and previous tube misplacements. Pulmonary aspiration risk prevention remains the only indication for anesthesia-related intraoperative use. There are no singularly effective tools that predict or verify the proper placement of blindly inserted gastric tubes. Current placement facilitation techniques are perpetuated through anecdotal experience, and technique variability warrants further study.

**Conclusions:** In the absence of aspiration risk factors or the need for surgical decompression in ASA classification I and II patients, a moratorium should be instituted on the elective use of gastric tubes. Also, based on the cumulative mortality associated with reinsertion attempts, anesthesia practitioners should utilize a placement facilitator to assist in correct placement after 1 recognized misplacement.

### **Appropriate Utilization of Type and Screen Testing in Obstetric Patients**

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**Introduction:** Postpartum hemorrhage (PPH) is a leading cause of maternal morbidity and mortality worldwide. Rates of PPH in the United States have been on the rise since the 1990s. The increase is multifactorial and may be explained by changes in practice, patient population, varying study designs, and differing definitions. Using evidence-based criteria to identify those at risk for PPH will result in appropriate screening and judicious use of resources, such as blood products. The aim of this project was to identify those most at risk of requiring transfusions and develop recommendations for appropriate screening.

**Methods:** A retrospective review of the charts of obstetric patients who received transfusions over a 10-year period was conducted. These patients were matched by delivery type (cesarean or vaginal) to patients who did not receive transfusions. All records were searched for the presence of transfusion risk factors (identified from the literature). Statistical analysis included odds ratio, p-value, and statistical logistic regression. Statistical analysis was performed using JMP software.

**Results:** The following risk factors were associated with receiving a postpartum blood transfusion as identified by a p value <0.05: induced labor, placenta previa, uterine/cervical laceration, fibroids, gestation age <32 weeks, bleeding disorders, anticoagulant use, preeclampsia, second stage labor >3 hours, retained placenta, placental abruption, instrumental delivery, chorioamnionitis, betamethasone, and episiotomy. In comparing this list with the current blood institutional protocol, it was found that the existing screening criteria were not reflective of practice. Identifying the risk factors will inform the development of a type and screen protocol that will more accurately capture patients at risk for PPH and ensure proper antepartum testing.

**Conclusions:** There are predictive factors that can help identify patients at risk for PPH and accurately identify those requiring an antepartum type and screen. Utilizing evidence-based criteria in practice enables providers to ensure appropriate care is given. The ability to identify patients at greatest risk for PPH leads to appropriate use of laboratory resources.

## **Barriers Faced by CRNA Entrepreneurs Looking at Establishing an Office-Based Anesthesia Practice**

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**Introduction:** CRNAs may encounter barriers to full practice authority that limit their ability to practice anesthesia to the full scope of training and experience and to meet the needs of the patients they serve. The removal of practice barriers remains a high priority requiring legislative changes at various levels of government. State regulatory restrictions of practice, and the requirement of physician supervision, may restrict nurse anesthetist entrepreneurs wishing to establish an office-based anesthesia practice (OBA).

**Methods:** An extensive literature review informed the formulation of a descriptive survey instrument to gather data on the barriers experienced by CRNAs when transitioning into autonomous OBA practices. The questionnaire was distributed online using Qualtrics, via Facebook and Yahoo, to groups of CRNAs in autonomous OBA practice, yielding a sample size of 88 CRNAs. The survey data was analyzed to determine the perceived barriers encountered by CRNAs administering anesthesia in the physician office setting.

**Results:** The analyses of the survey results revealed the following 3 primary barriers: (1) state statutes prevent CRNAs from practicing to the full extent of their education and training, (2) fair reimbursement for CRNA services by third party payers, and (3) challenges related to other disciplines' recognition of the CRNA scope of practice. Of the 88 participants surveyed, 90% perceived state statutes to be the greatest barrier to OBA practice.

**Conclusions:** Barriers to CRNA OBA practice are complicated and multifactorial. CRNAs need to continue advocating for patient safety in physician office settings and obtain support from federal and state governments, health insurers, healthcare professionals, and consumers of health services. This may assist in overcoming barriers faced by CRNAs establishing autonomous OBA practices. Continued research aimed at outcome data related to CRNA effectiveness and quality in providing anesthesia independently at an office location is necessary to aid in the successful reduction of the perceived barriers to practice.

## **Choosing the Right Sedatives for Supraventricular Tachycardia Ablations: A Contemporary Review**

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**Introduction:** This study provides a review of the contemporary literature for the effects of most commonly used anesthetic drugs for sedation and anesthesia during adult electrophysiologic studies where supraventricular tachycardias (SVT) need to be induced for diagnostic purposes and/or catheter ablation. Some medications may affect cardiac electrophysiology and conduction, altering the ability to induce the rhythm and may have negative impact on mapping and ablation treatment. The objective of the study is to determine the best sedative choice during SVT ablations.

**Methods:** The MEDLINE and Google Scholar databases were searched for published articles within the past 15 years (2000-2015) that have evaluated the effects of common anesthetic drugs during SVT ablations. Further articles were identified through cross-referencing, discussion with electrophysiologists, and handsearching key journals. Eight review articles, 2 randomized controlled trials, 4 prospective observational studies, and 1 case report were reviewed. Four of the studies focus on the pediatric population.

**Results:** Sevoflurane had no clinically important effect on sinoatrial (SA) node activity or the normal atrioventricular (AV) or accessory pathway. Midazolam, fentanyl, or in combination, have not altered the inducibility of reentrant tachycardia and shown no effects on SA node, refractory periods of AV conduction, or accessory pathway. Similar findings were reported with propofol, except for ectopic atrial tachycardia in children, which remained uninducible. Remifentanyl and dexmedetomidine lengthened both sinus cycle and AV conduction. Dexmedetomidine increased the atrial refractory period and diminished atrial excitability. Ketamine shortened atrial conduction and successfully returned prolongation of sinus node conduction due to dexmedetomidine.

**Conclusions:** The current literature regarding SVT studies in the adult population is sparse. Midazolam, propofol, fentanyl, and remifentanyl can be used safely in patients undergoing EP studies without significant interference with electrophysiological variables or the inducibility of reentrant tachycardias in usual clinical doses. Low-dose ketamine has potential use as an adjunctive medication in the EP lab and additional studies would be beneficial. Dexmedetomidine is not an appropriate sedative agent for patients undergoing EP studies for SVTs as a single agent.

A23

**Comparison of an Endotracheal Cardiac Output Monitor to a Pulmonary Artery Catheter: Part 2**

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**Introduction:** CRNAs provide initial resuscitation in austere environments by securing an airway and administering fluid therapy. Maintenance of hemodynamic stability as indicated by invasive monitoring can influence the overall outcome of a casualty. Although invasive monitoring is complicated, inserting an endotracheal tube is, by comparison, easy. The purpose of this study was to explore the accuracy and precision the CONMED endotracheal cardiac output monitor (ECOM) apparatus, by comparing it with the Edwards Vigilance II monitor (Edwards LifeSciences, Irvine, California) pulmonary artery catheter (PAC) under hypothermic and hemorrhagic conditions.

**Methods:** Power analysis (G\*Power 3.1) suggested 8 animals would be sufficient for comparisons. After induction of anesthesia, instrumentation, and stabilization in experiment 1 (hemorrhage), animals were exsanguinated to produce type III hemorrhagic conditions. Cardiac output (CO) values were collected from the PAC and the ECOM over a 3-hour period. In experiment 2 (hypothermia), swine were cooled to a temperature of 33°C using the Stryker Gaymar TP700 cooling device, and CO values were recorded from both instruments. The protocol was approved by the Wilford Hall Ambulatory Surgical Center's Institutional Animal Care and Use Committee (FWH 20140100A).

**Results:** Using GraphPad Prism to conduct nonlinear fit analyses comparing the slopes of the curves for ECOM versus PAC, we found that the curves from the ECOM data were significantly different from the PAC data curves under both conditions, but more pronounced differences were found under hemorrhagic conditions.

**Conclusions:** Although the ECOM apparatus simplifies data acquisition while limiting potential complications associated with the PAC, the ECOM does not appear to reliably reproduce CO values acquired from a traditional PAC under hemorrhagic or hypothermic conditions.

**Source of Funding:** USAF Surgeon General Office.

A24

### **Cultivating a Culture of Coaching: Equipping Medical Educators With a Skillset for Transformation**

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**Introduction:** Medical educators are likely to step into their role without formal education in pedagogical practice, struggle with working under complex practice settings, feel isolated in their work, and have a desire to connect with a network of peers. Furthermore, professional development opportunities that focus on developing an individual to their full potential are sparse. Coaching is a professional development tool that has been used as a strategy to target these impediments and is linked to the development of educators' teaching skills, leadership skills, personal and professional development, as well as creation of a support network.

**Methods:** The coaching skill acquisition session was delivered as a 6-hour session where participants were equipped with the appreciative coaching skillset. Next, faculty participated in 6 monthly coaching application sessions with the addition of preparatory online modules. The first 30 minutes of the sessions was spent in an engagement activity to further develop and apply the coaching topic introduced in the module. The remaining time was spent engaging in a peer coaching practicum. Coaching was executed with formal debriefing on coaching performance. Qualitative data was obtained on the participants' experience via monthly participant reflective journaling and individual interviews.

**Results:** The program has helped to foster a coaching culture within 2 cohorts of graduate medical education disciplines: (1) laboratory medicine and pathology and (2) Certified Registered Nurse Anesthetists, demonstrated from qualitative data captured from monthly journals and individual interviews. The narratives reinforced that coaching was an effective tool for enhancing personal development as a faculty member, improving communication skills, and created supportive and empowering peer relationships across disciplines.

**Conclusions:** Faculty report applying the skillset outside of the formal coaching sessions and using it with their student learners, colleagues, and direct reports. Trained faculty are an invaluable resource to their peers and are helping to cultivate an environment fostering empowerment.

**Source of Funding:** Endowment for Education Research Award (EERA) grant.

**Developing an Inclusive Recruitment Model: Increasing Diversity in the CRNA Candidate Pool**

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**Introduction:** The nursing workforce is comprised of only 24.6% minorities, and among CRNAs only 9%. Increasing the number of minority nurses is 1 solution for eliminating health disparities and increasing quality of care. Project examines impact of individual-level and social-level strategies of recruitment and education outreach on minorities applying to and gaining acceptance in an MSN-NA Program.

**Methods:** Project implemented both individual-level and social-level strategies over two 12-month periods to target minorities nearing eligibility for applying to CRNA programs at 2 entry points: colleges and the workplace. Strategies included developing and hosting information sessions and workshops, partnering with diversity organizations, and strategic recruiting at conferences. Demographic data was collected at each entry point. Data analysis compared 18 program candidates in 2016 and 19 program candidates in 2017 with historical applicant data. UTC IRB (FWA00004149) has approved this research project # 15-005.

**Results:** Of the 98 applicants for the 2016 MSN-NA Program, 24.5% were candidates of color—a significant change ( $p < .01$ ) resulting in an increase of 100% over the previous year. Of the 92 applicants for the 2017 MSN-NA Program, 22% were minorities—an increase of 67% over baseline data. Of the 50 program-specific information session participants, 34% identified as nonwhite. Data analysis reveals a statistically significant ( $p < .05$ ) upward trend in the percent of applicants of color who are offered an interview and ultimately gain acceptance to the program over the duration of the project.

**Conclusions:** Outcomes over the 2-year project period demonstrates sustained increase of minority applicants compared to preproject data. Project strategies resulted in significant gains in overall program applicant diversity. The model for recruitment strategies across the BSN and nursing population to the CRNA pathway has proven to be highly successful and one that could be easily replicated. Repeated exposure and education to program information and CRNA-related tasks targeted toward minority nursing students and professionals result in increased diversity across program candidates and enrollees.

**Source of Funding:** The Health Resources and Services Administration of the U.S. Department of Health and Human Services (HHS) under grant number D19HP26972 and title, CRNAs in 3D: Increasing Diversity, Reducing Disparities, & Understanding the Social Determinants of Health.

## **Educational Interventions to Decrease the Occurrence of Lateral Violence: A Scholarly Leadership Project**

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**Introduction:** Lateral violence (LV) is an encounter that leaves the victim feeling upset, threatened, humiliated, or vulnerable and can lead to ineffective communication and patient care. Lateral violence destroys the workplace environment. The effects of LV are accompanied by physical, emotional, and financial effects on hospital staff. Lateral violence increases staff turnover and job dissatisfaction. The Joint Commission (2008) mandates that healthcare organizations have a policy and procedure for dealing with and educating providers on the topic of LV and disruptive behaviors.

**Methods:** The goal and purpose of this project was to educate anesthesia providers on LV and have the successful implementation of educational programs on the occurrence and perceptions of LV. This facilitates supporting the project's mission statement. The target population for the educational interventions was all anesthesia providers. The methods used to address this problem included a modular 4-phase educational program. The mission statement and purpose were met and in some cases succeeded.

**Results:** This project was designed to increase awareness of LV in healthcare and identify factors that contribute to LV. This was achieved by introducing a 4-phased modular educational program that focused on increased awareness about LV. The results demonstrated that the educational programs were successful in increasing both awareness and understanding about LV. The project also identified the massive impact of LV and how LV is impacting both patient care and staff well-being.

**Conclusions:** The elimination of LV has the potential to affect healthcare in monumental ways. A project like this can be implemented in any size organization, small or large, urban or rural, with little cost and major benefits. As more stakeholders start to focus on LV, the need to have fundamental education will become even more important. Given the high expense of LV, we must reexamine ways to improve positive behavior and develop mechanisms to eliminate LV behavior. The educational modules and training program offer a low-cost intervention for discussing and dealing with LV.



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**Effect of Subanesthetic Intravenous Ketamine Infusion on Corticosterone and Brain-Derived Neurotrophic Factor in Male Sprague-Dawley Rats**

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**Introduction:** Alterations in stress hormone (corticosterone; CORT) and proteins associated with memory formation such as brain-derived neurotrophic factor (BDNF) have been implicated in dysfunctional fear memory and the development of posttraumatic stress disorder (PTSD) following trauma. Ketamine, a potent analgesic and dissociative anesthetic, is frequently administered in the peritrauma period, but its impact on the relationship of CORT and BDNF is unknown. Therefore, we used a subanesthetic intravenous (IV) ketamine infusion to characterize changes in plasma CORT and BDNF and determine a CORT:BDNF relationship in rodent fear-conditioning (FC) model.

**Methods:** Male Sprague-Dawley rats were divided into 6 groups (n=10-12). Group 1 (SAL) did not undergo FC and received a 2-hour saline infusion. Groups 2 (KET5) and 3 (KET20) did not undergo FC and received a ketamine bolus + 2-hour infusion. Group 4 (FC) underwent FC and received a 2-hour saline infusion. Groups 5 (FC-KET5) and 6 (FC-KET20) underwent FC and a ketamine bolus + 2-hour infusion. Fear conditioning consisted of 3 auditory tones (20s) paired with a foot shock (0.8 mA x 0.5 s). Two doses of ketamine were used. KET5 = 2 mg/kg IV bolus + 5 mg/kg/h x 2 hours. KET20 = 5 mg/kg IV bolus + 20 mg/kg/h x 2 hours. Plasma CORT and BDNF concentrations were measured at 2 hours and 4 hours after FC using enzyme-linked immunosorbent assay.

**Results:** A subanesthetic IV ketamine infusion dose dependently increased CORT at 2 hours and reduced BDNF at 4 hours. There was a significant negative correlation between CORT and BDNF following IV ketamine (KET20) infusion after FC.

**Conclusions:** Our results are in line with others that used acute and chronic stress models to increase CORT concentrations and reduce BDNF expression; however, none have utilized a ketamine infusion to examine the CORT:BDNF relationship. Our findings show that an extended ketamine infusion in rodents mimics acute stress and negatively impacts BDNF, a protein required for synaptic plasticity and neuronal health. These results suggest that extended ketamine infusions in the peritrauma period may exacerbate dysfunctional fear memory formation. Further study is required to examine the psychological impact of a ketamine infusion on rodent fear behaviors and fear memory extinction.

**Source of Funding:** AANA Foundation, Jonas Center for Nursing and Veteran Healthcare, and a USUHS Intramural grant.

## **Effects of Lean Enterprise Implementation in the Perioperative Environment**

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**Introduction:** Healthcare costs currently exceed 17% of the gross domestic product and are continuing to rise. Current healthcare reforms are demanding that organizational safety and quality of care drive reimbursements. Establishing a healthcare organization as a lean enterprise could provide a means to maintain and even improve quality of care and safety while increasing efficiency, minimizing waste, and decreasing overall cost. A comprehensive understanding of lean concepts will enable CRNAs the opportunity to effectively participate in the application of these principles.

**Methods:** The Scopus database was searched to identify applicable studies, articles, and analyses. Search terms included: lean in healthcare, lean enterprise, lean perioperative, lean principles, and continuous improvement. To be included for consideration, articles must be published between 2012 and 2016, published in English, and address the use of lean principles in the perioperative area. Each article was assessed for strengths, weaknesses, study methods, outcomes, and conclusions. A review was completed to determine effects of lean principles when implemented perioperatively.

**Results:** The studies focused on the elimination of waste in different segments of the perioperative period. The primary goal of lean enterprise implementation was to decrease cost. Aside from decreased cost, an improvement in patient and staff satisfaction, as well as increased patient safety, were added benefits to the reduction of waste. Specifically, there was a decrease in preoperative patient preparation, surgical time, surgical errors, distance traveled by staff, and number of central line infections. Additional outcomes included improvements in data entry, operating room turnover efficiency, and first case start times.

**Conclusions:** Each result of lean implementation is central to the current climate of healthcare focusing on reducing cost and improving efficiency. A better understanding of lean principles will allow CRNAs the opportunity to contribute to the entire process of lean implementation. The elimination of waste is integral to the current focus of increasing hospital reimbursement and increasing profits. With the current trend of national anesthesia groups becoming predominant, it is an added value for a CRNA to be able to increase the efficiency of their practice.

**Effects of Volatile Anesthetics on REM Sleep Homeostasis**

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**Introduction:** Studying the link between sleep and general anesthesia has expanded understanding of both brain states. Exposure to general anesthesia may influence homeostatic sleep regulation. Experimentally, propofol anesthesia has been shown to satisfy the homeostatic need for sleep in rodents. The rapid eye movement (REM) sleep phase is associated with vivid dreams, muscle atonia, and episodic hypoxemias in obstructive sleep apnea patients. Whether or not anesthesia from volatile halogenated ethers can satisfy homeostatic need for REM sleep may have clinical implications for postanesthetic recovery.

**Methods:** Articles pertinent to the matter of how volatile anesthetics influence sleep homeostasis were found using the PubMed database via access from the Albany Medical College Schaffer Library website on May 7, 2016. Keyword search terms included rapid eye movement, REM, general anesthesia, volatile anesthetics, sleep homeostasis, and sleep deprivation. Articles deemed relevant to the research question were identified and selected upon title and abstract review.

**Results:** Three experimental animal studies were reviewed. One study using a selective REM sleep-deprivation protocol observed that isoflurane anesthesia did not satisfy a preexisting REM sleep debt. A second study using a total sleep-deprivation protocol observed that sevoflurane anesthesia did not satisfy REM sleep debt but did satisfy non-rapid eye movement (NREM) sleep debt with greater efficiency than natural sleep. A third study with no sleep-deprivation protocol observed an accrual of REM sleep debt during isoflurane, sevoflurane, and halothane anesthesia, while an accrual of NREM sleep debt occurred during halothane anesthesia only. Halothane was associated with more sleep microarchitectural disturbances than other agents.

**Conclusions:** Available evidence suggests that volatile anesthetic ethers are unlike propofol in that they can affect sleep homeostasis differentially between REM and NREM sleep phases. No volatile anesthetics studied were found to satisfy homeostatic need for REM sleep. These findings may present considerations for the anesthesia provider in managing risks of adverse sequelae associated with REM sleep rebound phenomena.

A30

**Impact of a Pilot Wellness Curriculum on Healthy Behaviors, Resilience, Stress, Burnout, and Anxiety Among Student Registered Nurse Anesthetists**

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**Introduction:** Student registered nurse anesthetists (SRNAs) experience multiple stressors during their graduate education that can impact their mental, emotional, and physical well-being. Providing a comprehensive wellness curriculum during anesthesia graduate education may provide the SRNA with tools to improve health and well-being during their education and beyond.

**Methods:** Three classes of nurse anesthesia students participated: 2 classes participated in the pilot wellness curriculum (N=45), and 1 class (N=24) served as a control group. Outcome measures evaluating stress, anxiety, burnout, resilience, and healthy behaviors were completed at baseline, 3 months, and 6 months. Scale scores at 3 and 6 months were compared with baseline using the paired t-test. The change from baseline was compared between each of the interventional classes and the control class using the 2-sample t-test.

**Results:** Statistically significant improvements were observed in perceived stress at 6 months in the class of 2019, personal burnout at 3 months in the class of 2017, work burnout at 3 months in the class of 2019 and 6 months in the class of 2017, patient burnout at 3 and 6 months in the class of 2019, and healthy fitness behaviors at both 3 and 6 months in the class of 2017. Perceived stress was increased from baseline at both 3 and 6 months in the class of 2018. Anxiety decreased at both 3 and 6 months in the interventional group and was increased from baseline at both 3 and 6 months in the control group. Resilience increased at both 3 and 6 months in the class of 2019 and was decreased from baseline at both 3 and 6 months in the class of 2018; however, none of these changes were statistically significant.

**Conclusions:** Improvements in perceived stress, various forms of burnout, anxiety, and healthy behaviors were observed as results of this wellness intervention. Timing of the intervention was important. Nurse anesthesia programs should consider implementing a wellness curriculum to improve SRNA health and well being.

**Implementation of Goal-Directed Transfusion Strategy Improves the Outcome of Pregnancies Complicated by Severe Postpartum Hemorrhage**

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**Introduction:** Implementation of point-of-care testing allows for rapid adjustment of administration of blood products to achieve predefined goals during the management of patients with severe hemorrhage. We evaluate the result of introduction of a goal-directed transfusion (GDT) strategy during the peripartum period.

**Methods:** We performed a cohort study to compare outcomes among parturients with severe PPH (estimated blood loss [EBL] 1,500 mL or more) who were managed before and after the implementation of a GDT strategy. Clinical outcomes (including EBL, blood product replacement, hysterectomy, ICU admission, length of hospital stay) were abstracted from the medical records.

**Results:** Eighty-six patients met criteria for inclusion; 58 in the non-GDT group and 28 in the GDT group. Median and interquartile ranges for EBL were 3,000 (2,000-4,000) for non-GDT versus 2,000 (1,600-2,500) for GDT ( $p=0.0005$ ). Transfused units of PRBC were 4 (2-8) for non-GDT versus 1 (0-2) for GDT ( $p<0.0001$ ). Similar results were for fresh frozen plasma (FFP). In non-GDT group, 44.8% of patients received platelets versus none in the GDT group ( $p<0.0001$ ). Incidence of cesarean hysterectomy was 53.5% for non-GDT versus 25% for GDT ( $p=0.02$ ). Incidence of ICU admission was 43.1% for non-GDT versus 3.6% for GDT ( $p=0.0001$ ). Median and interquartile ranges for postpartum length of hospitalization were 5 (4-6) days for non-GDT versus 4 (3-5) days for GDT ( $p=0.0007$ ).

**Conclusions:** Implementation of a goal-directed transfusion strategy for the management of severe PPH is associated with decrease in use of blood products, reduced rate of cesarean hysterectomy, fewer ICU admissions, and shortened postpartum stay.

A32

### **Improving Epidural Utilization and Management in the Perioperative Period**

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**Introduction:** Evidence suggests use of local anesthetics in regional anesthesia may improve cancer patients' perioperative outcomes, including time to recurrence, respiratory insufficiency, morbidity and mortality, and hospital costs. This is especially important for patients with low 5-year cancer survival rates. Epidural utilization leads to decreased opioid consumption and preservation of immune function, facilitating reduction in recurrence. Lack of standardized infusion protocols and perioperative management techniques for use of epidurals contributes to confusion among anesthesia providers.

**Methods:** After IRB approval, an educational intervention with repeated measure survey design was developed with Plan Do Study Act Framework. The study site was a 500-bed academic center specializing in cancer. Participants were members of Department of Anesthesiology (93 CRNAs and 42 anesthesiologists). In 2015, the institution performed over 3,000 procedures for which epidural can be utilized. During departmental meeting, participants were provided a packet with consent and presurvey/postsurvey at the beginning of the session. A 20-minute education session was presented via PowerPoint with time for questions and answers.

**Results:** Pre/post surveys collected were matched with unique code identifier (37 CRNAs and 22 anesthesiologists). Majority (54%) of CRNAs had 0 to 4 years and majority (45%) of anesthesiologists had >15 years experience. Ninety-three percent responded they customarily utilized epidurals in large abdominal cases. Six questions examined provider knowledge of epidural utilization and its effects on cancer patients. There was an increase in knowledge from pretest to posttest, but only 1 question demonstrated statistical significance ( $p = 0.005$ ). Participants were asked to state how likely they would increase utilization of epidurals after educational session and 82% strongly agreed/agreed. Ninety-five percent strongly agreed/agreed the educational session was useful for practice.

**Conclusions:** Results favor an increase in knowledge on effects of epidurals in cancer after the educational session. Epidural utilization was high; however, dosing and timing is inconsistent and not evidence based. Findings support need for further studies examining standardized protocols for infusions and timing. Future education should include all perioperative staff to encourage epidural utilization and appropriate local anesthetic dosing. Although this was a single institution and 1 educational session was delivered, it highlights the need for departments to consider supplementary lecture series for staff.

**Induction with Etomidate for Prevention of Hyperglycemia in Type II Diabetics**

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**Introduction:** Elevations in blood glucose have shown to increase the patient's risk for pneumonia, increased hospital stay, risk of infection, and poor wound healing. These contribute to an increased rate of morbidity and mortality. By potentially altering medications used for anesthesia, less adverse effects may occur by preventing hyperglycemic episodes. Etomidate has been shown to decrease cortisol secretion allowing adrenal suppression. In suppressing the body's stress response, it is hypothesized that major alterations in blood glucose levels may be avoided.

**Methods:** This single blind randomized control trial will evaluate blood glucose levels of diabetic patients for etomidate induction to anesthesia compared with propofol. A total of 18 subjects will be enrolled. The experimental group will receive etomidate, and the control group will receive propofol. Both groups will have their blood glucose levels determined by a glucometer prior to induction to anesthesia and following emergence. A statistical analysis will be performed to evaluate significant changes in perioperative blood glucose levels of patients who received etomidate compared with the control group.

**Results:** Eight control group patients and 10 experimental group patients were included in the study. The patient populations were comparable between the groups. The average dosage of etomidate administered was 0.22 mg/kg (SD=0.05 mg/kg) and average propofol administration dose was 1.75 mg/kg (SD=0.43 mg/kg). When comparing the mean increase in blood glucose, propofol had an increase of 34.5 mg/dL (SD=18.85 mg/dL) and etomidate increased by 19.9 mg/dL (SD=21.05 mg/dL). After using an unpaired t-test, there was no significance found within the mean increases in glucose ( $p=0.1456$ ). However, significance was found when comparing the propofol group starting blood glucose with the ending blood glucose ( $p<0.05$ ), while the etomidate blood glucose did not differ significantly from its ending ( $p>0.05$ ).

**Conclusions:** Based on this study, there appears to be no statistical significant findings between the mean increases in blood glucose levels when comparing the 2 groups. A large variation among the mean was obtained without significance, but a larger sample size could lead to alternating results. However, there was significance noted within each group. This result states that patients who received propofol with type 2 diabetes will sustain higher postoperative glucose level compared with etomidate. In conclusion, in order to establish significant correlation, additional research is recommended.

**Intraoperative Administration Time of Dexmedetomidine to Minimize Emergence Delirium in the Pediatric Population**

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**Introduction:** Pediatric emergence delirium (ED) is a postoperative behavioral disorder. ED can manifest itself on a continuum of severity from inconsolability and uncontrollable crying to injury of the patient due to irrational motor movement. Pediatric ED causes distress not only for the pediatric patient but also for parents and caregivers. Dexmedetomidine has demonstrated effectiveness in preventing ED in children in several studies compared with both placebo and other agents. One important aspect of dexmedetomidine use that has not been thoroughly researched is the timing of administration.

**Methods:** Twenty-one patients were observed. Participants were between 18 months and 17 years old, physical status 1 or 2, received general anesthesia with anesthesia start to stop time greater than 14 minutes. Patients dosed within 15 minutes of anesthesia start time or an anesthesia time <30 minutes were placed in the early dose group. Those who received a dose within 15 minutes of anesthesia stop time were said to be late dosing. Upon arrival to the PACU, 2 observers independently observed the patient. Observers utilized the Pediatric Anesthesia Emergence Delirium (PAED) scale to rate participant's postoperative behavior.

**Results:** There were 10 patients in the early administration group and 11 patients in the late administration group. There were 10 females and 11 males, with ages ranging from 20 months to 17 years. Mean age was 7.7 years old. Weights ranged from 12.2 kg up to 83.3 kg (average weight of 26.8 kg). Dexmedetomidine weight based dose range from 0.1 mcg/kg to 0.45 mcg/kg (average dose of 0.29 mcg/kg). The average high PAED score for males was 6.4 and for females was 6.65. Age, gender, and dosage did not appear to be statistically significant. A significant difference was seen in overall high PAED scores between early and late administration. The mean PAED score for early dosing was 9.05 and for late dosing was 4.23. Late dosing did show a significant decrease in PAED scores ( $P=0.03$ ).

**Conclusions:** The results of this study clearly demonstrate a statistically significant reduction in the maximum PAED scores observed with late administration (within 15 minutes of procedure end time) compared with early administration. While a reduction in scores was demonstrated, developers of the PAED scale lacked a numerical value to correspond with a diagnosis of emergence delirium, making the clinical significance more difficult to determine. More studies, including the development of an improved numerical scale are needed to produce more transferable results to the clinical setting.



**Moving Toward Holistic Admissions in CRNA Programs: Revising the Interview Process**

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**Introduction:** Increasing the number of minority nurses is one solution for eliminating health disparities. Institutionalized admissions criteria play a role in patterns that may present barriers to female applicants and/or candidates of color. Research on holistic admissions processes emphasize the importance of review and revision of said policies. This study examines the impact of multiple interventions, instituted within the interview process, on the diversity of the accepted candidate pool.

**Methods:** Self-assessment of the admissions processes revealed potential barriers for diverse candidates. Aggressive interventions were developed and implemented including: increase panel diversity, interviewer training, development of standardized question pool, revised scoring rubric, online scoring format, and inclusion of nontraditional evaluation criteria. Analysis of candidate demographic data was conducted to determine impact of intervention strategies. Data will inform a greater understanding of the impact of the interview process on the race and gender makeup of the accepted cohort.

**Results:** Postintervention data analysis found no significant gender differences between the 3 admission stages ( $p < .05$ ). The proportions of white candidates, nonwhite candidates, and “did not report” candidates remained consistent from application, to interview, to acceptance, with no statistically significant differences between the 3 stages ( $p < .05$ ). The proportion of African American candidates, in the 2017-2019 cohort, advancing from application to acceptance increased dramatically from the 2 prior cohort years. The increase in the retention of African American candidates across the 3 stages of the admission process was highly statistically significant ( $p < .001$ ). UTC IRB (FWA00004149) approved research project #15-005.

**Conclusions:** As a result of holistic intervention strategies, gender-based and race-based patterns, once visible across the 3 stages of the admissions process, have diminished to the point of losing all statistical significance. After 1 year of implementation (from the 2016-2018 cohort to the 2017-2019 cohort), there was a marked improvement in the proportion of nonwhites advancing from application to interview stage. Analysis of interview data has proven extremely valuable in checking for interrater reliability and illuminating scoring patterns that may foster selection bias.

**Source of Funding:** The Health Resources and Services Administration of the U.S. Department of Health and Human Services (HHS) under grant number D19HP26972 and title, CRNAs in 3D: Increasing Diversity, Reducing Disparities, & Understanding the Social Determinants of Health.

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**MPOG (Multicenter Perioperative Outcomes Group) Detection of Suspicious Bronchospasms  
Intraoperatively**

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**Introduction:** Bronchospasm is a serious adverse intraoperative event. The scientific community within anesthesia data science desires to innovatively find ways to discover events suspicious for intraoperative bronchospasm using physiologic data. Once the frequency is established, predictive, and then prescriptive analytics can be used to guide improved anesthesia techniques to improve patient outcomes.

**Methods:** Anesthesia cases where patients were intubated were identified. The middle half of all of those cases were analyzed for steep drops in SpO<sub>2</sub>. A subset of those cases were analyzed for steep drops in tidal volume. A subset of those cases were analyzed for steep drops in ETCO<sub>2</sub>. A subset of those cases were analyzed for steep increases of PIP. Cases with all 4 events within 2 minutes were analyzed for correlative risk factors.

**Results:** A total of 168 cases out of 46,000 met criteria for suspected bronchospasm. Those cases designated level 1 were then eliminated because they only indicated a drop in SpO<sub>2</sub>. Final number of cases in our study is 135. Case data was then put into an analysis system (RapidMiner) for final analysis to determine correlations between time of year of surgery, time of day of surgery, weight, gender, pathology, barometric pressure, temperature, and pollen count.

**Conclusions:** Intraoperative bronchospasm is an adverse anesthetic event suspected to be underreported. This project sought to clarify actual occurrence. An algorithm was developed and applied to thousands of cases in MPOG with hopes of achieving an accurate record of suspected bronchospasm occurrences. Limitations included data from 1 medical site and lack of prior research in this area. Advancement in healthcare technology would potentially allow for automated detection, elimination of self-reporting, and improvement in patient care.

**Predicting Success of Student Nurse Anesthetists in the National Certification Examination (NCE): A Retrospective Study**

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**Introduction:** The purpose of this research is to guide nurse anesthesia academic institutions, faculty, and students toward an understanding of the factors that generate higher scores on the National Certification Examination (NCE). Specific variables, including personal demographics, academic profile, and clinical education, will be identified to help predict success for student registered nurse anesthetists (SRNAs) on first attempt of the NCE. It is expected for there to be a difference among overall exam scores on the NCE when these variables of academic and clinical education are taken into consideration.

**Methods:** IRB approval was obtained prior to initiation of this study. A retrospective study was performed using data from all students who successfully completed an accredited nurse anesthesia program during the years 2005 to 2015 and attempted the NCE at least once. NCE scores were compared with student age, gender, GPA, number of clinical cases, surgical case acuity, type of surgical procedure, number of regional anesthetics administered, and the number of emergency cases performed. NCE scores were linked to these variables using a backward stepwise linear regression model to determine which variables affected certification scores.

**Results:** Linear regression analysis of the variables and the NCE scores demonstrated a statistically significant correlation among age, gender, and GPA, as well as emergent and neuraxial clinical cases experienced by the SRNAs. The results indicated that SRNAs with higher GPAs were more likely to score higher on the NCE ( $p < .0001$ ). Male students typically performed better than female students ( $p = 0.001$ ). An inverse relationship was observed between NCE scores and a student's age ( $p = 0.05$ ), number of neuraxial cases ( $p = 0.01$ ), and number of emergent cases ( $p = 0.03$ ).

**Conclusions:** Age, gender, clinical experience, and GPA are useful predictors of NCE scores and outcomes. This information can be utilized by program directors for formative assessment of their students. Therefore, early intervention may occur with students determined to be at risk for poor performance on the NCE. NCE success is likely multifactorial, and additional factors such as time elapsed between graduation and NCE test day should be explored in future studies. Therefore, program directors and other evaluators should consider additional sources of information when making decisions about selecting students for their programs.

**Reported Effectiveness and Usefulness of Electronic-Based Clinical Evaluations for BSN- DNP Student Registered Nurse Anesthetists by Certified Registered Nurse Anesthetists and Anesthesiologists in Multiple Integrated Healthcare System**

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**Introduction:** Student registered nurse anesthetists' clinical evaluations are essential to ensure clinical competencies are met based on standards established by the Council on Accreditation of Nurse Anesthesia Educational Programs. Electronic clinical evaluations (ECEs) have various advantages compared with paper-based evaluations. This Nurse Anesthesia Program utilizes ECEs, which can be completed by preceptors on portable electronic devices at the point of clinical experience and provides immediately accessible feedback. The aim of this study was to obtain feedback from CRNAs and anesthesiologists' precepting SRNAs in a multiple integrated healthcare system to assess the effectiveness and usefulness of ECEs.

**Methods:** After IRB exception was received, an anonymous Qualtrics survey link was sent to the clinical preceptors (CRNAs and anesthesiologists) who frequently precepted SRNAs in 11 different clinical sites. The survey was sent to total of 94 preceptors in the healthcare system, and only 32 responses were submitted from January 2016 to March 2017. Data received from these surveys was collected and analyzed by using SPSS.

**Results:** Survey responses were received from 7 of the 11 clinical sites. Nineteen (61%) of the responders precepted SRNAs once a week. Twenty-two (71%) of the respondents were CRNAs and (9) 29% were anesthesiologists. Twenty-two of preceptors (69%) liked using the ECEs system. All of the respondents who liked the ECEs (100%) agreed or strongly agreed that ECEs was user friendly, 17 (85%) agreed or strongly agreed that the ECEs system provided detailed feedback, while 18 (90%) of the respondents agreed or strongly agreed that the ECEs system is easy to submit and complete via handheld electronic devices. Furthermore, 19 (62%) of the respondents agreed or strongly agreed that ECEs are convenient to use in the clinical environment. An unexpected finding was that the program's daily clinical evaluation compliance increased from 85% to 96% since the implementation of ECEs.

**Conclusions:** The implementation of an ECEs submission for BSN-DNP SRNAs in an integrated multicenter healthcare system appears to be promising. Although technological barriers such as lack of Internet connectivity appear to be one of the most prominent challenges, a significant number of preceptors still favored the utilization of ECEs versus paper-based evaluations. The preceptors' ability to submit immediate feedback provided to students and register it to faculty members is another appealing feature to this innovative method of submitting clinical data. Furthermore, the ECEs allow educational programs to collect individual and collective student data to be used to adapt clinical learning needs.

### **Safe Patient Handling Practices and Equipment Use in the Perioperative Setting**

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**Introduction:** Healthcare occupations are at highest risk for work-related musculoskeletal disorders (WRMSDs) resulting from patient-handling tasks (lifting, transferring, and repositioning). These injuries have significant consequences to staff, healthcare facilities, and patients. Barriers that hinder proper safe patient handling (SPH) practices and equipment use are multifactorial. This study aimed to understand perceived barriers for use of SPH equipment and to obtain recommendations for enhanced equipment use in the perioperative setting. It was hypothesized that different barriers would be identified in the perioperative areas.

**Methods:** This project was a 2-part design. Part 1: a 16-question electronic survey was sent to 812 staff members in the perioperative setting at Mayo Clinic, Rochester, Minnesota. It assessed demographics, current SPH practices, and suggestions for improvements to SPH usage. Responses to survey questions were categorized and qualitative data were analyzed into themes. Part 2: a perioperative focus group was assembled and created a value stream map of barriers to SPH equipment use. Solutions were proposed for the different steps as the patient moved through the system from AM admission area to postoperative area.

**Results:** Survey response rate was 38%. Surgical and preoperative/postoperative areas moved patients more often than the AM admission area. Equipment was most frequently used in AM admission (79%), followed by surgical (48%), and preoperative/postoperative (45%) areas. The slider board/sheet was used in all areas (92%), while use varied for Airpal (0%-11%) and portable equipment (3%-14%). Ceiling lifts were rarely used preoperatively or postoperatively. Barriers to use were sufficient staff, patient able to move self, equipment availability, and time to move patient with equipment. Five focus group themes to improve SPH practices emerged: need for a peer leader, benefits of equipment, equipment availability/accessibility, repeated mobility assessments, and culture of safety with managerial support.

**Conclusions:** Healthcare has the highest rate of WRMSDs that are documented as harmful to staff, patients, and institutions. Barriers hindering proper SPH practices arise from issues with patients, staff, policy, work environment, and organizational and education/training factors. Improvements should be aimed at overcoming identified barriers that are unique to each institution. Creating a supportive safety culture, providing accessible and adequate SPH equipment, competency-based SPH education/training, and the presence of managerial support were facilitators in this study and are supported in the literature.

## **Stroke Volume Variation as a Method of Goal Directed Therapy in Patients Undergoing Vascular Surgery**

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**Introduction:** The endothelial glycocalyx is a key structure in vascular homeostasis. Vascular disease can cause damage to the glycocalyx that causes an increase in permeability. In patients undergoing vascular surgery, fluid management is an integral part of maintaining hemodynamic stability. Improper fluid balance contributes to postoperative morbidity. Goal directed therapy can improve resuscitation of the endothelium by decreasing vascular permeability. Improved endothelial resuscitation may lead to decreased tissue edema, decreased tissue hypoxia, and decreased organ dysfunction.

**Methods:** The literature in this review was obtained through a comprehensive search of the PubMed database, accessed through Albany Medical College's Schaffer library. Keywords for the search included stroke volume variation, vascular surgery, goal directed fluid therapy, and fluid responsiveness. Dates of search include May 19, 2016 to July 8, 2016. Only English language, peer reviewed articles were accepted for inclusion.

**Results:** Funk et al revealed significantly fewer postoperative complications, higher cardiac index, and lower postoperative complications when utilizing stroke volume variation in patients undergoing open abdominal aortic aneurysm repair. Van der Linden et al revealed there was no difference in hemodynamic data or hospital stay between groups. The use of goal directed therapy in patients undergoing peripheral arterial surgery was not different from patients who received standard hemodynamic monitoring. Kim et al revealed a significantly higher stroke volume variation prior to fluid loading. Kim et al determined stroke volume variations to be a reliable predictor of fluid responsiveness in patients undergoing general anesthesia for carotid endarterectomy.

**Conclusions:** Maintaining integrity of the endothelium, to decrease permeability and decrease postoperative complications, is crucial in the management of vascular surgery patients. Simultaneously preventing hypovolemia and hypervolemia is known to improve outcomes among surgical patients, and this is especially important in the vascular surgery patient. Funk et al suggests that vascular integrity was maintained despite an inflammatory response. Maintaining endothelial integrity resulted in less tissue hypoxia and organ dysfunction. The study suggests that improved postoperative outcomes, associated with goal directed therapy are related to mechanisms other than inflammatory response.

## A41

### **The Development of an Instrument to Measure the Concept of Workload for Certified Registered Nurse Anesthetists**

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**Introduction:** Research indicates high workload among CRNAs is significantly associated with perceptions of: 1) unsafe work setting, 2) fair to failing patient safety ratings, and 3) higher incidence of adverse event reporting. To further evaluate how CRNA workload affects patient safety, it is important to determine exactly what factors comprise CRNA workload because it is unclear whether existing tools capture CRNA workload. The specific aim of the study was to develop an instrument to accurately measure CRNA workload, based on 2 workload instruments that have been validated in inpatient staff nurses.

**Methods:** The study was a mixed method, exploratory study. Part 1 consisted of expert review of existing workload instrument for content. Part 2 consisted of use of CRNA focus groups to review the tool developed from part 1; the tool developed in part 1 was administered to small focus groups at the 2016 AANA Annual Congress. Participants completed the preliminary workload survey tool and participated in structured interviews to generate and validate instrument content.

**Results:** Focus group data was transcribed and reviewed by research team using NVIVO 10 software. The research team produced a 12-question instrument with a 1-5 Likert scale scoring.

**Conclusions:** A tool to measure CRNA workload was developed. Next steps include a psychometric analysis of the tool using exploratory and confirmatory factor analysis.

**Source of Funding:** UAB School of Nursing Dean's Scholar Award.

**A42**

**The Effect of Autologous Human Amniotic Fluid on Platelet Aggregation**

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**Introduction:** Amniotic fluid embolism (AFE) is a rare complication associated with pregnancy. AFE typically presents with respiratory distress, cardiovascular collapse, and coagulopathy in the absence of other explanation. Eighty years of research has inspired a number of theories about AFE, but none that have improved the ability to predict or prevent its occurrence. Hypotheses about the cause of AFE include mechanical pulmonary obstruction, an immunologic mechanism, and platelet activation with release of mediators causing severe pulmonary hypertension. The aim of this study is to determine if platelet aggregation occurs when platelet rich plasma (PRP) is exposed to autologous amniotic fluid.

**Methods:** This ex vivo investigation was conducted with a control and experimental groups. Fresh autologous amniotic fluid (AF) and maternal venous blood samples were collected during cesarean delivery. Amniotic fluid was introduced into PRP in an aggregometer to test for aggregation. Additionally, PRP samples were incubated with AF before introducing an aggregant, adenosine diphosphate, in order to test for a synergistic or enhancing effect.

**Results:** Amniotic fluid, when introduced to PRP, produced little to no observable effect. Adenosine diphosphate added to PRP incubated with AF showed no significant difference in aggregation when compared with control assays. For this experiment,  $P < 0.05$ .

**Conclusions:** Although this study did not evoke platelet aggregation, previous studies have supported that coagulation is directly impacted by AF in blood. Irreversible platelet aggregation, platelet-neutrophil aggregation, and decreased time to clot formation have been reported. It is recommended that future research explore aggregation using whole blood and platelet activation measuring release of relevant mediators, serotonin in particular.

**Source of Funding:** Webster University Nurse Anesthesia Department.



**The Effect of Leadership Rounding on Staff Satisfaction and Retention**

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**Introduction:** Healthcare facilities today face the tremendous challenges of retaining their employees. Turnover of healthcare staff has mainly been attributed to antagonistic supervisory relationships as well as dissatisfaction with their workplace environment. The practice of executive walk-rounds, also known as leadership rounding, has been introduced in hospitals as a method for leaders to forge stronger, more collaborative relationships with their staff via scheduled, structured activities. The purpose of this research endeavor is to review the relevant literature and document the findings that illustrate the effect of leadership rounding on staff satisfaction and retention.

**Methods:** An extensive peer-reviewed literature search for articles in the English language was conducted through EMBASE, CINAHL, and PubMed. Different combinations of keywords were used, which included executive, leadership, nurse managers, rounding, walk-rounds, staff satisfaction, nurse retention, and engagement. Studies evaluating patient satisfaction, patient care, and patient-centered rounding were not considered to be within the scope of the review. The evidence of the 13 articles selected and analyzed indicates that leadership rounding helps build closer relationships between leaders and staff, improves staff satisfaction, and increases staff retention rates.

**Results:** Leadership rounding has been successfully employed in many hospitals and various units and departments with satisfactory outcomes. With this practice, leaders proactively collect information, track employee progress, implement improvements, reinforce positive behaviors, and recognize achievements. Feedback from healthcare staff has been found to be positive as well. Specifically, healthcare subalterns value the support, empowerment, direct communication, and motivation provided through leadership rounding. Exhibiting pronounced increase in job satisfaction and greater engagement, healthcare employees will culminate in improving the work culture, thus benefiting the organization as a whole.

**Conclusions:** Based on a selection of peer-reviewed articles, there is ample evidence supporting the benefits gained from leadership rounding in healthcare facilities. The practice of leadership rounding can be employed for any healthcare professions at any level of leadership. However, it is advocated that future research investigate and report the impact of additional approaches and other strategies being implemented have on factors such as job satisfaction, retention, turnover, and relationship quality. Such research will yield more precise insights regarding the leadership rounding processes and their impact on the organizations.

**The Effect of Preoperative Beta-blocker Therapy on Postoperative Pain in Orthopedic Surgery**

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**Introduction:** Opioids are the treatment of choice for managing postoperative pain; however, they are associated with adverse physiological and psychological effects. An increasing number of prescription opioid-related deaths has prompted providers to seek alternative methods for pain control, and multimodal pain management approaches have been effective in minimizing the negative side effects of opioids. Previous research shows the efficacy of intravenous beta-blockers in reducing postoperative opioid requirements; this study questioned if oral beta-blocker therapy had a similar opioid-sparing effect.

**Methods:** After IRB approval was obtained, a retrospective chart review at MUSC took place on patient data from July 1, 2014 to June 1, 2016. Records were randomly selected from the EPIC database; a sample of 140 subjects was obtained. Intra-rater reliability was analyzed using percent agreement. Inclusion criteria included age 35 to 75 and total hip or total knee replacements. Exclusion criteria included dementia, chronic pain, postoperative ICU admission, and patients in the non-beta-blocker group who received preoperative beta-blockers. Data were analyzed to compare relative opioid consumption between the groups.

**Results:** Among the 2 compared sample groups, there was no statistical difference of age, length of hospital stay, gender, type of surgery, presence of peripheral neuraxial blockade, or presence of nerve block catheter. However, subjects in group 1 were more likely to have higher BMI, despite randomization. The data showed that between the 2 groups, there was no difference in morphine-equivalents given postoperatively at any of the measured time intervals, and there was no difference in pain scores at any of the measured time intervals, examining both mean and maximum pain scores.

**Conclusions:** This study concluded that there was no reduction in postoperative opioid requirements or pain scores in patients on preoperative beta-blockers. This study did not support the findings of other studies that evaluated the effect of intraoperative esmolol on postoperative pain. Incidentally, this study demonstrated that there is a positive association between obesity and beta-blockade.

## The Effects of an Educational Intervention on Ultrasound Imaging Competency Among Practicing CRNAs

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**Introduction:** Ultrasound imaging (UI) benefits many procedures commonly performed by CRNAs, such as peripheral anesthesia and vascular access. These advantages are highly dependent on clinician proficiency, and improper use may result in procedural medical errors. Despite the Anesthesia Patient Safety Foundation's recommendations, there are few studies exploring interventions to improve UI competency within the nurse anesthesia literature. Therefore, the purpose of this research is to measure the effects of a new UI educational intervention on UI competency levels among practicing CRNAs.

**Methods:** This was a pretest, test, and posttest design. CRNAs performed ultrasound-guided vascular assessments of the radial artery (RA) and internal jugular vein (IJV). During these simulations, UI competency was measured by expert raters using the Objective Structured Assessment of Ultrasound Skills (OSAUS), a tool previously used by other medical specialties to evaluate UI skill. Participants then completed the educational intervention: two 1-hour lectures available on AANA Learn and practice with the SonoSite Edge device. UI competency levels were reassessed after 2 months postintervention time.

**Results:** The mean total competency scores for the ultrasound-guided RA and IJV assessments improved significantly ( $p < 0.03$ ) compared with preintervention scores. Furthermore, mean scores for the OSAUS subcomponents: systematic examination, image interpretation, and documentation, improved significantly ( $p = <0.05$  to  $<0.01$ ) compared with preintervention scores during RA assessments. Similarly, mean scores for the OSAUS elements: applied knowledge and image optimization, improved significantly ( $p = <0.05$ ) compared with preintervention scores during the IJV assessment. Finally, intraclass correlation using the OSAUS instrument was established among expert UI raters, yielding  $\kappa = 0.92$  and  $ICC = 0.91$  ( $p < 0.001$ ).

**Conclusions:** This research has 2 primary outcomes relevant to the education of CRNAs on the use of ultrasound technology. First, it shows the positive effects of an educational program on UI competency for arterial and venous assessments among practicing CRNAs. Second, this investigation extends the previous literature on the OSAUS instrument to the anesthesia specialty by assessing CRNA competency levels when completing ultrasound-guided vascular assessments.

**Source of Funding:** Department of Anesthesia, Critical Care and Pain Medicine sponsored CRNA Developmental Fund.

A46

**The Effects of Sternal Intraosseous and Intravenous Administration of Amiodarone in a Hypovolemic Swine Cardiac Arrest Model**

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**Introduction:** Hypovolemia is the leading cause of cardiac arrest (CA) in civilian and military trauma. CA is the leading cause of morbidity and mortality in the United States. Increased return of spontaneous circulation (ROSC) has been shown when emergency medications are given. Timely establishment of vascular access for fluid resuscitation and emergency medication administration is essential, and a delay will have negative implications for the patient. Establishment of intraosseous (IO) access has been demonstrated to take less time than IV access. No studies have examined IO versus IV amiodarone administration in a hypovolemic model.

**Methods:** This study was a prospective experimental design comparing administration of amiodarone by sternal intraosseous (SIO) and IV in a hypovolemic cardiac arrest model relative to ROSC and time to ROSC. Swine were randomly assigned to 4 groups: CPR only (n = 7), CPR and defibrillation (n = 7), SIO amiodarone and defibrillation (n = 7), and IV amiodarone and defibrillation (n=7). Subjects were anesthetized, placed into cardiac arrest, and administered amiodarone per AHA guidelines for cardiopulmonary resuscitation to establish ROSC and time to ROSC.

**Results:** Multivariate analysis showed no significant differences in time to ROSC between SIO and IV amiodarone (p=0.191). There were no significant differences between IV and SIO in Tmax (p=0.317) or Cmax (p=0.260). Fisher exact test showed significant difference between SIO amiodarone versus CPR only (p=0.005) and IV amiodarone versus CPR only (p=0.005). Odds ratio for SIO and IV versus CPR showed a 33 times greater chance of survival (p=0.033). No significant difference was found between IO versus SIO concentration at time intervals (Wilks lambda=0.515).

**Conclusions:** The data collected from this study showed no statistically significant difference in ROSC, time to ROSC, and Tmax and Cmax between SIO and IV routes of administration. However, there were significant differences between SIO/IV groups versus the CPR/Defib and control groups. Based on these findings, we recommend that SIO should be considered the first choice for administration of amiodarone in cardiac arrest given no previous access has been established. Future research could evaluate the time required to establish IV access as well as include simultaneous kinetic studies.

**Source of Funding:** This study was funded by a grant from the TriService Nursing Research Foundation.

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### **The Effects of Tibial Intraosseous Versus Intravenous Amiodarone Administration in a Hypovolemic Cardiac Arrest Porcine Model**

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**Introduction:** Survival from cardiac arrest depends on a rapid sequence of therapeutic interventions, and establishing intravenous (IV) access is a vital step in this process. Obtaining IV access can be challenging and so utilizing intraosseous (IO) devices can provide reliable and efficient delivery of drugs. This study aimed to compare peripheral IV versus tibial IO route of medication administration in hypovolemic cardiac arrest on the following: return of spontaneous circulation (ROSC), time to ROSC, maximum drug concentration (C<sub>max</sub>), time to maximum concentration (T<sub>max</sub>), and concentration over time.

**Methods:** The study was a randomized, prospective, between-subjects experimental design. Twenty-eight Yorkshire swine were randomly assigned to a computer-generated random number program to 1 of 4 groups including IV, tibial IO, CPR plus defibrillation or CPR-only group. Both the CPR + defibrillation and the CPR-only group served as controls. A large effect size of 0.6 was calculated. A porcine model was used because of the similarities between the cardiovascular system and osseous tissues of swine and humans. Additionally, swine and humans have similar blood volume ratios of 60 to 70 mL/kg of body weight.

**Results:** A MANOVA demonstrated no significant differences by group in reference to weight, hemorrhage amount, hemodynamic parameters, and vital signs indicating that the groups were equivalent ( $p > 0.05$ ). No significant difference was found between IV and TIO groups in reference to C<sub>MAX</sub> ( $p = 0.291$ ). There was no significance found in T<sub>max</sub> between the TIO and IV groups ( $p = 0.475$ ). There were no significant differences in the mean concentrations between the TIO and IV groups. There was no significant difference between the TIO and IV groups relative to time to ROSC. A chi-square test showed no significant differences in rates of achieving ROSC between TIO and IV groups ( $p = 0.515$ ). There was a significant difference found between IV and CPR-only groups.

**Conclusions:** There were no significant differences in outcome variables relative to the administration of amiodarone by TIO route compared with the IV route. Prompt vascular access using TIO insertion can circumvent the interruption in the treatment observed with attempting IV access. Insertion of an IV can take from 2 to 30 minutes, while insertion of an IO line can be obtained in about 20 seconds. Timely vascular access is essential in successful resuscitation of patients in cardiac arrest. The findings of this study suggest that the TIO route may be a prudent first choice for obtaining vascular access.

**Source of Funding:** The study was funded by a grant from the TriService Nursing Research Program grant N09-CO1.

### **The Impact of High-Fidelity Simulation on Malignant Hyperthermia Management**

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**Introduction:** Malignant hyperthermia (MH) is a high risk, low incidence medical emergency that carries a high incidence of mortality. High-fidelity simulation (HFS) has been utilized as a training model for managing scenarios that are infrequently seen in the clinical environment but manifest potentially lethal outcomes if not addressed promptly. The purpose of this research is to address whether HFS retention of knowledge and confidence to successfully treat an MH crisis when compared with didactic only training in student registered nurse anesthetists (SRNAs).

**Methods:** A 10-question MH quiz was administered at 3 different points in time to assess retention of knowledge based on didactic training alone compared with those supplemented with simulation. There were 12 participants, 6 in each group. The participants also rated their confidence level pertaining to each of their answers on a 5-point scale. Group 1 received the 3 MH exams and did not participate in simulation. Group 2 received the 3 MH exams along with HFS. HFS was conducted in a simulated OR with a trained facilitator. Simulation ended with a group debriefing allowing the group to reflect on how they handled the scenario.

**Results:** Two sample t-tests were used to compare the total test scores between both groups at each point in the examination timeline. A p-value of less than 0.05 was considered statistically significant. Results concluded that students exposed to simulation had higher scores on all 3 individual tests provided. Cumulatively, group 2 scored 5.56% higher than group 1. Comparing the confidence scores of 0 (not confident) to 5 (confident), group 1's average confidence score was 2.62 and group 2's average confidence score was 3.23. At the end of the research, group 1 had a cumulative total of 69.44% correct, while group 2 had a cumulative total of 75% correct.

**Conclusions:** High-fidelity simulation coupled with didactic training resulted in higher test scores. Although it was not proven statistically significant, students exposed to simulation had better outcomes than those with simulation alone. The confidence scores suggest the participants were more confident in their knowledge of how to treat an MH crisis after experiencing simulation.

## The Impact of Perioperative Adverse Events on Anesthesia Providers/Learners at a Large Academic Healthcare Institution in the Midwest

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**Introduction:** Efforts have been made to decrease adverse events in healthcare, but most of this attention has focused on caring for patients and families as first victims. It is time to focus on involved clinicians as second victims to adverse events, including anesthesia providers. It's inevitable that anesthesia providers will be involved in cases that cause harm or result in unexpected patient outcomes. Organizations need to have an awareness of the impact that adverse events may have on affected clinicians, along with adequate postevent support. Investing in support systems strengthens the organizational culture of safety and continually improves the quality of care provided.

**Methods:** In this descriptive study, a survey design was used to obtain both quantitative and qualitative data from a sample of 587 anesthesia providers. Quantitative data were obtained through questions consisting of dichotomous, multiple choice response sets, and forced-choice Likert scales. Open-ended questions elicited qualitative data. Respondent characteristics were summarized using frequency counts and percentages for categorical variables. Survey responses were summarized using descriptive statistics with point estimates. Qualitative responses were reviewed using qualitative data analysis, resulting in identification of themes. Quantitative data analysis was done using JMP software.

**Results:** A total of 353 responses were received (60% response rate). Adverse events were experienced by 68%. Symptoms included reliving the event (78%), guilt (72%), anxiety (71%), professional self-doubt (56%), depression (54%), and sleeplessness (54%). Sixty-two percent reported compromised emotional well-being postevent: 31% recovered in a week, 27% in a day, and 13% have never fully recovered. In the first 24 hours postevent, 85% provided anesthesia: 72% believe their ability to provide care was compromised in the first 4 hours and 63% for 24 hours. The majority (69%) sought support from anesthesia colleagues. Desired postevent procedures include: 90% debriefing with anesthesia colleagues, 82% time away from the ORs, and 76% debriefing with entire OR team. Sixty-five percent do not feel adequate support is available postevents.

**Conclusions:** A large percentage of anesthesia providers have experienced an adverse event during their anesthesia careers, displaying various symptoms of the second victim phenomenon. The majority use informal support from anesthesia peers but also desire a formalized debriefing process to be standard operating procedure postevent. Support available is perceived as inadequate by the majority of anesthesia providers, demonstrating the need for the development and implementation of an enhanced evidence-based peer support program.

**Source of Funding:** Survey development was possible through the assistance of the Survey Research Center at Mayo Clinic Rochester. The statistical analysis was completed with the expertise and guidance of the Mayo Clinic Center for Clinical and Translational Science (CCaTS).

**A Comparison Between Dexmedetomidine and Propofol on Extubation Times in Postoperative Adult Cardiac Surgery Patients: A Systematic Review and Meta-analysis**

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**Introduction:** This systematic review will investigate the effects of dexmedetomidine compared with propofol on time to extubation, total length of ICU and hospital stay, and in-hospital mortality rates in postoperative cardiac surgery patients. Early extubation is a key component to reducing complications relating to long-term mechanical ventilation, and development of early extubation protocols may be of value to practitioners as it may help reduce the patient's length of stay (LOS) in the ICU and in the hospital, resulting in decreased hospital costs and ultimately improved patient outcomes.

**Literature Review Analysis:** One randomized controlled trial and 3 retrospective cohort studies were included in our review and meta-analysis after a systematic literature search and critical appraisal. A meta-analysis of our data shows dexmedetomidine is associated with a statistically significant decrease in length of mechanical ventilation, ICU length of stay, and total hospital length of stay. Included studies report no significant difference in adverse drug events or complication rates.

**Implement Evidence:** Prior to implementation of our findings, we advise practitioners to assess patients for any contraindications to propofol or dexmedetomidine, including preexisting bradycardia or hypotension, fixed cardiac output, dependence on sympathetic tone, or significant liver disease. These findings are only appropriate for cardiac surgery patients and cannot be extrapolated to other patient populations.

**Conclusions:** Dexmedetomidine, compared with propofol, is associated with a shorter length of mechanical ventilation, decreased ICU length of stay, and decreased total hospital length of stay in postoperative cardiac surgery patients. Incidence of adverse drug events and medical complications are similar between the groups. Excluding contraindications, dexmedetomidine can be recommended for implementation into fast-track cardiac surgery recovery protocols.



**A Process for Assessing Parental Satisfaction With the Pediatric Outpatient Surgical Experience**

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**Introduction:** Patient satisfaction plays a vital role in healthcare. While once considered desirable, but not mandatory, it is now used as a patient-centered quality of care indicator. Patient satisfaction surveys can affect hospital reimbursement through pay for performance programs. Using patient satisfaction surveys such as H-caps can also drive practice improvement efforts. To evaluate satisfaction in a large academic medical center's outpatient pediatric surgical population, a survey was developed to evaluate and measure parental satisfaction with a child's perioperative care.

**Literature Review Analysis:** Literature supports the use of parent satisfaction surveys to assess need for practice change. A recurring theme throughout the literature is that parents are satisfied with the same day surgery process; however, there is room for improvement. Some areas of concern discussed within the literature are communication, wait times, anxiety management, and postdischarge pain management. Research supports the need to develop and implement a survey to ensure medical centers are providing quality care to pediatric outpatient patients and their families. Although it is likely that the standard of care is being met, a study of this nature is necessary to evaluate service performance and indicate areas of needed improvement.

**Implement Evidence:** To evaluate parental satisfaction at the institution, a survey was developed based on best evidence, in collaboration with experts from the institution's Survey Research Center. Oral consent was obtained on the day of surgery during the perioperative period. If they opted to participate, the parent/caregiver was given a choice to complete the survey either by telephone or via email. The survey was administered 48 to 72 hours following their child's procedure.

**Conclusions:** The survey consisted of questions that focused on the child's experience before the day of surgery, on the day of surgery, after surgery while in the hospital, and postdischarge. The development and implementation of the survey provided valuable insights into the lived experience of patients and families at the study institution. Developing and conducting the survey is consistent with recommendations from literature that encourages healthcare providers and systems to continually assess quality of patient care, and it may provide valuable information on which to base a practice change.

**A Review of the Department of Veterans Affairs' Proposed Rule Permitting Full Practice Authority With an Examination of Anesthesia Delivery Models**

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**Introduction:** At a time when the US government is attempting to identify strategies to increase veterans' access to healthcare, examining the role of advanced practice registered nurses in the Veterans Health Administration has been deemed appropriate. In an attempt to address this problem, the Department of Veterans Affairs proposed rule RIN 2900-AP44 in May 2016 allowed advanced practice registered nurses to practice to their full scope of education, training, and experience without physician supervision. Recently, opponents cited safety issues as reason to deny the rule for CRNAs.

**Literature Review Analysis:** PubMed, CINAHL, and the Cochrane Library were searched from May to October 2016 at Albany Medical College's Shaffer Library. Studies included are all retrospective cohort studies that used predictive regression models to analyze anesthesia outcomes published within the last 15 years. Studies using limited surgical populations were excluded. Pine et al (2003) found no difference in risk adjusted mortality rates by type of anesthesia provider. In Dulisse and Cromwell (2010), complication rates did not differ between CRNAs and anesthesiologists. In Negrusa et al (2016), comorbidities, patient characteristics, and procedures correlated to anesthesia-related complications but scope of practice laws and delivery models did not.

**Implement Evidence:** Military CRNAs are accustomed to practicing without supervision. When active duty ends, practice is dictated by state practice acts, and they may no longer be eligible to work without physician supervision. Enabling a smooth transition of CRNA professional practice between active duty and Veterans Health Administration employment by allowing CRNAs to practice to their full scope of education, training, and experience would have increased the number of qualified practitioners within the Veterans Health Administration while maintaining cost neutrality.

**Conclusions:** Recent arguments against the Veterans Affairs' proposed rule RIN 2900-AP44 cited safety concerns among delivery models to be the main reason to reject the proposed rule. The evidence presented in this literature review failed to demonstrate a significant difference in anesthesia outcomes between different anesthesia provider models or scope of practice regulations. Concerns of decreased level of safety among different CRNA practice models should not have been a deterrent from supporting rule RIN 2900-AP44.

**Addition of Buprenorphine Augments Bupivacaine in Femoral and Sciatic Nerve Blocks**

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**Introduction:** Regional anesthesia improves analgesia and reduces systemic side effects in patients undergoing lower extremity surgery. It is associated with fewer adverse effects than systemic opioids. Duration of block may be insufficient, leading to increased opioid use and adverse effects. This literature review evaluates if buprenorphine added to femoral and sciatic nerve blocks prolongs duration of action and reduces opioid use. A comprehensive electronic database search was performed. Three peer reviewed English language articles published in the last 7 years were selected for final review.

**Literature Review Analysis:** Buprenorphine prolonged duration and analgesic effect of the femoral nerve block ( $48.07 \pm 5.0$  h) compared with control ( $43.6 \pm 7.16$  h,  $P=0.014$ ) (Kosel et al, 2015). NRS pain scores were 50% lower in PACU (Candido et al, 2010). LA group had lower pain scores at 6 and 12 hours ( $P<0.0005$ ), IM control group lower scores at 12 and 24 hours ( $P<0.0005$ ), buprenorphine additive group lower scores 24 and 36 hours ( $P<0.0005$ ). Duration was longest in buprenorphine additive group (36 hours). Buprenorphine group required fewer postoperative opioids. Twenty-four-hour postoperative opioid administration was lower in buprenorphine groups (YeDeau et al, 2015). There was no difference in 24-hour pain scores ( $P=0.149$ ). Mean duration of block was 45 hours in the buprenorphine additive group.

**Implement Evidence:** Total knee arthroplasties (TKA), one of the most common orthopedic procedures worldwide, has risen in volume by 154% between 1993 and 2011. The Centers for Disease Control and Prevention (CDC) reports approximately 720,000 TKAs were performed in 2015 and projects the demand will increase to 3.48 million TKAs in 2030. Such a high demand will require providers to use techniques that extend analgesia further into the recovery phase. Buprenorphine addition provides a way to prolong analgesia more than local anesthetics alone while decreasing systemic opioid use, thus reducing side effects and enhancing recovery.

**Conclusions:** The addition of buprenorphine to femoral and sciatic nerve blocks demonstrated a prolonged duration of analgesia and a reduction in postoperative opioids. This addition may enhance recovery and reduce side effects caused by systemic opioids. Other studies have demonstrated similar effects of buprenorphine in upper extremity blocks. Further studies evaluating the perineural mechanism of action of buprenorphine is required before addition becomes a standard of care.

**A54**

**American Association of Nurse Anesthetists Draft Guidelines for the Management of Postcesarean Pain**

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**Introduction:** Approximately 4 million births occur each year in the United States, with cesarean delivery rate exceeding over 30%. Effective analgesia is important after cesarean delivery to facilitate recovery and optimize the mother's ability to care for her newborn. Consistent utilization of evidence in clinical practice regarding optimal postcesarean pain control modalities may reduce variations in outcomes. The development of evidenced-based practice guidelines, which are constructed with rigor and preciseness, will connect current literature with clinical practice with the intent to improve maternal and newborn care.

**Literature Review Analysis:** A literature search was conducted using the National Center for Biotechnology Information (NCBI) PubMed, CINAHL, and Cochrane Databases to identify literature. Full text articles were identified through the following MeSH terms: cesarean section, chronic pain, pain management, spinal anesthesia, epidural anesthesia, general anesthesia, and opioids. Upon reviewing 123 abstracts, 29 articles were retained for analysis. Review of the literature suggests the provision of optimal pain relief for cesarean delivery patients can be attained through the combination of a minimum effective dose(s) of opioid(s) combined with an NSAID, acetaminophen, and dexamethasone. Patients who are challenged with a history of chronic pain or substance abuse may benefit from the addition of local anesthetics and/or ketamine.

**Implement Evidence:** AANA guidelines will be published and available on the AANA website. Various podium presentations will be conducted including at the AANA Annual Congress.

**Conclusions:** The prevalence of acute pain is high in postsurgical patients. Poorly controlled pain is associated with lower patient satisfaction, impaired rehabilitation, delayed hospital discharge, and long-term medical problems such as chronic pain development. Superior pain relief is provided with minimum effective doses of neuraxial opioids combined with multimodal agents including nonsteroidal anti-inflammatory drugs, acetaminophen, dexamethasone and, if needed, ketamine and local anesthetics.

## **An ERAS Protocol Utilizing Gabapentin for the Prevention of PONV**

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**Introduction:** Postoperative nausea and vomiting (PONV) is the greatest cause of unplanned hospital readmission after outpatient surgery. The prevalence of PONV in the general surgical population is 30% to 80% in high-risk surgical populations. Over 137 million obstetric and laparoscopic procedures are performed annually. Gabapentin is believed to inhibit the excitatory neurotransmitters responsible for the PONV response. The purpose of this evidence-based practice research is to evaluate the empirical evidence on the effects of gabapentin on PONV with regard to safety, efficacy, and cost.

**Literature Review Analysis:** A double-blind clinical trial involving 200 patients undergoing cesarean delivery under spinal anesthesia concluded that the administration of gabapentin prior to incision resulted in a significant decrease in PONV ( $P=0.048$ ). A meta-analysis of 8 trials concluded that gabapentin significantly reduces PONV with a confidence interval of 99%. A systematic review of 17 trials concluded that gabapentin decreases PONV in patients undergoing abdominal surgery with a confidence interval of 95%. Economic evaluation of an enhanced recovery after surgery (ERAS) protocol showed that the primary length of stay was significantly reduced and resulted in an overall healthcare cost saving of \$2,290,000 or an average of \$1,768 per patient.

**Implement Evidence:** Preoperative administration of 600 mg to 900 mg of gabapentin 1 hour prior to anticipated surgical incision followed by an oral regimen of 600 mg to 900 mg every 6 hours for 24 hours will decrease the incidence of PONV in obstetric and surgical patients. The utilization of gabapentin reduces nausea and vomiting after surgery, decreasing costs to the healthcare system associated with PONV treatment. An ERAS protocol utilizing gabapentin for the prevention of PONV will decrease length of stay and eliminate the negative sequelae such as dehydration, wound dehiscence, and patient dissatisfaction.

**Conclusions:** The use of preoperative gabapentin has been shown to reduce the incidence of PONV in obstetric and surgical populations. The implementation of an ERAS protocol utilizing gabapentin will lead to increased patient satisfaction, higher hospital reimbursement rates, and positive patient outcomes. Its economical impact will serve as a business model to help institute practice change globally. An ERAS protocol serves as evidence that can guide future research while spreading awareness about the impact of PONV in the surgical population and healthcare economy for increased safety, efficacy, and cost.

A56

## **An Evidence-Based Review Examining Telemedicine's Use in the Preoperative Anesthesia Evaluation**

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**Introduction:** Before elective surgery, patients are required to have a preanesthetic evaluation with the primary objective to assess medical optimization. This evaluation includes an airway examination, review of medical records, laboratory data, and any other tests. Surgery cancellations and delays can result from not performing the preanesthetic evaluation due to reasons such as transportation challenges or work commitments. The use of telemedicine (TH) in the preanesthetic evaluation may facilitate safe patient care while reducing patient inconvenience and cost.

**Literature Review Analysis:** The search for evidence using PubMed, Cochrane Library, ancestors approach, and Google Scholar resulted in 115 potential evidence sources. Six descriptive studies (2 case reports, 2 retrospective studies, and 2 surveys) and 1 randomized controlled trial met the inclusion criteria. The evidence overall suggests that the preanesthetic evaluation using TH technology is as reliable as those conducted by traditional in-person methods. Studies confirmed that TH assessments are not only accurate and efficient, but also patients are becoming more accepting of this technology.

**Implement Evidence:** The findings of this review will be used to explore TH technology to accomplish the preanesthetic interview for patients undergoing surgery at a small Midwestern specialty healthcare facility. Findings from this evidence-based review will also help to identify areas of future research such as refinement of technology used in TH. Issues that continue to need attention include TH licensure and the ability to consult across state lines, professional liability, and patient privacy.

**Conclusions:** The existing evidence suggests that TH is establishing itself in healthcare and the preanesthetic evaluation. With faster Internet connections and the everyday use of smartphones and tablets, it may become more convenient and economical to use a video conference for one's healthcare appointment.

**Anesthesia and Perioperative Management of Patients With Ehlers-Danlos Syndrome**

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**Introduction:** Ehlers-Danlos syndrome (EDS) is a rare, inherited connective tissue disorder caused by production of dysfunctional collagen. Symptoms are most noticeably seen in tissues with an abundance of collagen, including joints, skin, and soft tissues. There are multiple subtypes of EDS. Type IV is the only type associated with an increased risk of death, but all patients with EDS require careful attention from the anesthetist because of an increased risk of bleeding, fragility, and rupture of the vasculature and soft tissues, joint instability and hypermobility, and reported resistance to local anesthetics, all of which could potentially alter anesthesia management.

**Literature Review Analysis:** Five authors point out that typing is important to EDS anesthesia management. Some suggest avoiding invasive lines. A PICC line became dislodged in a patient in 1 report; however, there were no other issues with invasive lines throughout the studies. Two authors advocate for the use of invasive lines because of the benefits of close hemodynamic monitoring in the event of arterial rupture. In 2 cases, the nose was instrumented, resulting in bleeding. Eleven case reports were performed with regional anesthesia, all without serious complications. There were no reports of resistance to local anesthetics. Two cases were performed successfully with general endotracheal anesthesia with rapid sequence induction; no issues were noted.

**Implement Evidence:** It is especially important to perform a detailed preoperative evaluation, history, and physical on these patients in order to individualize their anesthetic plan and identify risks. Invasive monitoring is possible and may be used if it is determined that the benefits outweigh the risks. Nasal instrumentation, however, should likely be avoided, and providers should be prepared for bleeding. Regional blocks can be performed safely in these patients. General endotracheal anesthesia may be safe if the airway is carefully instrumented and airway pressures are minimized.

**Conclusions:** The current literature is mostly case reports from the last 30 plus years, likely due to the rarity of this disease. No high-level practice recommendations can be made given these limitations; however, the literature does indicate that despite the risks involved with EDS patients, anesthesia can be safely performed using standard techniques if careful consideration is given to potential complications specific to this patient population. The preoperative evaluation is especially important in order to determine EDS type and identify risks. Given the rarity of this disease it is important to add to the current research, particularly with the lesser studied subtypes and complications.

A58

## **Anesthetic Application of Ketamine for the Rapid Treatment of Depression**

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**Introduction:** Depression is a common and significant comorbidity seen by the nurse anesthetist. Depression has significant effects on patient outcomes: increased postoperative pain, increased postoperative opioid use, delayed return to function, decreased satisfaction with received care, increased length of stay, and increased hospital cost. Ketamine has received significant attention as a pharmacological agent with rapid-acting antidepressive effects. This literature review attempts to assess current findings of implementation of ketamine for depression as part of anesthetic management. Reduction in depressive symptoms with ketamine may improve the quality of care provided by the CRNA.

**Literature Review Analysis:** A comprehensive electronic search of the literature was conducted. Jiang et al (2016) implemented a double-blind design with an orthopedic population. Patients received either ketamine or placebo. The ketamine group had reductions in both depressive symptoms and pain up to postoperative day (POD) 5. Kudoh et al (2002) implemented a double-blind experimental design with a depressed orthopedic population. Depressed patients received either ketamine or placebo. Patients receiving ketamine were found to have significant reduction in depression and pain on POD 1. No differences in postoperative delirium were seen between the 2 groups. Ghasemi et al (2014) implemented a head-to-head comparison of ECT to ketamine administration. Ketamine was found to be equally effective at reducing depression with faster onset of effect when compared with ECT.

**Implement Evidence:** The current anesthetic armamentarium provides supportive treatment to patients with comorbid depression. Secondary effects of depression are often managed by the CNRA. Yet literature review suggests that perioperative ketamine administration may offer primary treatment of depression. Effective reduction of depressive symptoms occurred with ketamine dosing of 0.5 mg/kg. Onset of antidepressant effects were rapid, and the reduction of depressive symptoms lasted up to 5 days postoperatively. Ketamine was also found to significantly reduce pain in this population. Therefore, the anesthetist may consider tailoring anesthetic plans to include ketamine for depressed patients.

**Conclusions:** Ketamine may be ideal for the perioperative management of depression due to the agent's intravenous route of administration, preexisting role as an established anesthetic, short anesthetic duration, and rapid-onset antidepressant effects. Administration of ketamine (0.5 mg/kg) reduced depression for up to 5 days postoperatively, which may lead to overall improvements in patient outcomes through the reduction of depressive symptoms. Patients receiving ketamine had significantly lower pain scores when compared with placebo. Thus, perioperative implementation of ketamine may directly improve the nurse anesthetist's quality of care delivered to patients affected by comorbid depression.



A59

## **Anesthetic Implications of Posttraumatic Stress Disorder and Emergence Delirium**

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**Introduction:** It is estimated that the incidence of emergence delirium after general anesthesia is approximately 27% in military combat veterans compared with only 5% in the general population. Evidence suggests that the rate of occurrence will continue to rise due to military members returning from wars in the Middle East and other combat-related deployments. Emergence delirium is characterized by “transient agitation, confusion, and violent physical and verbal behavior” in the operating room or the postanesthesia care unit (PACU) immediately following general anesthesia. Emergence delirium typically occurs during the first 30 minutes following general anesthesia.

**Literature Review Analysis:** Current literature suggests 1) screening patients for the associated risk factors that may predispose them for emergence delirium, 2) instituting preventative measures during the perioperative period to minimize the risk of emergence delirium for those identified, 3) assessing for and recognizing emergence delirium in the immediate postoperative period by using an emergence delirium scale, and 4) implementing prompt and appropriate interventions when necessary. The Iowa EBP Model is relevant to the project because it systematically directs the project to achieve quality patient outcomes by reducing the incidence of emergence delirium in the veteran population based on current literature.

**Implement Evidence:** Education was provided to all anesthesia providers regarding the importance of screening patients for the associated risk factors related to emergence delirium, instituting preventative strategies during the perioperative period to minimize the risk of emergence delirium, assessing for and recognizing emergence delirium in the PACU using an emergence delirium scale, and implementing prompt and appropriate interventions for patients experiencing emergence delirium in the immediate postoperative period. Evaluation of provider awareness and intervention strategies was also completed.

**Conclusions:** This quality improvement project positively impacted the veteran population by providing a thorough preoperative assessment, patient-specific anesthetic care plans, and prompt interventions in the immediate postoperative period to reduce the challenges related to emergence delirium. The project improved the care provided to military veterans and prevented emergence delirium in patients with PTSD by identifying an optimal practice approach. It also improved awareness of anesthesia providers regarding emergence delirium.

A60

### **Animal Assisted Therapy in the Surgical Setting**

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**Introduction:** Pain has been reported to cost up to \$635 billion a year. Utilization of opioids as a primary means of pain management has contributed to the current healthcare crisis. Nonpharmacological measures offer a viable option to decrease pain in the surgical setting. Animal assisted therapy (AAT) has been widely used in various health settings as a means to reduce patient's pain and stress levels while increasing patient satisfaction. The purpose of this evidence-based practice research is to evaluate the best empirical evidence on the effects of AAT in the perioperative period.

**Literature Review Analysis:** A randomized controlled trial involving 50 children undergoing venipuncture concluded that patient's distress and cortisol levels decreased with animal interaction,  $P < .042$  and  $P < .034$ . A randomized controlled trial of 48 patients concluded that in those paired with a dog, the stress response was greatly attenuated, as evidenced by a reduction in cortisol, heart rate, and State-Trait Anxiety Inventory levels. In a randomized pretest/posttest study, 218 patients experienced significant decreases in anxiety,  $P < .001$ , and pain,  $P < .001$ , after AAT. In a quasi-experimental study, 87.8% of patients and 92% of staff approved of AAT for both adult and pediatric patients in the emergency department.

**Implement Evidence:** Utilizing the evidence, an AAT model will be developed for implementation into the perioperative surgical setting. Assessment of the feasibility of facility implementation will be assessed. Educational material will be presented to anesthesia providers in the form of a seminar along with an electronic pamphlet, which will be distributed via email to a large teaching hospital. The benefits of AAT will be highlighted for the perioperative surgical setting to decrease pharmacological interventions, increase patient satisfaction, and decrease stress. Evaluation will be conducted via a survey.

**Conclusions:** The Centers for Disease Control and Prevention concluded 48.3 million surgical procedures were performed in the United States. Pharmacological methods have been the standard of treatment for pain and anxiety. Implementation of AAT in the perioperative setting has significantly decreased anxiety, pain, and increase patient satisfaction. Spending 5 minutes with an animal has proven to decrease pharmacological interventions and undesirable side effects of medications. Animal assisted therapy is a safe and effective intervention for surgical patients in the perioperative setting.

## A61

### **Are There Other Options Before Epidural Blood Patch?**

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**Introduction:** Postdural puncture headache (PDPH) can be treated with epidural blood patch (EBP), a gold standard of PDPH treatment. However, its invasive nature can lead to complications such as infection, spinal cord injury, and paralysis. Instead, many drugs have been proposed to treat PDPH, avoiding the complications from EBP. This literature review was conducted to examine intravenous and oral drugs to treat PDPH. The mechanism of PDPH is theoretical and not understood. Numerous drugs have been utilized. There are uncertainties in drug efficacy that require exploration of the options to avoid using EBP and complications.

**Literature Review Analysis:** Nine randomized controlled trials (680 participants), ie, 3 trials (348 parturients), and 6 trials (332 patients with PDPH following spinal anesthesia) from PubMed and EMBASE (2012-2017) were included in this review. GABA-analogues treatment (gabapentin and pregabalin) resulted in better visual analogue scale (VAS) scores or delayed the onset of PDPH and reduced the severity and duration of PDPH. Theophylline treatment showed better VAS scores compared with acetaminophen and with conservative treatment. Treatment with steroids (dexamethasone and hydrocortisone) showed better VAS scores at 6, 24, and 48 hours and reduces the incidence of PDPH in the first 24 hours and the first week after surgery. However, pretreatment with dexamethasone did not show prevention of PDPH.

**Implement Evidence:** In cases where EBP is contraindicated (fever, infection at site, coagulopathy, or patient refusal), it's reasonable to consider intravenous and oral drugs to treat PDPH. GABA-analogues, theophylline, and steroids are widely available and frequently used. Most studies have risk of bias due to small sample sizes. Future research can be strengthened by larger sample size, longer duration of VAS assessment with follow-ups, and including possible adverse events from pharmacological drugs would increase applicability of the studies; this can improve quality of the evidence by increasing drug administration safety.

**Conclusions:** This literature review was conducted to examine intravenous and oral drugs to treat PDPH. GABA-analogues, theophylline, and steroids have been studied for their efficacy in reducing the incidence of PDPH. GABA-analogues and theophylline appear most appropriate for therapy when EBP is contraindicated due to their efficacy and availability. EBP is not always the best option to treat PDPH for various reasons. Clinicians should consider risks, benefits, and patients' preferences of aforementioned drugs when treating PDPH. Future research should strive for larger sample size and extended follow-up periods.

**Assessment and Management of Failed Epidural During Labor: Translating Science Into Practice**

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**Introduction:** Labor epidural (LE) is one of the safest and most popular methods of analgesia for laboring patients. Additionally, LE provides the safest anesthesia for patients scheduled for cesarean delivery. Despite its increased popularity, labor epidurals may not always be optimal during the labor process and subsequently fail to provide adequate labor analgesia. This literature review outlines the basics of labor epidural analgesia: risk factors, assessment, and strategies employed by anesthesia practitioners in the management of a parturient with an failed labor epidural (FLE).

**Literature Review Analysis:** An FLE can range from inadequate analgesia or absence of block resulting in additional local anesthetic dosing with or without opioids. Despite identifying contributing factors leading to epidural failure such as obesity, lumbar spine abnormalities, technique, and equipment related factors such as migration of the catheter and the use of air to locate epidural space, the absence of evidence-based guidelines regarding labor epidural management of analgesia for laboring patients with failed epidurals still exists.

**Implement Evidence:** The intent of this review is to develop a practice guideline for anesthesia providers with the goal of optimizing analgesia and clinical management in patients with FLE. Evidence supports the use of test dose to detect intrathecal or intravascular placement of the catheter, threading catheter 3 to 5 cm into the epidural space, manipulation of the catheter for one-sided blocks, utilizing saline for loss of resistance, use of the combined spinal epidural technique, and early replacement of a poorly functioning catheter to facilitate optimal labor analgesia.

**Conclusions:** Utilization of this practice guideline has the potential to alleviate pain and suffering endured from an FLE and increases maternal and family satisfaction culminating in a positive birth experience.

## **Assessment of Postprocedural Pain in Patients Undergoing Pacemaker or Defibrillator Implantation**

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**Introduction:** It is estimated that over 1,000 cardiac pacemakers and defibrillators are placed annually at our facility. One of the most frequent complications of this procedure is ipsilateral shoulder pain, which is known to be a significant predictor of shoulder impairment that may decrease quality of life. Our institution's anesthesia team was unaware of patients' perceptions of their pain control following the placement of these devices. That left CRNAs without necessary information to evaluate our current pain control practices and to assess if a change in practice is warranted.

**Literature Review Analysis:** Despite increased familiarity with the implantation procedure and new technologies, various complications, including pain, may arise during or following the placement of a pacemaker or defibrillator. If left unaddressed, pain may become a chronic issue for patients. The number of pacemaker leads implanted has been identified as a significant predictor of postprocedure shoulder pain and disability; however, very little information is available in the literature regarding patient experiences with pain after pacemaker or defibrillator placement. Review of the literature identified that there was a need for a tool that could be used to guide future practice by assessing patients' postprocedural pacemaker or defibrillator implantation pain.

**Implement Evidence:** Factors related to pacemaker or defibrillator placement that may impact pain were identified. This information was used to create a chart review tool. Surveys were then created to assess patient experiences and perception of pain. These surveys were conducted at various points throughout the recovery process to gain insight into patient satisfaction with current pain management practices. Data collected was analyzed to identify areas for improvement and to guide future practice in regard to this patient population.

**Conclusions:** On postoperative day 3, 86.8% of patients reported their pain was mostly or completely controlled. No significant difference in pain was noted between initial device placement and repeat procedure; however, patients undergoing defibrillator placement reported significantly higher than average pain than patients undergoing pacemaker implantation. The patients (61.1%) agreed that they experienced pain for less than 3 days. The most common site of pain reported was the incision site. These results indicate room for improvement in pain control in the first 3 days following defibrillator placement.

**Auricular Acupuncture for Postoperative Nausea and Vomiting**

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**Introduction:** Over 30% of all surgical patients are expected to experience a particularly unpleasant complication of surgery: postoperative nausea and vomiting (PONV). A protocol-based auricular acupuncture (AA) intervention given preoperatively decreases the incidence of PONV in select populations.

**Literature Review Analysis:** Two randomized controlled studies to date have prospectively examined the effect of auricular acupuncture on PONV outside the United States. These studies have validated the utility of AA on PONV, but their results are limited to the populations studied. Kim et al (2003) showed its efficacy for reducing vomiting in open abdominal hysterectomy but did not adequately address whether nausea was affected. Sahmeddhini et al (2006) showed efficacy for reducing PONV in women having open cholecystectomy. The remaining question was whether PONV would be effective and well-tolerated by patients having a wider variety of surgeries, within a US-accredited military hospital, where patients are concurrently given antiemetics and opioids routinely.

**Implement Evidence:** After a review of the literature, an evidence-based quality improvement project was initiated to make AA available to all surgical patients over a 60-day time period. A database was used to record the results, including primary markers such as incidence of postoperative nausea or vomiting during the first 24 hours. Secondary markers included antiemetic medications, opioid use, duration of surgery, and calculated PONV risk factor score. Retrospective analysis of 210 general anesthetic cases was conducted; of those cases, 25 had received AA.

**Conclusions:** AA recipients had more risk factors for PONV ( $P < .001$ ) but experienced less PONV than expected based on risk factor scoring. The reduction from expected risk was greater in the AA group. Incidence of PONV, postanesthesia care unit duration of stay, and opioid consumption demonstrated similar rates between groups. Satisfaction among patients receiving AA was 96%. Despite a higher pretreatment PONV risk score, those receiving AA received less prophylactic antiemetic medication ( $P < .001$ ), and PONV rates remained similar to the conventional group who had a lower pretreatment risk score.

## **Bispectral Index Monitoring and Postoperative Delirium**

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**Introduction:** Clinical evaluation of anesthesia depth is challenging. Incorporating technology into the monitoring and evaluation of patients is a logical step to supplement the anesthetist's own senses. One of these options is bispectral index (BIS) monitoring, an algorithmic tool based on electroencephalogram (EEG) sensing. This method is still being tested for effectiveness compared with standard physiologic monitoring. Our goal is to determine whether there is a consensus about the safety and effectiveness of BIS monitoring. Specifically, the adverse event of postoperative delirium will be examined.

**Literature Review Analysis:** Literature reviewed does not correlate well to each other. Despite differences, the literature tended to agree on several points. First, it is generally accepted that BIS monitoring is a reliable indicator of anesthesia depth. Second, higher BIS values are closer to brain activity in an awake, alert patient and therefore correlate to more shallow anesthesia. Third, it is accepted that more shallow anesthesia correlates to a higher risk of intraoperative awareness. Fourth, patients deserve appropriate, compassionate, professional anesthesia, and monitoring, while not necessarily cost-effective and indicated in all cases, does not harm the patient or interrupt anesthesia to the point of adding risk.

**Implement Evidence:** Little consensus exists regarding implementation of BIS monitoring in practice. Due to the expense and need for training of experienced providers, larger venues have an advantage in implementation. Novice providers did not gain benefit from BIS monitoring, and it is difficult to compare complications of anesthesia between studies of widely varying design.

**Conclusions:** There is a significant body of evidence related to BIS monitoring. A majority of this evidence cannot be directly related to other research due to differences in population, study aim, research design, outcome measures, or intervention type. With this in mind, additional research relating to BIS monitoring is necessary, noting that BIS monitoring generates a value, rather than an intervention, and depth of anesthesia is the true measure to be studied.

**Breastfeeding After Surgery: Influencing Postoperative Recommendations**

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Uniformed Services University of the Health Sciences

**Introduction:** Breastfeeding mothers face the burden of deciding when to resume breastfeeding after surgery. Interrupting breastfeeding can negatively impact maternal and child health outcomes and healthcare costs. Inconsistent recommendations from anesthesia practitioners and perianesthesia staff may worsen the apprehension that breastfeeding mothers experience. Anesthesia providers should deliver consistent, up-to-date information about the risks of resuming breastfeeding after surgery, which will empower mothers to make an informed decision about resuming breastfeeding after surgery.

**Literature Review Analysis:** A systematic review of the evidence was conducted using PubMed, CINAHL, Embase, and LactMed. An evaluation of the quality of each article was conducted using the Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP). Perianesthesia staff received an educational intervention that included the evidence and recommendations from the systematic review. A pretest/posttest measured the change in provider knowledge, change in provider recommendations, and provider confidence in the postoperative breastfeeding recommendations.

**Implement Evidence:** Posttest scores demonstrated significant improvement over pretest values (pretest-median score 5, IQR = 2.5; posttest median = 7, IQR = 2.25; N = 18, Wilcoxon signed rank test, W = 102.5, p <0.00). The number of staff recommending immediate resumption of breastfeeding increased from n = 8 to n = 16, a significant difference (McNemar test; p = 0.01). Provider self-reported confidence in ability to deliver evidence-based recommendations increased from a median of 2/4 (IQR 1; representing a response of “somewhat confident”) to a median of 3/4 (IQR 1, representing a response of “confident”).

**Conclusions:** Providers are willing to modify their practice if evidence is presented in a manner that promotes change. Postoperative breastfeeding recommendations at Naval Hospital Jacksonville were conflicting and often not in line with the most current recommendations. However, after the delivery of an educational session, there was a 100% increase in the number of perianesthesia staff that would recommend resumption of breastfeeding as soon as the mother had recovered from anesthesia.



## **Capnography Monitoring in the Postanesthesia Care Unit**

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Florida International University

**Introduction:** Patients recovering from anesthesia are at great risk for serious respiratory compromise due to the residual effects of anesthetics and analgesics, as well as individualized patient risk factors. Current practice guidelines recommend pulse oximetry for the detection of impending adverse respiratory events in the postanesthesia care unit (PACU). Capnography provides an accurate picture of ventilatory status at the alveolar level and is therefore an earlier, more sensitive indicator of respiratory depression versus pulse oximetry alone.

**Literature Review Analysis:** The electronic databases PubMed, EMBASE, and CINAHL were searched for studies published between January 2007 and March 2017 that evaluated the use of capnography versus no capnography during the postoperative period. The literature search yielded 60 relevant articles, 14 of which were used for this review. The strength and quality of research evidence was determined by using Johns Hopkins Nursing Evidence-based Practice (JHNEBP) process. The evidence clearly demonstrates that capnography is a more sensitive indicator for early recognition of respiratory depression versus standard monitoring alone and provides support for adding capnography to standard monitoring for patients recovering from anesthesia in the PACU.

**Implement Evidence:** Capnography is an evidence-based, noninvasive method for monitoring patient ventilatory status. Based on the evidence, implementing capnography monitoring as a standard of practice in the PACU would be beneficial in improving patient safety by providing clinicians with the opportunity to recognize impending adverse respiratory events before they lead to serious neurological events or even death. The addition of capnography to standard monitoring would help clinicians to better direct necessary interventions, thereby providing higher levels of patient safety and resulting in better outcomes.

**Conclusions:** Respiratory depression and apneic episodes are common events that occur in the PACU in both pediatric and adult postoperative patients. Capnography monitoring as a standard of care in the PACU can help in the early recognition of these events, resulting in enhanced patient safety. There is a paucity of advanced studies that evaluates the impact of routine capnography monitoring on patient safety in the PACU. Further advanced clinical research is needed regarding capnography use, specifically in the PACU and the barriers to implementation such as feasibility, staff education, and cost effectiveness.

## **Cerebral Oximetry: Decreasing Risk of Cognitive Dysfunction in On-Pump Coronary Artery Bypass Grafting Patients**

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**Introduction:** Cardiopulmonary bypass disrupts normal physiology in patients undergoing coronary artery bypass grafting. The effects of bypass on physiology include inflammatory changes and coagulation cascade activation. The blood brain barrier is affected, releasing the S100B protein. Postoperative cognitive dysfunction has an incidence as high as 60% in these patients. Cerebral oximetry can be used to monitor regional saturation of oxygen in the brain. Using an interventional protocol to maintain oximetry above a standardized threshold may prevent postoperative cognitive dysfunction in these patients.

**Literature Review Analysis:** The purpose of this literature review was to discover whether or not there was a significant difference in postoperative cognitive dysfunction incidence when cerebral oximetry was used in patients undergoing coronary artery bypass grafting with cardiopulmonary bypass. PubMed database was used for literature search. Key terms included coronary artery bypass graft, cardiopulmonary bypass, cognitive dysfunction, cerebral, oxygenation, near-infrared spectroscopy, CABG, CPB, and NIRS. Studies were in the English language. Four studies were chosen.

**Implement Evidence:** Postoperative cognitive dysfunction is a change in mental capacity ranging from days to months after the surgery. Loss of daily activity, executive function, and depression may demonstrate cognitive dysfunction. Interventions for cerebral oximetry include positioning, ventilatory strategies, transfusion, and increasing depth of anesthesia. By decreasing the time and depth of desaturation through decisive intervention, providers may impact the outcomes of postoperative cognitive dysfunction, while mitigating negative postoperative sequelae of decreased mental capacity.

**Conclusions:** Postoperative cognitive dysfunction is associated with prolonged desaturation. In turn, prolonged desaturation is associated with release of the S100B protein. When an interventional protocol was used to increase cerebral oximetry, there was clinical relevance in relation to postoperative cognitive dysfunction and statistical significance in the difference of its incidence. Researchers encourage quick intervention via a standardized protocol. In the future, standardized definitions of prolonged desaturation and postoperative cognitive dysfunction may serve to clarify study efforts.

## **Comparison Between Adductor Canal Block and Femoral Nerve Block Following Total Knee Arthroplasty: A Literature Review**

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**Introduction:** The femoral nerve is formed from nerve roots L2 through L4 and stems down through the pelvis between the iliacus muscle and psoas major muscle. The femoral nerve block (FNB) anesthetizes the anterior thigh, anteromedial knee, and the medial aspect of the lower leg, ankle, and foot, whereas the adductor canal block (ACB) is primarily a sensory block of the anteromedial knee and the medial aspect of the lower leg, ankle, and foot. In theory, the ACB preserves quadriceps muscle strength while providing pain control to the lower portion of the leg (Hussain, 2016). The only motor nerve within the adductor canal is that to the vastus medialis (Jaeger, 2013).

**Literature Review Analysis:** PubMed, Embase, CINAHL, and Scopus were searched. Key terms used were: adductor canal block, femoral nerve block, total knee arthroplasty, total knee replacement, and regional anesthesia. A total of 24 studies were reviewed. Eligible studies were assessed and, in total, 14 studies were included in the literature review consisting of 5,457 knees. Included studies consisted of 5 meta-analysis/systematic reviews, 7 randomized controlled trials, and 2 retrospective chart reviews. Patients underwent either spinal or general anesthesia and received multimodal analgesia such as acetaminophen, celecoxib, gabapentin, oxycodone, hydromorphone, fentanyl, or morphine for breakthrough pain. No difference was found in pain scores or opioid consumption. The ACB preserved quadriceps strength and overall increased mobility after surgery compared with FNB.

**Implement Evidence:** Femoral nerve blocks have been associated with quadriceps weakness that can delay rehabilitation. The ACB would be an appropriate alternative to FNB for patients undergoing total knee arthroplasty (TKA). ACB preserves quadriceps strength and ambulation ability better than FNB. This could potentially reduce the risk of falls related to weakness and immobility. We determined that there was no statistically significant difference in pain scores between the 2 blocks. Opioid consumption varied between all of the studies, but was not statistically significant.

**Conclusions:** The reviewed studies determined that the ACB is superior to the FNB in patients undergoing TKA because it preserved quadriceps function. There was no statistical significance when comparing postoperative analgesia or opioid consumption between the 2 blocks. More research should be done in determining the type of local anesthetic used as well as the amount injected. One limitation we came across was that the studies used different types of multimodal analgesia, and this could have played a role in differing VAS scores. Some of the studies utilized continuous catheters while others only observed single shot blocks. Prolonged exposure to local anesthetic may have skewed the results.

A70

## **Cryoneurolysis for the Treatment of Sensory Nerve Pain**

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**Introduction:** Prescription opioid overdose is a leading cause of death due to injury in the United States. Traditional pain management strategies for acute and chronic pain have focused on opioid pain medications, which are associated with significant side effects. Cryoneurolysis is a nonpharmacologic pain management procedure that uses cold temperatures to ablate the sensory nerves that cause pain. Due to its safe and reversible nature, cryoneurolysis should be considered as part of a multimodal pain management plan in patients experiencing pain originating from sensory nerves.

**Literature Review Analysis:** Cryoneurolysis has been used to treat sensory pain from multiple origins. One randomized controlled trial and 1 retrospective study show cryoneurolysis is useful to manage osteoarthritic knee pain both before and after total knee arthroplasty. Two prospective studies found that cryoneurolysis of the lumbar facet joint provided statistically significant pain relief for 1 year postprocedure. One randomized controlled trial shows cryoneurolysis of intercostal nerves after thoracotomy provides statistically significant reduction in pain and opioid consumption. Two prospective studies, 1 retrospective study and 1 case report explore cryoneurolysis treatment of other sensory nerves, with 1 study reporting pain relief for 5 years posttreatment.

**Implement Evidence:** The American Association of Nurse Anesthetists (AANA) recommends nerve ablation techniques, including cryoneurolysis, be considered as part of a multimodal pain management strategy. Cryoneurolysis should be considered in patients with sensory nerve pain when traditional pain management strategies have failed. Intimate knowledge of neural anatomy and use of diagnostic nerve blocks should be employed prior to cryoneurolysis treatment to avoid complications and improve success of treatment. Cryoneurolysis is a safe and reversible procedure that may provide long-term pain relief.

**Conclusions:** All studies reviewed concluded that cryoneurolysis is a safe and effective method to treat sensory nerve pain. The use of cryoneurolysis as part of a multimodal pain management strategy may help reduce the need for prescription opioids. Multimodal pain management has been endorsed by the AANA, American Society of Anesthesiologists, and the American Pain Society. Due to its safe and reversible nature, cryoneurolysis should be considered as a viable addition to a multimodal pain management plan in patients who experience pain originating from sensory nerves.

A71

## **Decreased Length of Stay Using Goal Directed Fluid Therapy for Open Abdominal Surgery Patients**

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**Introduction:** Open abdominal surgery can result in intraoperative sequel resulting in longer length of stay. It is unclear if the use of goal directed fluid therapy (GDFT) would decrease length of stay in patients undergoing open abdominal surgery. GDFT is the use of dynamic vital parameters to guide intravenous fluid. FloTracks and noninvasive cardiac output monitors (NICOMs) are the most commonly used tools to dictate the need for GDFT. GDFT may improve patient outcomes thus reducing length of stay. The purpose of this work is to describe the evidence of on the efficacy of GDFT on length of stay in patients who undergo open abdominal surgery.

**Literature Review Analysis:** Five randomized clinical trials and 1 meta-analysis of 23 randomized controlled trials consistently found no adverse events and with an added benefit of reduced hospital and intensive care LOS. The types of open abdominal surgeries were variable in all studies including vascular, urologic, gynecologic, and general gastrointestinal. The acuity of patients also varied between studies from low to high surgical risk. The utilization of GDFT was appropriate for open abdominal surgery patients and the findings can be generalized.

**Implement Evidence:** This project has confirmed IRB exemption. In a hospital surgical setting, with the support of the Director of Anesthesia and Chief Certified Registered Nurse Anesthetist, a presentation will be given to the anesthesia department on GDFT and its efficacy in open abdominal procedure cases. The most current evidence on fluid management in open abdominal surgeries, and the need, benefits, and plan for implementation of practice change will be discussed. The facility already tracks the use of FloTracks and NICOMs. Thus, after the presentation, the researchers will determine if a significant increase in the use of tools for GDFT resulted in a practice change for improved patient care.

**Conclusions:** Based on these findings, it is recommended that GDFT be used in patients underdoing open abdominal surgeries. Reduced length of stay was a definitive indication of the success of this fluid management modality. The use of GDFT and resultant decreased length of stay may increase hospital savings and improve patient outcomes.

A72

## **Dexmedetomidine Dosage and Administration Timing for the Prevention of Pediatric Emergence Delirium Without Prolonging PACU Stay**

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**Introduction:** Dexmedetomidine is known to be an effective, preventive treatment for emergence delirium in pediatric patients. However, studies have shown that dexmedetomidine may prolong discharge times from the postanesthesia care unit. Up to this point, an optimum pediatric dose of dexmedetomidine has not been established. The purpose of this systematic review was to determine the most appropriate dose and administration time for dexmedetomidine that would reduce the incidence of emergence delirium without delaying discharge from the postanesthesia care unit.

**Literature Review Analysis:** Evaluation of the data suggested that an intravenous dose of 0.38 to 0.5 µg/kg of dexmedetomidine should be given immediately after induction and up until 5 minutes prior to the completion of surgery. This administration dose and time frame has dramatically reduced the occurrence of emergence delirium without significantly prolonging discharge times from the postanesthesia care unit. In fact, the aforementioned dose of dexmedetomidine may reduce the discharge time because patients will not have to be treated after the emergence delirium has already occurred.

**Implement Evidence:** Consider the use of dexmedetomidine on all pediatric patients undergoing general anesthesia with an inhaled agent. If resources are limited, then pediatric patients can be screened for preoperative anxiety since there is direct correlation between preoperative anxiety and emergence delirium. The modified Yale Preoperative Anxiety Scale is an appropriate tool for the evaluation of patients. Once selected, administer an intravenous dose of 0.38 to 0.5 µg/kg of dexmedetomidine immediately after induction and up until 5 minutes prior to the completion of surgery. This should prevent the occurrence of emergence delirium in most children.

**Conclusions:** Pediatric emergence delirium is a significant problem for pediatric patients and for anesthesia providers. The consequences of emergence delirium include the risk of harm to the patient and prolonged stays in the postanesthesia care unit. Patients may develop new-onset postoperative maladaptive behavioral changes that can last for weeks. Dexmedetomidine consistently reduces emergence delirium in pediatric patients. By adhering to the dose and time frame given in this review, the provider can reduce the incidence of emergence delirium without prolonging discharge time from the postanesthesia care unit.

A73

## **Double Gloving as Means to Reduce Transmission of Pathogens in the Operating Room**

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**Introduction:** Healthcare associated infection represent one of the most common sources of preventable harm to patients. Approximately 1 in 25 patients admitted to US hospitals in 2014 had at least one such infection. As described in numerous case reports, anesthesia work environment and anesthesia provider hand hygiene practices can contribute to healthcare associated infection. Addressing the issue of pathogen transmission by anesthesia providers could lower the numbers of healthcare associated infections attributed to the surgical environment.

**Literature Review Analysis:** A literature review was conducted on the outcomes of double gloving during anesthesia induction. Keywords utilized in search queue included gloves, gloving, glove, pathogen, disease, contagion, infection, and anesthesia. Three randomized controlled trials involving from 20 to 45 anesthesia practitioners found statistically significant reduction in anesthesia environment contamination with oral inoculum when providers wore double gloves and removed the outer pair immediately after simulated intubation.

**Implement Evidence:** The literature review shows significant reduction in number of contaminated surfaces in the anesthesia environment (ie, anesthesia machine adjustable pressure-limiting valve and agent vaporizer) when providers wore 2 sets of gloves for induction of general anesthesia and then removed the outer pair immediately after intubation. Spread of oral inoculum was further minimized when one of the outer pairs of gloves was used to sheath the laryngoscope blade. Double gloving technique is inexpensive and easy to master for novice and experienced anesthesia practitioners. Simulated induction of anesthesia is a useful way to teach double gloving technique to new anesthesia practitioners.

**Conclusions:** A total of 157,500 healthcare associated infections reported in 2014 were associated with inpatient surgery. The financial burden of these infections for the 5 major infections is estimated at \$9.8 billion annually. Surgical site infections contribute the most to overall cost (33.7%). Double gloving can help reduce morbidity and mortality, as well as lower the cost associated with healthcare associated infections. Double gloving during anesthesia induction was shown to reduce contamination of the anesthesia work environment. This easy and inexpensive technique could be mastered in a simulated environment.

A74

## **Effect of Peak Inspiratory Pressure on the Development of Postoperative Pulmonary Complications in Mechanically Ventilated Adult Surgical Patients: A Systematic Review**

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**Introduction:** Research exploring protective ventilation techniques has generally compared a lower tidal volume (VT) with varying levels of positive end-expiratory pressure (PEEP) against a higher VT, with or without the use of recruitment maneuvers (RMs). Although lower VT ventilation is intended to deliver a lower peak inspiratory pressure (PIP), it does not guarantee a lower pressure ceiling. We synthesized primary research results regarding the effect of maintaining  $PIP \leq 30$  cm H<sub>2</sub>O compared with  $PIP > 30$  cm H<sub>2</sub>O on the incidence of postoperative pulmonary complications (PPCs).

**Literature Review Analysis:** All data was extrapolated from 3 randomized controlled trials (RCTs) that provided PIP data and evaluated for the effects of VT, PEEP, and RMs on the development of PPCs. Interventions varied between individual study designs as no 2 trials utilized the same VT, PEEP, or RM.  $PIP > 30$  cm H<sub>2</sub>O was not maintained with each breath in any group, but the use of RMs in the range of 40 to 45 cm H<sub>2</sub>O did temporarily increase PIP above 30 cm H<sub>2</sub>O in 3 groups. In total, 974 mechanically ventilated adult abdominal surgical patients were reviewed. Temporary increases in  $PIP > 30$  cm H<sub>2</sub>O during RMs showed no statistical difference in the occurrence of atelectasis, pneumonia, or acute respiratory distress syndrome when compared with PIP maintained  $\leq 30$  cm H<sub>2</sub>O.

**Implement Evidence:** Two RCTs reported a lower incidence of PPCs in groups that received RMs combined with VT 7 to 8 mL/kg of predicted body weight (PBW). One RCT reported an increased incidence of atelectasis and pneumonia in the group that received RMs combined with VT 10 mL/kg of PBW. The utilization of PEEP was associated with improved outcomes in all 3 RCTs. While the sample size is small, the use of VT 10 mL/kg or greater was the variable associated with increased PPCs. This review supports the use of  $RM \leq 45$  cm H<sub>2</sub>O and PEEP 5 to 12 cm H<sub>2</sub>O in combination with VT  $< 10$  mL/kg of PBW to reduce the incidence of PPC.

**Conclusions:** No data were available to evaluate the effect of  $PIP > 30$  cm H<sub>2</sub>O maintained with each inspiration on the occurrence of PPCs in patients receiving mechanical ventilation during surgery. However, the use of RMs that temporarily raised PIP as high as 45 cm H<sub>2</sub>O during the mechanical ventilation of adult abdominal surgical patients did not have any statistically significant effect on the occurrence of PPCs. The use of RMs that temporarily raise PIP as high as 45 cm H<sub>2</sub>O during the mechanical ventilation of adult abdominal surgical patients is safe and may be beneficial.



**Enhanced Recovery After Surgery: Implementation in Rural Iowa**

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**Introduction:** The Enhanced Recovery After Surgery (ERAS) Society developed guidelines that have reduced morbidity and mortality, improved patient outcomes, and reduced cost for colorectal surgery. This project implemented a 21-step ERAS protocol for colorectal surgery patients at a rural critical access hospital where all anesthesia is provided by CRNAs.

**Literature Review Analysis:** Conventional care for colorectal surgery results in a 6 to 12 day length of stay and 20% to 30% morbidity rate (Zhuang et al, 2015). Surgical complications for these patients increase the cost of care by \$6,358 to \$42,790 (Vonlanthen et al, 2011). The use of ERAS protocols for colorectal surgical patients reduces morbidity, length of stay, and healthcare costs (Spanjersberg et al, 2015). Increasing the use of ERAS protocols by CRNAs in rural hospitals will improve the care provided by CRNAs, the outcomes for their patients, and reduce the cost of healthcare in the United States.

**Implement Evidence:** A 21-step ERAS evidence-based protocol for colorectal surgery was implemented in a rural critical access hospital with an all-CRNA anesthesia department. A multidisciplinary implementation team including nurses, surgeons, hospital administration, and IT personnel was formed and led by a student registered nurse anesthetist. All staff were educated, outcomes data was regularly disseminated, and staff reinforcement was provided. After 12 months, opioid use decreased 60%, visual analog pain scores decreased 4 points, and length of stay decreased by 25%. Costs of implementation were recouped after 4 months.

**Conclusions:** The use of ERAS recommendations reduce morbidity by 48%, length of stay by 3 days, and overall costs. The ERAS protocol for elective colorectal surgery include 21 recommendations across the surgical encounter and requires multidisciplinary implementation. CRNAs are in the perfect role to implement ERAS protocols.

**Identifying Nontechnical Skills During Malignant Hyperthermia Crisis Simulation as a Teaching Strategy for Objective Structured Clinical Examination Development and Implementation**

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**Introduction:** Simulation instruction is a formative process where trainees engage in an experiential learning platform. High-fidelity simulation boosts the authenticity and brings the student's experience closer to real-life patient care. This high-fidelity simulation climate is the bridge for the didactic knowledge to cross over into the clinical environment. Patient safety is at the center of nursing education that aligns with simulation-based education as a teaching strategy that allows clinicians to learn, practice, and gain experience in a safe structured environment without risk to patients.

**Literature Review Analysis:** Human error in nontechnical skills (NTS) accounts for 80% of accidents in high risk industries. NTS include communication, teamwork, situation awareness, and decision-making. The identification and education of NTS in a rare crisis such as malignant hyperthermia (MH) can exalt awareness and lead to better outcomes. One 3-hour lecture of NTS presented notably improved results in posttest scores of NTS ( $p=.028$ ). Student registered nurse anesthetists (SRNAs) may not experience MH during clinical, increasing the need for a simulated training scenario incorporating NTS. Simulated experiences present opportunities for reflection where students can process and augment the mental models guiding behavior along with preexisting knowledge.

**Implement Evidence:** The Objective Structured Clinical Examination (OSCE) is used to provide summative assessments of technical and nontechnical skills. This intervention describes the development and implementation of an OSCE that identifies both technical and nontechnical skills during MH crisis simulation. This teaching strategy has been incorporated into the simulation curriculum to manage MH crisis scenarios for clinical competency among first-year SRNAs. Simulation training has enabled students from an experimental group to improve their skills and knowledge to a greater extent than those from the control group ( $p<0.05$ ).

**Conclusions:** Nursing education utilizes simulation to teach principles of nursing care. The complexity of patient care in the operating room necessitates a wide range of skills and attributes from nurse anesthetists. Along with technical aspects of skills, intuitive aspects such as professional attitude and the student's systematic approach to situations, OSCEs are typically based on NTS and complement clinician-examiner ratings. Identifying NTS during MH crisis simulation as a teaching strategy for OSCE development and implementation can productively model the clinical performance of SRNAs.

A77

### **Identifying Staff Misconceptions Regarding DNR Orders in the Perioperative Period**

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**Introduction:** The Patient Self-Determination Act of 1991 requires providers to engage in and document discussion with patients about their rights to accept or refuse medical treatment. This is an ethical responsibility and necessary to ensure institutional reimbursement from Medicare and Medicaid. Accordingly, the American College of Surgeons and the American Society of Anesthesiologists have published related guidelines. Despite guideline existence, the complexity of medical and ethical issues surrounding do not resuscitate (DNR) policies continues to cause confusion among providers.

**Literature Review Analysis:** In 2014, the Institute of Medicine released *Dying in America: Improving Quality and Honoring Individual Preferences Near the End of Life*. This document was created with the intention of addressing the needs of patients and families and provides clinicians with tools and recommendations surrounding the topic of end-of-life care. End-of-life issues are becoming more relevant every day; 1 in 5 Americans will be age 65 or older by the year 2030. The increasing aging patient population combined with advances in modern medicine has resulted in larger numbers of surgical procedures being performed on the elderly. As such, providers must be aware of policies and procedures surrounding end-of-life issues in the perioperative population.

**Implement Evidence:** A survey was developed to assess the knowledge and practices of providers surrounding DNR orders in patients undergoing procedures involving anesthesia. The survey was administered to a variety of perioperative providers (surgical, anesthesia, and nursing personnel). Subjects were chosen based on their likelihood of engaging with patients presenting for surgical procedures with an active DNR order in place. Evidence generated from the survey contributed to the development of an institutionwide educational module as part of a guideline convergence policy update.

**Conclusions:** Providers have an ethical obligation to discuss end-of-life issues with patients and families. Conducting a needs assessment survey and developing and providing education on end-of-life policies is consistent with recommendations from the Institute of Medicine. This project has resulted in better-informed providers who are able to present evidence-based information to patients. This project has impacted the health institution's sites nationwide, as the educational intervention has been implemented enterprisewide.

**Source of Funding:** Funding for the survey was provided through institutionally supported survey software. Educational development and dissemination was provided through institutionally supported educational committees.

**Implementation of Acceleromyography to Increase Use of Quantitative Neuromuscular Blockade Monitoring**

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**Introduction:** Neuromuscular blocking drugs are often needed to facilitate surgical procedures and, to some degree, patient safety. The quantity of nondepolarizing muscle relaxant molecules still present at the effect site at the end of each procedure directly impacts return of full neuromuscular function with wide variation between patients. Clinically, patients with some muscle relaxant remaining can experience residual neuromuscular blockade (RNBD) and inadequate muscular function in the postoperative period such as hypoxemia, patient discomfort, prolonged postanesthesia care unit stay, reintubation, critical care admission, and perioperative mortality.

**Literature Review Analysis:** Respiratory events after surgery are almost always associated with RNMB (Murphy, 2011). Neuromuscular blocking agents significantly increase the risk of respiratory complications (Grosse-Sundrup, 2012). Small amounts of RNMB have been associated with hypoxemia (Sauer, 2011). Patients who did not receive any reversal of neuromuscular blocking drugs were 2.26 times more likely to develop pneumonia after surgery (Bulka, 2016). Pulmonary function testing was conducted on postoperative patients and demonstrated a decrease in forced vital capacity and peak expiratory flow in all RNMB cases that were evaluated. The complexity of a patient's current condition and comorbid diagnoses can further increase the risk of RNMB complications (Kumar, 2012).

**Implement Evidence:** Group-level assessments of residual neuromuscular blockade among PACU patients, as well as the recording and potential future reporting of group-level survey data about attitudes and education on the device and device use during cases was undertaken. A quality improvement project was implemented using a preintervention/postintervention design to evaluate the effectiveness of the implementation of a blended educational program. The focus of this educational program was on the implementation of a clinical practice guideline for use of a quantitative neuromuscular monitor (acceleromyography).

**Conclusions:** The program was effective in increasing the utilization of a new neuromuscular monitoring modality by 74% among clinicians. We also demonstrated that the impact on provider workflow was not perceived to be a significant barrier to adoption after education. Anesthesia practitioners' attitudes regarding RNMB was not significantly changed by the project. This is likely due to the fact that those who were surveyed believed strongly, both before and after implementation, that RNMB is a clinically significant problem for patient care, and thus the scores did not change.

**Implementation of the Stanford Emergency Manuals Using Simulation**

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**Introduction:** When a crisis happens in the operating room, the patient is entirely reliant on the experience and training of the intraoperative team to make the right decisions. These rare, fast paced stressful situations leave little margin for error. The utilization of cognitive aids such as the Stanford Emergency Manuals (SEMs) reduces human error and improves intraoperative team performance. The SEM is designed to help providers remember key information during critical anesthesia events. The implementation of SEMs in several Iowa hospitals improves the quality and safety of patient care.

**Literature Review Analysis:** Emergent situations affect cognitive function leading to: inability to recall information, fixation errors, and lack of situational awareness (Marshall, 2013). Arriaga et al (2013) found that when crisis cognitive aids are used, the intraoperative team missed critical steps just 6% of the time compared with 23% when not used ( $P < 0.001$ ). Increased familiarity, educational training, and the use of multidisciplinary simulation increases the likelihood of real-time application of emergency manuals and improves team communication (Goldhaber et al, 2015).

**Implement Evidence:** All project directors completed a 3-day team-based simulation workshop to gain expertise in conducting simulation sessions. Simulations were designed specifically for 7 Iowa hospitals and included scenarios such as amniotic fluid embolism and local anesthetic toxicity. Prior to each simulation, a presentation on crisis resource management and the use of the SEM was provided. Postsimulation debriefing sessions were conducted after each simulation, and participants completed postsimulation surveys to evaluate staff awareness and familiarization of the SEMs, accessibility of the SEMs, and whether staff would utilize the SEM in future emergency situations.

**Conclusions:** In situ simulation sessions increased clinician awareness and familiarity of the manual, and more importantly, the probability that the SEM will be used during perioperative emergencies. The integration of SEMs into practice in Iowa hospitals ensures that clinicians will be equipped with the resources necessary to successfully manage emergency situations and improve patient outcomes. Several other Iowa hospitals have contacted the project directors to request implementation of the SEM at their facility, and SEM simulation will occur at the Iowa Association of Nurse Anesthetists Spring Meeting.

## **Implementing a Sterile Cockpit During Anesthesia Induction and Emergence: Evaluating the Use of Visual Reminders**

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**Introduction:** Noise is an occupational hazard in the operating room. Many factors can affect the anesthesia provider's concentration, and noise has been increasingly attributed with disrupting anesthesiologists during the most critical times: induction and emergence. Noise contributes to the top causes of anesthesia error: distraction and error in judgment. This places the patient at risk for hypoxia and iatrogenic harm. The purpose of this prospective study, using both a control and an education group, was to determine if a visual reminder (SoundEar) would provide noise reduction during induction and emergence.

**Literature Review Analysis:** Although noise has been recognized as a health hazard throughout the hospital setting, there is no single intervention that has consistently reduced noise. Education alone is unreliable at implementing a change in practice, and most settings require multiple interventions. Various methods have been identified for integrating research knowledge into practice. The most effective methods for implementing research include decision support, interactive educational meetings, and multifaceted approaches. Many noise programs involve the use of a decision support tool in the form of a sound meter, which can provide instant feedback on sound levels. This has been implemented successfully in ICUs and in ORs to decrease noise.

**Implement Evidence:** A 3M NoisePro was mounted on the anesthesia machine to continuously record noise levels (dB). There were 3 sequential intervention groups: control (n=30), education only (n=28), and SoundEar(n=28). The primary endpoint for this study was Lav(max) during induction, a logarithmic average of 5-second maximal sound pressure readings in dB A-scale. This endpoint was compared across assessment periods (preintervention, educational awareness, use of visual reminders) using analysis of variance (ANOVA). Comparisons were done using a 2-sample t-test. In all cases, 2-tailed p-values  $\leq 0.05$  was considered statistically significant.

**Conclusions:** Education alone did not significantly reduce noise. Of the 3 interventions, the group that received the SoundEar with education had significantly lower noise levels compared with the control during induction (P=0.04), maintenance (P= 0.006), and emergence (P<0.001). The threshold for the lights on the visual reminder at 65 dB, 70 dB, and 75 dB, were all significantly lower when the meter was present. The largest decrease in noise levels (1.6 dB) was found during emergence. Future research with the visual reminder is needed to determine its clinical significance as a noise reduction tool.

**Source of Funding:** Project funding was provided by the Mayo Clinic Department of Anesthesia in Rochester, Minnesota, and statistical support was provided by Mayo Clinic's Center for Clinical and Translational Science (CcATS).

## A81

### **Improving SRNA Clinical Experience**

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**Introduction:** The success of a clinical rotation is important. Mutual respect between instructor and learner, commitment from the instructor, and ownership of completing a successful rotation by the student are just a few components. A mentoring program was already in place at the time of the study in which a visiting student would be assigned to a staff CRNA. The goal of this study was to gauge the experience of student registered nurse anesthetists (SRNAs) on rotation at Monroe Carell Jr. Children's Hospital at Vanderbilt (VCH) and to make improvements where applicable.

**Literature Review Analysis:** Searches were conducted using PubMed with the following keywords: preceptor, mentor, student, satisfaction, clinical rotation, and nurse anesthetist. Articles on the effectiveness of clinical nurse anesthesia education were used to guide survey questions. Surveys were then sent to SRNAs rotating at VCH and staff CRNAs that were interested in mentoring or had mentored students in the past. The students were asked if they felt respected by the various care team members they encountered at VCH, the value they placed on the cases in which they participated, and strengths and weakness of the rotation overall. The CRNAs were asked about the time they put into mentoring and what they felt could be done to strengthen the mentor program.

**Implement Evidence:** The students rated the rotation highly favorably in how they were treated at VCH, but largely stated that the number of clinical hours was a burden. SRNAs were in the OR 5 days per week. They were also expected to research the cases assigned to them and discuss their plan with the attending anesthesiologist the evening prior. CRNA mentors asked for more days paired in the OR with their mentees. Changes have been made to the student schedule, and they are now in the OR 4 days per week and paired more often with their mentor while on orientation.

**Conclusions:** As the students spend 12 to 13 weeks at VCH, follow-up of changes made could not be obtained from the original group of students. Therefore, success of the intervention was inferred because the SRNAs no longer cited number of clinical hours as a weakness in the rotation. SRNA comments supported the the quality of relationships formed with preceptors. Changes were made to the SRNA suggested assignments in order to pair them twice per week while in the first month (orientation) and as much as possible after that to foster a more effective relationship for instruction and feedback.

## **Integrated Wellness Model and Peer-Mentoring Program for Student Registered Nurse Anesthetists**

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**Introduction:** Student registered nurse anesthetists (SRNAs) are under considerable amounts of pressure to be efficient and vigilant in a multifaceted, challenging operating room environment. SRNAs experience either a moderate or major life crisis related to scholastic, clinical, or external stressors. Excessive stress beyond the adaptive capacity of the individual can lead to anxiety and negative coping mechanisms. An integrated wellness model and peer-mentoring program available to SRNAs will aid to reduce stress, burnout, fatigue, attrition rates, and improve social behavior.

**Literature Review Analysis:** Stress during nurse anesthesia school is well documented, and reports illustrate adverse consequences can arise for the pupil contributing to physical and emotional disease. Student nurse anesthetists reported a mean stress score of 7.2 out of 10 on an online survey. Nationally, most of the SRNAs (78%) reported on a questionnaire that their school did not have a stress management program. Medical residents experienced lower depression scores after implementing a wellness model compared with the control group ( $p = 0.003$ ). In aggregate, medical, dental, radiology, and nursing schools with formal peer-mentoring programs have indicated improvements in pass rates on board examinations, communication, procedural skills, and mitigated social isolation.

**Implement Evidence:** Full buy-in from the nurse anesthetist program is essential to successfully implement and translate a wellness model with a peer mentorship program for SRNAs. An oral presentation is planned with team building skills during SRNA orientation to lessen the initial SRNA anxiety by familiarity application of resources available to the incoming class. Mentors and mentees will be matched based on questionnaire responses. The student government body and faculty are key stakeholders to ensure sustainability of the wellness model and peer-mentoring program.

**Conclusions:** Detrimental levels of stress during nurse anesthesia school have shown to negatively affect dexterity, learning, and remembrance of knowledge. A wellness model and peer-mentoring program are prolific solutions to reduce perceived stress and enhance social behavior. The future profession of the Certified Registered Nurse Anesthetist relies heavily on the student's experience during school and clinical training. A wellness model and peer-mentoring program provides students with invaluable knowledge, a positive experience, and long-lasting relationships beyond their educational training.



### **Ketamine Gargle for the Attenuation of Postoperative Sore Throat**

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**Introduction:** Postoperative sore throat (POST) is a common complaint from patients undergoing general anesthesia with endotracheal intubation. Though providers implement interventions to reduce POST, no intervention is completely effective at eliminating POST. A preoperative ketamine gargle was investigated in its role in reducing POST. Topically or locally injected ketamine targets peripheral glutamate and NMDA receptors. By accumulating higher concentrations in the local tissue, it minimizes adverse effects because of low systemic absorption.

**Literature Review Analysis:** A comprehensive PubMed and CINAHL search was conducted from February to June 2016 for this literature review using the terms: postoperative sore throat and ketamine gargle. One systemic review and 4 randomized controlled trials were identified. Inclusion and exclusion criteria were similar. The intervention group gargled 40 to 50 mg of ketamine in saline or water, and the control group gargled saline or water. General anesthesia was induced 5 minutes later and orally intubated. Postoperatively, patients were asked to rank their POST on a 4-point scale, from 0 indicating no sore throat to 3 indicating severe sore throat. The results found a statistically significant reduction in POST in the ketamine group at 0, 4, 8, and 24 hours.

**Implement Evidence:** Preoperative ketamine gargle can reduce POST and improve patient satisfaction. Gargling with ketamine localizes its analgesic and anti-inflammatory effects to the desired area. Localized trauma from direct laryngoscopy and intubation can cause inflammation, and ketamine's role in reducing oral mucosa inflammation could have contributed to decreased incidences of POST.

**Conclusions:** The studies found that a ketamine gargle significantly reduced POST in the first 24 hours for patients undergoing general anesthesia with oral endotracheal intubation. Limitations of studies include small sample size, no plasma ketamine levels, and pain is a subjective experience. Future research studies are needed to investigate ketamine's effectiveness in patients undergoing all modes of airway manipulation. Also obtaining plasma ketamine levels would identify if any ketamine was absorbed systemically and thus contributed to systemic analgesia.

**Liposomal Bupivacaine Transversus Abdominal Plan Blocks After Cesarean Delivery**

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**Introduction:** Postsurgical pain after cesarean delivery has traditionally been controlled with neuraxial or intravenous opioids. Although effective, opioids can cause undesirable side effects such as nausea, vomiting, pruritus, ileus, and increased length of stay. Implementing pain interventions that maximize pain control while minimizing side effects is critical in the obstetric population. The purpose of this review was to examine the efficacy and safety of transversus abdominal plane (TAP) blocks using liposomal bupivacaine in patients undergoing cesarean delivery.

**Literature Review Analysis:** A literature review was conducted using PubMed, Cochrane Library, and Guidelines.gov. The search revealed 11 sources (systematic reviews, randomized controlled trials, and observational studies) meeting inclusion criteria. No evidence specifically examined the efficacy of TAP blocks using liposomal bupivacaine in women undergoing cesarean delivery. The evidence supported the use of TAP blocks with traditional local anesthetics in these patients, alone or with intrathecal opioids. TAP blocks using liposomal bupivacaine have been shown to be efficacious in nonobstetric patients undergoing abdominal surgery. The evidence indicated there was lower opioid usage, reduced pain scores, and earlier mobilization.

**Implement Evidence:** The findings of this evidence-based review will be presented to the anesthesia providers at a large West Coast academic medical center. The center uses liposomal bupivacaine TAP blocks for open abdominal surgical procedures in nonobstetric patients. There is a large obstetric population. Currently intrathecal opioids are used for postoperative analgesia after cesarean delivery. This review will serve as the basis for further research exploring the safety and efficacy of TAP blocks in patients undergoing cesarean delivery with and without the addition of intrathecal opioids.

**Conclusions:** Evidence supports the safety and efficacy of liposomal bupivacaine TAP blocks in nonobstetric patients undergoing abdominal surgery. Further research is needed to evaluate the safety and efficacy of using this preparation for TAP blocks in patients undergoing cesarean delivery.

**Low-Dose Intraoperative Intravenous Ketamine for Postoperative Pain**

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**Introduction:** Postoperative pain following surgery can affect mobility and patient satisfaction, accompanied with undesirable side effects that go along with narcotic use. Although intravenous ketamine has been used as an adjunct for postoperative pain, its effectiveness is unclear. The purpose of this work is to describe the evidence on the effectiveness of low-dose intravenous ketamine in reducing postoperative pain for patients following surgery.

**Literature Review Analysis:** A critical appraisal of 2 systematic reviews inclusive of multiple surgery types and 6 randomized controlled trials focusing specifically on knee surgery patients found consistent evidence on the effectiveness of low-dose intravenous ketamine. The results of these studies found a reduction of opioid consumption, an improvement in joint mobility, and lower pain scores in patients who received low-dose intraoperative ketamine. The greatest effect was seen in adult patients undergoing painful surgeries, with limited effect on pediatrics, and head and neck surgeries. Patients receiving low-dose ketamine experienced less postoperative nausea and vomiting with no difference in other side effects compared with placebo.

**Implement Evidence:** It is recommended that low-dose intravenous ketamine be incorporated into clinical practice for adult patients undergoing orthopedic, thoracic, and abdominal surgery. An education session was held with anesthesia providers during a monthly meeting to disseminate the evidence regarding low-dose ketamine. After the education session, ketamine dose cards were provided to anesthesia providers, and reminders were posted in high traffic areas and drug carts. A comparison of ketamine usage prior to and after the educational intervention will be monitored to evaluate the effectiveness and sustainability of this practice change.

**Conclusions:** Ketamine is an effective adjunct for reduction of postoperative pain following surgery. It is inexpensive, readily available, and simple to incorporate into practice. However, cultural barriers remain that limit full implementation.

**Mass Trauma Protocol at the University of Cincinnati**

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**Introduction:** With over 160 mass shootings since 2000, the climate of terrorism, and natural disasters, the need for anesthesia personnel to be prepared to handle large influxes of trauma patients is more evident than ever. The University of Cincinnati Medical Center is a level 1 trauma center serving a large region. The focus of this poster is to describe the critical components of a mass trauma protocol, as well as the necessary education that must follow within an anesthesia department to adequately prepare to manage multiple trauma admissions at once.

**Literature Review Analysis:** The current mass trauma protocol is a general policy for the hospital in a disaster situation. The disaster plan is lacking in specificity and does not provide for organization within the anesthesia department. There is currently no protocol within the anesthesia department for a mass trauma situation. This project identifies the necessary components of a specific protocol through review of current literature. The project will present a protocol and then educate within the anesthesia department at the University of Cincinnati on the new protocol.

**Implement Evidence:** After development of the protocol, based on literature and current evidence available, a presentation will be made to the anesthesia department. The focus will be to educate nurse anesthetists, student nurse anesthetists, and other anesthesia personnel on the literature available, as well as a proposed protocol for the department. The education plan allows for time for feedback and input from members of the department on the protocol.

**Conclusions:** The literature available supports the need for a specific plan for anesthesia departments to be able to effectively manage a mass trauma situation. The end goal of the project is to implement a department specific mass trauma protocol that requires annual education and review. It will effectively organize the department and prepare for a high volume trauma situation. The plan to educate begins in the fall of 2017. The project will present the reviewed literature, a proposed protocol, and the plan to educate.

## **Mode of Mechanical Ventilation and Surgical Blood Loss in Lumbar Spine Surgery in the Prone Position**

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**Introduction:** The aim of this review is to evaluate the relationship between mode of mechanical ventilation and surgical blood loss in spine surgery in the prone position. The prone position exerts external pressure on the abdomen, elevating intra-abdominal pressure (IAP), which shifts the diaphragm cephalad, increasing peak inspiratory pressure (PIP) and contributing to venous engorgement. This manifests clinically as an increase in epidural bleeding and decreased surgical exposure. Limiting PIP during mechanical ventilation may minimize surgical blood loss.

**Literature Review Analysis:** A search of the words “pressure control ventilation” and “blood loss” on PubMed, EBSCO, and Web of Science yielded 4 relevant studies. A prospective, randomized study of 56 patients undergoing lumbar spine surgery revealed that surgical bleeding was significantly less in patients receiving pressure control ventilation (PCV). A study of 40 patients undergoing lumbar microdiscectomy ventilated with either a high volume–low frequency technique or a low volume–high frequency technique demonstrated that the latter group had lower PIP and less mean epidural bleeding. Additional prospective studies revealed that the prone position was associated with increased mean PIP and that the use of PCV is associated with lower PIP while prone.

**Implement Evidence:** Studies suggest that intraoperative blood loss correlates with airway pressure changes in the prone position. Modes of mechanical ventilation that minimize PIP, such as PCV or low volume–high frequency techniques, may decrease spinal venous engorgement and enhance surgical exposure. PCV, with its high and decelerating inspiratory flow, is able to deliver volumes at lower PIP. By limiting PIP, the anesthesia provider may decrease blood loss and influence a patient’s hemodynamic status, reduce transfusion requirements, and minimize complications and costs associated with these unfavorable outcomes.

**Conclusions:** There is a unique interaction between patient positioning, respiratory dynamics, and surgical blood loss in posterior lumbar spine surgery. External pressure on the abdomen contributes to both increased IAP and increased PIP, which clinically manifest as decreased venous return and spinal vein engorgement. Venous engorgement results in epidural bleeding and decreased surgical exposure. Research suggests that mode of mechanical ventilation can influence airway pressures and ultimately intraoperative blood loss, but studies larger in scope are warranted to determine the efficacy of these results.

## **Noise in the OR: Facts, Findings, and Solutions**

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Beaumont Health Systems

**Introduction:** Noise levels in operating rooms (ORs) have increased due to modern-day equipment and human behaviors. Excess noise in the OR poses safety risk to patients and staff due to disrupted communication and concentration, difficulty hearing monitors, increased stress, and hearing loss. Because CRNAs are concerned about hazards of excess noise, a translational research project was done to create evidence-based strategies to reduce noise levels in the OR, namely during critical events in patient care. In this project, a literature review was done, sound level data from ORs were analyzed, and noise reduction strategies were proposed.

**Literature Review Analysis:** Articles from a literature search of PubMed and CINAHL including full text, peer-reviewed articles, dated January 1, 2000 to December 31, 2015 showed that noise generated in ORs by equipment and humans frequently exceeded NIOSH limits. Noise sources included surgical instruments; moving, clanging, and dropping instruments; conversations; and music. Communication, attention, memory, and psychomotor skills were all impaired by excess noise. Sound level data from Beaumont Health System ORs revealed excess noise present in all cases using general anesthesia. In 23 of 29 cases, excess noise was present at induction and/or emergence from general anesthesia.

**Implement Evidence:** All OR team members should acknowledge hazards and sources of excess noise in the OR and collaborate to reduce noise. During critical anesthesia events, staff should avoid loud or unnecessary conversations, turn off music, avoid clanging and dropping instruments, and move equipment in and out of the OR quietly.

**Conclusions:** The hazards of excess noise to patients and staff is clearly supported in nursing and medical literature. The presence of excess noise in ORs was confirmed by sound level recordings obtained in 29 ORs of Beaumont Health Systems and present during critical events in patient care. All OR staff members should work collectively to protect both patients and themselves from harm.

**Nurse Anesthesia Faculty and the Library Collaborate to Create a Unique Student Resource**

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**Introduction:** Nurse anesthesia students at Quinnipiac University consist of both nurses studying to become CRNAs and experienced CRNAs choosing to expand their focus to include education and leadership roles. These nurse anesthetists may have been out of the academic setting for many years and desire models of education and support that will aid them in their busy practices. These students and their faculty expressed a need for a concise and organized portal to aid them in their searches for the wide variety of literature, videos, study guides, texts, and other materials needed during their program.

**Literature Review Analysis:** LibGuides is [Change per website description. Okay?] a content management and knowledge sharing tool for libraries that offer a platform for subject pathfinders, focusing support to enhance the information literacy skills and research quality of students. LibGuides can be found in over 5,000 libraries. They are easy to create, online, easily updated in response to changes, interactive, can be embedded into course management systems, and mobile-optimized. In the past, Wiki software was promoted by librarians as a useful pathfinding tool; recent literature suggests, however, that libraries are now more frequently employing LibGuides. Research and subject guides must be actively promoted and updated to ensure that they are used consistently and effectively.

**Implement Evidence:** Nurse anesthesia faculty and the nursing librarian have engaged in an ongoing collaboration to categorize and make available an offering of databases, online resources, tutorials, and textbooks, etc. The annotated links are offered through the library content management system, LibGuides, and are reviewed annually by major stakeholders. Content is added, removed, or changed by the librarian year round, and suggestions are taken from any student or faculty member. The guide is introduced by the librarian to students during their orientation residency; usage statistics are gathered yearly.

**Conclusions:** Giving the library a presence in the learning environment adds value to the resources the library purchases and strengthens the library's connection with students. A subject guide offers a "one-stop shop" to library information and resources for students, particularly online students who do not have ready in-person access to the librarian. Orientation is an easy point at which to introduce the guide and promote its use. Students can offer input throughout the curriculum to both the educator(s) and the librarian as to what addition(s) and needs they might have.

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## **Opioid-Sparing Effects of Intraoperative Dexmedetomidine in Abdominal Surgery**

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**Introduction:** Pain and discomfort after abdominal surgery are the primary causative factors for increased opioid use, which results in adverse effects and delayed recovery. Current studies of opioid-sparing anesthesia utilizing multimodal analgesia techniques show promising potential in enhanced recovery after surgery. This review aims to examine the efficacy of dexmedetomidine (DEX), a highly selective alpha-2 agonist, in reducing pain and opioid requirements in patients undergoing abdominal surgery.

**Literature Review Analysis:** Studies suggest that intraoperative DEX in abdominal surgery can significantly decrease overall opioid requirements. The use of DEX demonstrated a reduction of intraoperative opioid needs. While most trials found reduced total opioid consumption for only the early postoperative period, 4 studies also presented extended benefits over the first 24 hours. The short duration of analgesic properties of DEX is due to its elimination half-life of 2 hours. Notably, Fan et al found no improvement of analgesic effects with a loading dose of DEX. Although these studies employed different DEX techniques with variable dosing, timing, and duration, they all demonstrated the reduction of pain scores.

**Implement Evidence:** Intraoperative DEX provides satisfactory opioid-sparing effects and reduces perioperative pain in abdominal surgery without significant adverse events despite variation in techniques. The reviewed studies reported improved satisfaction scores, early recovery, and decreased the length of hospital stay ( $P < 0.05$ ). These beneficial properties potentially play a role in the enhanced recovery from anesthesia. Anesthesia providers should consider utilizing DEX in their comprehensive anesthetic plans to improve postoperative outcomes for patients undergoing abdominal surgery.

**Conclusions:** Current studies agree that DEX provides adequate analgesic properties and reduces postoperative pain in abdominal surgery, thereby contributing to its opioid-sparing effects. Additionally, these studies found no significant adverse effects caused by DEX. Using DEX as part of a comprehensive anesthetic plan could serve to enhance recovery from abdominal surgeries. Further research is needed to analyze the optimal dosing, as well as the ideal initiation and discontinuation times for DEX. Researchers should also consider new strategies to prolong the opioid-sparing effects of DEX.



A91

**Parturient Education for Neuraxial Analgesia: A Video Tool**

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Uniformed Services University of Health Sciences

**Introduction:** Patient education for neuraxial analgesia has historically occurred in the obstetric environment after the onset of labor, presenting unique challenges for anesthesia providers. To address issues of providing adequate information to parturients during the informed consent process, an educational video was developed to specifically target evidence-based negative experiences.

**Literature Review Analysis:** Generalized conclusions and themes were isolated and combined from all articles and included in the literature synthesis. Consistent findings relevant to the patient education process for neuraxial analgesia included: lack of understanding of risks and benefits, the procedure itself including required positioning, potential for discomfort during the procedure, and timing of relief. Positive themes included: increased knowledge and satisfaction with education or augmented informed consent process. Overall, the literature does not support any single method of education; however, it is evident that verbal discussion alone is not as effective for adequate patient education as the use of educational tools.

**Implement Evidence:** A single-site educational video for neuraxial analgesia in obstetric patients was developed and implemented as an adjunct to the informed consent process at a large Military Treatment Facility in February 2017. Participants were given the option of viewing the video, then complete an assessment of subjective and objective knowledge about labor analgesia. A total of 80 parturients agreed to participate in the project, with 30 opting to view the video. Parturients who viewed the video demonstrated higher perceived and measured knowledge scores compared with parturients who denied viewing it.

**Conclusions:** Offering a short educational video to parturients may improve knowledge with respect to anesthesia services provided for management of labor pain, specifically the use of neuraxial techniques for labor analgesia. Further dissemination of the educational video using other modalities and earlier in the antenatal period has potential to improve maternal satisfaction and may increase beneficiary recommendation of maternity services at an MTF.

**Pediatric Emergence Delirium: What Do We Really Know?**

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**Introduction:** Emergence delirium (ED) and emergence agitation (EA) are potential clinical phenomena following anesthetic exposure, most notably in children. The clinical impact of ED, EA, and/or uncontrolled pain in the postanesthesia period may include self-injury, injury to staff, additional nursing resources, parental distress, and possible long-term developmental or behavioral sequelae. Without the use of a validated diagnostic tool, delirium goes undetected in up to 3 out of 4 patients. This highlights the need for tools to rapidly and accurately diagnose delirium.

**Literature Review Analysis:** A literature review was conducted using the resources of the Eskind Digital Library at Vanderbilt University Medical Center. The keywords searched were: anesthesia, pediatric delirium, emergence delirium, pCAM, validated tool, and implementation. We concluded that delirium continues to have a presence in the pediatric population and that diagnostic challenges limit our ability to recognize, treat, and prevent delirium in pediatric patients. We also suspected that our current culture did not provide adequate diagnostic tools or education to both patients/caregivers and staff.

**Implement Evidence:** A questionnaire was distributed for each patient postanesthesia over a 4-week period and 1,309 surveys were collected. The goal was to determine baseline data for incidence and perception of delirium. A survey was also emailed to each perioperative staff member. The survey goal was to assess for knowledge of delirium, comfort of delirium assessment, recognition of hypoactive delirium, use of a tool for diagnosis of delirium, and resources available for management of delirium. Of note, there was no current screening tool or formal education provided to perioperative staff.

**Conclusions:** The questionnaire results revealed that 494 patients required intervention due to ED/EA/pain. Staff felt that 8.3% of patients exhibited either ED or EA, and 21.2% of patients exhibited pain in the PACU. The staff felt 65% of the time that delirium is underdiagnosed in the PACU. Greater than 50% of the staff felt that adequate delirium education is not in place nor are appropriate protocols available for staff regarding delirium. The data have revealed that there is a need for both education, as well as a validated tool to help diagnose patients with ED in the postanesthesia period.

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**Perioperative Guidelines for the Administration of Combination Intranasal Ketamine and Midazolam as Preprocedural Sedation in the Pediatric and Mentally Disabled Populations**

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**Introduction:** Pediatric and mentally disabled patients can be difficult to sedate preoperatively, which can result in: failure to secure an IV, delay or cancellation of the surgery, and exhausting hospital resources. Current practice utilizes oral Versed and intramuscular ketamine, with the later usually requiring physical restraint. Pre-sedation failure rates vary pointedly in PO Versed vs IN combo ketamine/Versed administration, with failure rates of 20.6% PO and 3.7% IN. IM ketamine has inherent faults such as increased anxiety and onset of action (3-5 min IN vs 5-25 min IM) and risk of injury to patient/staff.

**Literature Review Analysis:** Authors determined children given IN ketamine/Versed had an onset of sedation 5.3 minutes vs PO Versed (7.4 min). A randomized controlled study found nausea and vomiting (N/V) occurred in 16% of PO Versed administrations. Children given the IN combination were discharged from the PACU an average of 19 minutes earlier than those with PO Versed. Multiple studies examined the effects of IN ketamine in the adult population; these studies all found it to be safe and effective for the relief of postoperative pain and anxiety, sedation of severely agitated patients, and for acute traumatic pain. In a multicenter retrospective audit involving 222 episodes of preprocedural sedation of adults with learning disabilities, authors recognized IN Versed as safe and effective.

**Implement Evidence:** Through evidence-based practice and research, new policies and procedural guidelines have been established to ensure proper preprocedural sedation in the pediatric and mentally disabled populations. Dissemination of findings will be presented to the hospital facilities, administrators, and educators within the anesthetic field. Information will be dispersed through emails, oral presentations, and written materials. Implementation of guidelines aims to reduce anxiety, aid in smoother induction and emergence, and decrease recovery room time.

**Conclusions:** The use of IN ketamine and Versed is a safe, reliable, and effective form of preprocedural sedation for the pediatric and mentally disabled patient populations. A change in practice utilizing this technique will ensure these patient populations receive the most advanced level of care. The use of IN over IM ketamine will result in reduced time of onset, decreased patient and family anxiety, and decreased risk of physical harm to patient and staff during IM injection. Usage of IN over PO Versed will cause decreased N/V, decreased risk of emesis/aspiration, and certify adequate sedation.

A94

## **Postoperative Outcomes: General Anesthesia vs Local Anesthesia for Carotid Endarterectomy Surgery**

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**Introduction:** Carotid endarterectomy surgery has postoperative morbidity and mortality risks including myocardial infarction, stroke, and death. There has been debate on whether local anesthesia or general anesthesia is best for this patient population. The purpose of this work is to describe the evidence on the effectiveness of local anesthesia at reducing morbidity in this surgical patient population.

**Literature Review Analysis:** One randomized controlled trial (RCT), 2 retrospective cohort studies, and 1 systematic review were critically appraised. Three out of the 4 studies showed no statistical difference in patients receiving these 2 anesthetic techniques as measured by patient outcomes 30 days postoperatively. One of the retrospective cohort studies showed a statistical increased risk of unexpected intubation, myocardial infarction, aspiration, and pulmonary resuscitation in patients who received general anesthesia. From this evidence, it is recommended that anesthesia providers consider patient and surgeon preference when deciding on which anesthetic technique to employ.

**Implement Evidence:** From this evidence it is recommended that anesthesia providers consider patient and surgeon preference in deciding on which anesthetic technique to employ. The higher morbidity and mortality associated with general anesthesia in ASA III and ASA IV patients needs to be taken into account when developing the anesthetic plan. Stakeholders including anesthesia providers and surgeons involved in carotid endarterectomy surgery need to be educated about the similar morbidity and mortality between patients who receive general and local anesthesia.

**Conclusions:** The results of these studies found no statistically significant difference between 30-day morbidity and mortality in patients who received general anesthesia compared with local anesthesia for endarterectomy surgery in 3 out of 4 studies. A level IV retrospective cohort study found a statistically significant increase in unexpected intubation, myocardial infarction, and aspiration in ASA III and IV patients who received general anesthesia for carotid endarterectomy surgery.

**Postoperative Patient Handoffs: Impact of Checklists**

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**Introduction:** Postoperative handoff is a high-risk, error-prone event. Patient care demands, time constraints, and communication styles may impact the quality of postoperative handoffs and patient outcomes. Checklist use has been proposed to standardize handoff content and improve care delivery. A literature review was conducted to examine the implementation of a structured checklist or electronic tool for postoperative handoff communication. Data items assessed included the checklist content and structure, impact on information omissions, task errors, and level of staff satisfaction with handoff quality.

**Literature Review Analysis:** A literature search of the PubMed and CINAHL and the AHRQ databases was conducted for articles published from January 2006 through January 2017. The search yielded 679 nonduplicate articles. After application of inclusion/exclusion criteria, 10 quasi-experimental studies were selected for review. No practice guideline for handoff checklists was identified. Checklist content and structure varied greatly. One validated multidisciplinary tool was identified and yielded the greatest improvement (50%) in satisfaction. Electronic handoff tools improved information transfer the most (34%) among all tools. A statistically significant decrease in errors of omission, task, and equipment errors was noted with checklist use in 4 studies.

**Implement Evidence:** End-user input should be obtained when creating a handoff tool. The tool should prompt an assessment of readiness for handoff after addressing immediate care needs, followed by a review of the procedure, intraoperative course, and concerns for postoperative care. Airway management or concerns, analgesic plan, immediate postoperative equipment, medication, and testing needs should be included. The tool should include surgery and anesthesia contact information for postoperative concerns and prompt a discussion that facilitates anticipatory guidance for postoperative care.

**Conclusions:** Computerized handoff tools, while still an emerging technology, may offer additional benefits due to their ability to efficiently transfer information from the electronic chart to a handoff tool. Little research exists surrounding the impact of postoperative handoff checklist use on patient outcomes. Professional practice standards surrounding handoff content are needed. Optimum handoff checklist format, content, and patient outcomes because of handoff checklist use are areas for future research.

**Postoperative Residual Curarization Causes, Detection, and Prevention: A Literature Review**

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**Introduction:** Postoperative residual curarization (PORC) is defined as the presence of postoperative muscle weakness signs or symptoms after the administration of intraoperative, nondepolarizing neuromuscular blocking agents. PORC is associated with muscle weakness, oxygen desaturation, pulmonary collapse, and acute respiratory failure that could lead to severe permanent brain damage or death. Prevention of PORC by the anesthetists' use of intraoperative neuromuscular monitoring, reversal agents, and clinical judgment leads to improved patient outcomes and safe anesthesia care.

**Literature Review Analysis:** Surveys of anesthetists have shown that many providers do not believe that PORC is common in their patients and therefore they often forego the use of intraoperative neuromuscular monitoring and administration of reversal agents after using a neuromuscular blocking agent to facilitate tracheal intubation. The populations that most commonly experience PORC are the elderly, obese, and female patients. Current research suggests that PORC occurs in 45% of patients with a train-of-four ratio  $<0.9$ . Studies have suggested that patients who do not receive any reversal agents have a 70% to 75% chance of developing postoperative respiratory side effects. The introduction of sugammadex has helped to decrease the incidence of PORC symptoms.

**Implement Evidence:** Long-acting NMBAs, such as pancuronium, should be avoided as they have the greatest incidence of PORC. Train-of-four neuromuscular monitoring should become part of anesthetists' monitoring standards to help avoid residual paralysis. By avoiding reversal agents, the patient is at a 70% to 75% increased chance of developing respiratory complications related to residual weakness. Anesthetists must recognize that elderly, obese women have the greatest risk for PORC, and steps should be taken to monitor and to avoid residual weakness, especially in these patients.

**Conclusions:** PORC is a problem that has been present since the introduction of NMBAs. Anesthetists need to be able to identify patients at risk and prevent residual weakness in all patients. Providers should utilize neuromuscular monitoring, the use of reversal agents, and clinical judgment to help advance patient safety and decrease the incidence of PORC.

**Protective Ventilation: A Method to Decrease Postoperative Pulmonary Complications**

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**Introduction:** Postoperative pulmonary complications (PPCs) can occur when conventional ventilation with supraphysiologic tidal volumes overstretch and injure alveoli. Hospital costs increase by 55%, and hospital length of stay increases by 89% with the diagnosis of PPCs. The increased utilization of healthcare resources has made prevention of PPCs a hospital quality measure. Lung protective ventilation is a potential method to reduce PPCs by reducing tidal volume and administering positive end expiratory pressure (PEEP) and recruitment maneuvers.

**Literature Review Analysis:** Four meta-analyses, 5 randomized controlled trials, and a retrospective study involving nearly 70,000 patients supported the use of protective ventilation. Protective ventilation techniques varied among individual studies. The most commonly evaluated strategies included low tidal volume, application of PEEP, and implementing recruitment maneuvers. Many surgical and patient variables were also examined and include: minimally invasive esophagectomy, open and laparoscopic abdominal surgery, surgical length greater than 2 hours, obese patients, and patients greater than 40 years old. All studies supported the use of tidal volumes between 5 and 8 mL/kg predicted body weight (PBW), with most also favoring the use of PEEP and recruitment maneuvers.

**Implement Evidence:** Annually, greater than 230 million patients require mechanical ventilation for general anesthesia. Of those, 20% to 30% have an intermediate to high risk for developing PPCs. One of every 8 surgical patients develop PPCs, which are associated with more than 66% of all in-hospital postoperative deaths. Widely disseminating this evidence will educate the anesthetist to institute simple ventilator changes in the appropriate surgical population. These interventions potentially reduce the morbidity and mortality associated with PPCs.

**Conclusions:** According to the reviewed literature, tidal volumes of 5 to 8 mL/kg PBW are suggested to offer the benefits of lung protective ventilation. High PEEP defined as 5 to 10 cm H<sub>2</sub>O and recruitment maneuvers may also be beneficial in the absence of circulatory compromise. In the defined surgical patient population, a practice recommendation for lung protective ventilation is tidal volumes of 5 to 8 mL/kg PBW, 5 cm H<sub>2</sub>O PEEP, and recruitment maneuvers performed at 30 cm H<sub>2</sub>O, over 30 seconds and every 30 minutes after intubation.

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### **Providing Culturally Translational to Practice Assessments to the Transgender Patients**

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Florida International University

**Introduction:** Nonspecific preoperative assessment tools do not meet the diverse and multifaceted needs of transgender patients. The Joint Commission mandates that hospitals meet the standards for “assessment of patients.” Transgender patients have unique and complicated issues such as a need to for medication reconciliation, narrow social network, and higher economic insecurity. Evidence suggested that healthcare providers have not been adequately trained to meet the preanesthetic assessment needs of the complex transgender patients.

**Literature Review Analysis:** The transgender population was estimated to exceed 1.4 million persons in 2016. Transgender patients are presenting for a variety of multifaceted surgeries. One size does not fit all in preoperative assessment tools or effectively meet the needs of each individualized patient. Transgender patients present with complicated health issues that anesthesia providers do not encounter routinely. Without the proper training or education on the needs of the transgender patient, it is difficult for a provider to effectively navigate a generalized preoperative assessment tool. Twenty-one pieces of literature demonstrate a clinical significance between lack of provider education on transgender patients and poor patient outcomes.

**Implement Evidence:** Implementing an evidence-based practice preoperative assessment checklist is needed to meet the needs of the transgender patient. Identifying the most frequently overlooked, but critically important, risk factors anesthesia providers need to be incorporated into their preoperative evaluation in the literature. Those elements will then be used to implement a transgender-specific preoperative checklist to improve outcomes and educate providers. After postdevelopment and rollout, participating anesthesia providers will be tested on their knowledge of transgender-specific risk factors and associated protocols.

**Conclusions:** Evidence-based practice checklists make culturally competent providers and improves outcomes for the transgender patient. One size does not fit all regarding preoperative assessments. Transgender-specific risk factors can be overlooked in generalized preoperative anesthesia practice. Individualized checklists can help practitioners avoid missing those risk factors before the procedure, and the checklist can educate providers and improve patient outcomes. Education of the anesthesia provider on critically important risk factors of transgender-specific patients is an area for future research.



A99

### **Radiologic Monitoring of Faculty and Staff in an Electrophysiology Lab Using a Real-Time Dose Monitoring System**

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**Introduction:** A primary, quantitative crossover study of faculty and staff working in an electrophysiology lab at the University of Michigan Hospitals setting occurred. A real-time dose management system was used to determine if radiation exposure levels would decrease when providers were privy to their real-time radiation exposure data. Four aggregate categories of providers were first blinded (phase 1) and subsequently made aware of their radiation exposure levels during electrophysiology procedures (phase 2). In addition, a fifth category was assessed of a combined electrophysiologist-fellow role representing the operator position.

**Literature Review Analysis:** Using the mixed effect linear model, a significant decrease in radiation levels occurred in phase 2 as compared with phase 1 for the operator role represented by the combined electrophysiologist/fellow role with a p value of .025. Exposure levels in all other provider groups for phase 1 or 2 failed to reach statistical significance. All dose values were low and well below the US maximum allowable yearly dose of 5,000 mrem per year.

**Implement Evidence:** The project won first place at a poster session at the University of Michigan-Flint in December 2016. In February 2017, the results were presented at the annual UM-SICU conference as well as the UM-Mott-CRNA conference. At present, the results are planned for publication in 2017. Lastly, to foster change in practice within the university system, the university is directing an initiative to improve compliance of dosimeter wear and plan to consider the real-time dose monitoring system to aid in this goal. This action would aid at improving compliance and assist in lowering patient and occupational radiation exposure, thus lowering potential health risk.

**Conclusions:** A real-time radiation dose monitoring system during electrophysiology procedures may significantly lower occupational radiation exposure in healthcare workers.

## A100

### **Remifentanil for Labor Analgesia: An Evidence-Based Project**

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**Introduction:** Neuraxial analgesia is considered the gold standard for labor analgesia. Although effective in treating labor pain, contraindications associated with this technique can limit its availability to parturients. Remifentanil, a rapidly metabolized opioid, has been considered an effective alternative for pain management in the parturient population. At Fort Belvoir Community Hospital, we plan to develop a remifentanil protocol based on evidence that will standardize the administration of remifentanil.

**Literature Review Analysis:** Based on the literature review, we will implement: 1:1 nursing, baseline v/s and fetal heart monitoring, then v/s every 10 minutes x 3, then every 1 hour, and v/s every 15 minutes after any rate change. Continuous required monitoring includes ETCO<sub>2</sub>, pulse oximetry, and fetal heart monitoring. Women who have received opioid or sedative administration within the last 2 hours or a history of opioid/substance abuse will be excluded from receiving remifentanil. All patients will be placed on supplemental oxygen at 2 L. Anesthesia provider will act as a consulting service and will place the remifentanil orders and titrate dosages. Remifentanil will be stopped and anesthesia provider notified with the following: sedation score >4, respiratory rate less than <8, pulse oximetry <93%, and/or suspected fetal compromise.

**Implement Evidence:** Based on the literature search, a remifentanil protocol was developed. This protocol guided the computerized “anesthesia OB order set” developed for the anesthesia providers. In addition, in-services were held for the anesthesia providers, nursing staff, and OBGYN/midwives. In addition, to maintain sustainability of the remifentanil protocol and maintain staff competence, we created remifentanil binders and go-bys for the labor and delivery nursing staff and anesthesia providers. This will minimize any confusion and optimize patient care when the remifentanil is to be administered.

**Conclusions:** The order set consisted of the following: PCA bolus of 0.25 mcg/kg, lockout interval every 2 minutes, and a basal rate of 0.025 mcg/kg/min. If pain remains uncontrolled, the provider has the choice to either increase the basal rate to 0.05 mcg/kg/min or eliminate the bolus and maintain a basal rate between 0.025 mcg/kg/min and 0.1 mcg/kg/min. The anesthesia provider will remain at the bedside for 10 minutes following the initiation of remifentanil and with any changes in dosing. No sedative medication or any other medication to include antiemetics can be ordered without approval from the anesthesia provider.

## A101

### **Risks of Anesthesia Exposure During Early Childhood: A Review of the Literature**

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**Introduction:** On December 14, 2016, the US Food and Drug Administration (FDA) made a safety awareness announcement warning providers and consumers of the potential danger of administering anesthetics to children under the age of 3. The announcement was accompanied by a new mandatory warning label on several anesthetic gases and medications. The human brain goes through rapid growth and development, also known as a growth spurt, during the last trimester in utero and up to 3 years of age. Exposure to anesthesia during early brain development may be associated with neurodevelopmental delays.

**Literature Review Analysis:** Due to the vulnerability of the target population, current available research on neurodevelopmental delays in young children after anesthesia exposure is limited to retrospective cohort studies. A lack of consensus among the reviewed articles exists. Six of the 7 studies demonstrate increased risk of neurodevelopmental disabilities after early anesthesia exposure. Three of the studies examine effects of multiple anesthetic exposure, and 1 explores the length of exposure. A recently published study found no statistical difference in intellectual quotient (IQ) scores between children who had been exposed to anesthesia and those who had not. Further research on this topic will depend on the moral obligation of beneficence.

**Implement Evidence:** In response to the FDA announcement, the anesthetist should examine communication protocols between the multidisciplinary team and the pediatric patient and family. The risk and benefit of anesthesia should be concisely presented to the child's guardian(s). When planning the anesthetic care of the pediatric patient under the age of 3, the nature of the case must be examined. In cases that are nonemergent, or in which postponement of procedure does not produce increased risk to the patient, delay of the anesthetic until after the age of 3 may protect neurocognitive development.

**Conclusions:** The disseminated literature demonstrates an increased risk for neurodevelopmental disabilities in patients exposed to anesthesia in early childhood. The risks associated with anesthesia exposure to the developing brain may not be widely understood by medical providers. Education on these potential risks is imperative for both consumers and members of the medical community. Clinical practice change in response to the FDA safety announcement should include a communication protocol utilized among the medical team and education on anesthetic risks presented to the child's guardian(s).

**A102**

**Road to Recovery: Development and Implementation of a Standardized ERAS Algorithm for Adults Undergoing Elective Cardiac Surgery**

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**Introduction:** Surgery has major metabolic and endocrine responses prolonging patient recovery, hospital stay, and costs. Enhanced recovery after surgery (ERAS) programs integrate multimodal interventions to assist in decreasing variability in surgical care and costs, reducing postoperative morbidity, and reducing profound stress response in the surgical population. Presently, there is no standardized published protocol for ERAS in adult patients undergoing elective cardiac surgery. The development and implementation of a standardized ERAS protocol can provide an evidenced-based practice change for this patient population.

**Literature Review Analysis:** ERAS in cardiac surgical patients strives for optimizing hemodynamics, using multimodal analgesia to control postoperative pain and reduce opioid requirements, promoting earlier postoperative extubation, mobilization, and restoring homeostasis. The largest obstacle identified in the implementation process is the lack of communication between the multidisciplinary professional team. The “stepped approach” incorporates a step-by-step evidence-based multidisciplinary protocol meant to successfully implement the ERAS algorithm.

**Implement Evidence:** In order to facilitate the standardization of this process, multidisciplinary cooperation is key. The construction of a new care pathway will be standardized via the utilization of the stepped approach. A schematic outline of an anesthesia and perioperative multimodal protocol, as well as postoperative nursing care is provided to teams via the institutional intranet. This also appears in the care protocols and computerized medical record, thus facilitating standardization.

**Conclusions:** At a very basic level, a healthcare system is composed of interacting interdependent components. By incorporating a multidisciplinary approach, with an emphasis on anesthesia and postoperative nursing care, a successful implementation of a cardiac ERAS algorithm will be possible. Our clinical improvement project aims to promote faster recovery times, earlier extubation, cost efficiency, and stress response reduction from surgery. These goals, as well as the implementation of the proposed algorithm, provides current evidence that can mold the future of cardiac surgery.

**A103**

**Role of Esmolol in Decreasing Postoperative Pain and Analgesia Requirements in Laparoscopic Cholecystectomy Patients**

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**Introduction:** The beta-adrenergic antagonist esmolol has been investigated as an agent that decreases both pain and analgesic requirements in patients undergoing laparoscopic cholecystectomy. This review will examine the available evidence to support the use of esmolol intraoperatively for laparoscopic cholecystectomy.

**Literature Review Analysis:** A review of the literature was conducted. Six randomized controlled trials were identified and included ASA I-II patients for laparoscopic cholecystectomy. The randomized experimental groups underwent a protocol of esmolol bolus at induction followed by an infusion of esmolol. Patients who received esmolol reported lower pain scores and required less analgesic medication in the 24-hour postoperative period compared with their counterparts. Great variability in the designs of each trial was observed in regard to the opioids administered intraoperatively, the type of additional adjuvants used, the utilization of local anesthetic in the port sites, and the general anesthetic techniques such as combinations of propofol, volatile anesthetic, nitrous oxide, and remifentanyl. The confounding variables weakened the results.

**Implement Evidence:** Laparoscopic cholecystectomy is a common surgical procedure that creates multifactorial pain. Current practice is to use opioids and adjuvants, yet many patients continue to experience pain and require opioids in the postanesthesia care unit (PACU). Evidence inconclusively supports the use of esmolol as an adjuvant medication to improve patients' experiences by decreasing postoperative pain and mitigating the need for rescue analgesics in the postoperative period. Practitioners should continue to study the suspected efficacy of esmolol for laparoscopic cholecystectomy.

**Conclusions:** Evidence suggests that esmolol may reduce pain scores and opioid requirements for laparoscopic cholecystectomy patients. More coherent and standardized research is needed to determine if intraoperative esmolol is an effective strategy for managing pain in laparoscopic cholecystectomies and if its benefits elicit a change in practice.

**A104**

**Systematic Review Evaluating the Multimodal Benefits of IV Ondansetron in Parturients Undergoing Spinal Anesthesia for Elective Cesarean Delivery**

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**Introduction:** Spinal anesthesia is the most favorable type of anesthetic provided to parturients undergoing cesarian delivery. However, despite many advantages of spinal administration, some undesired side effects may routinely occur. The most frequently related adverse outcomes of spinal anesthesia in women undergoing cesarean delivery are spinal induced hypotension, intrathecal opioid induced pruritus, and nausea and vomiting. Ondansetron, a selective 5-HT<sub>3</sub> receptor antagonist may be effective and efficient as a multimodal treatment strategy for combating these most common and distressing adverse effects.

**Literature Review Analysis:** A comprehensive literature review was done searching the databases PubMed, EMBASE, CINAHL with Full Text, and MEDLINE. Over 40 articles that met inclusion criteria consisted of studies evaluating efficacy of IV ondansetron for attenuating spinal induced hemodynamic changes, reducing intrathecal opioid-induced pruritus, and reducing postoperative nausea and vomiting. Overwhelming scientific evidence purport benefits for maintaining maternal hemodynamics; a prior systematic review revealed significant decreases in pruritus (16%) and nausea and vomiting (8%) with ondansetron. The main findings reveal primary mechanism by which IV ondansetron exert its effect by blocking type 3 serotonin receptors.

**Implement Evidence:** Ondansetron is currently used and typically implemented most often in postspinal and postcesarean delivery for treatment of nausea and vomiting. In addition, ondansetron is often implemented well after any developed spinal induced hypotension has been treated with either vasopressor or fluids. Ondansetron is also used for the management of intrathecal opioid-induced pruritus. Therefore, the multimodal benefits of ondansetron can be optimized prophylactically as a standard of care combating common symptoms and side effects experienced by the parturient undergoing spinal anesthesia for elective cesarean delivery.

**Conclusions:** Evidence supports administration of prophylactic IV ondansetron to parturients receiving spinal anesthesia for elective cesarean delivery taking full advantage of its multimodal benefits that include maintaining maternal hemodynamics, reducing the incidence of opioid-induced pruritus and nausea and vomiting after spinal anesthesia. Clinical trials and education for anesthesia providers on utilizing ondansetron prophylactically as a standard of care especially in parturients who are having elective cesarean delivery and undergoing spinal anesthesia is an area for future research.

**A105**

**The Benefit of Preoperative Warming in Reducing Perioperative Hypothermia**

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**Introduction:** Hypothermia is defined as a core body temperature less than 36°C. Hypothermia in the surgical patient can lead to multiple postoperative complications and increased stays in the postoperative care unit and hospital. The use of active prewarming in the preoperative area can lead to a decrease in perioperative hypothermia and complications and extended stays in the hospital.

**Literature Review Analysis:** The majority of studies showed that active prewarming of surgical patients reduced the incidence of perioperative hypothermia. One study showed active prewarming of patients receiving combined epidural and general anesthesia during major abdominal surgery prevented postoperative hypothermia completely, while the control group had a 72% incidence of postoperative hypothermia. Another study showed there was no benefit to active prewarming in colorectal surgery in reducing the amount of perioperative hypothermia but found anecdotally that the prewarming reduced patient anxiety levels and increased patient comfort. Another study showed benefit of active prewarming in the intraoperative period and for up to 40 minutes in the postoperative unit.

**Implement Evidence:** Using active preoperative warming can help prevent hypothermia in surgical patients. This can also help reduce complications, decrease postanesthesia care unit stays, hospital stays, and help increase patient comfort and reduce patient anxiety. Adding a forced-air warming blanket in the preoperative area that would also be able to be used throughout the surgical process may be a simple and cost-effective change that is beneficial to the patient while increasing patient comfort and reducing anxiety.

**Conclusions:** All of the studies reviewed showed some benefit to active prewarming of the surgical patient. Some showed the benefit of preventing hypothermia preoperatively, while other studies showed anecdotal benefits of increased patient comfort and decreased patient anxiety. A standard active body warmer that can be adopted and used in the preoperative and perioperative areas may help reduce costs. As patient satisfaction becomes a more relevant topic with regard to reimbursement, using prewarming devices may help increase this measure while preventing other postoperative complications at the same time.

A106

**The Effect of Dexamethasone on the Time for Sugammadex to Reverse Rocuronium**

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**Introduction:** This poster explores sugammadex's (SGD's) ability to effectively reverse rocuronium-induced neuromuscular blockade with the concurrent administration of dexamethasone (DEX), despite published in vitro data suggesting otherwise.

**Literature Review Analysis:** Two in vitro studies demonstrate an affinity between SGD and DEX. Zwiers et al yielded a thermodynamic profile of molecular interaction. This study revealed a high affinity between corticosteroids and SGD. The in vitro study by Rezonja et al demonstrated a dose-dependent inhibition of SGD's efficacy as a reversal agent for aminosteroidal neuromuscular blocking agents (ASNMBAs). These studies spurred a series of randomized controlled trials to evaluate the clinical significance of these results. Rocuronium and DEX share the same steroidal structure and very similar molecular dimensions. The 3 in vivo research studies included in the systematic review each demonstrate a lack of clinical and statistical significance in DEX's inhibition of SGD reversal of ASNMBAs. Despite in vitro evidence of SGD and DEX interactions, no clinically significant effects were determined.

**Implement Evidence:** The continued concurrent use of SGD and DEX is acceptable. Further research is needed to elucidate the potential interaction between SGD and reactive substrates that may impact the effectiveness of SGD reversal of rocuronium. Further research is advisable to determine additional drug-drug interactions with SGD that may impact patient outcomes.

**Conclusions:** Despite in vitro studies indicating DEX may have affinity for SGD, there is no clinical studies demonstrating that DEX alters SGD and its ability to antagonize rocuronium.



**The Effect of Educational Video on Patient's Anxiety, Knowledge, and Duration of Preanesthesia Interview for Patients Who Speak Arabic, Spanish, and Somali and Receive General Anesthesia for Noncardiac Surgery**

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**Introduction:** Video education is thought to be more effective than verbal or written methods of teaching by a variety of experts. There is limited data available related to the use of an educational video for patients undergoing general anesthesia. Furthermore, there is even less available data for the utilization of instructional videos in a patient's native language, when the patient has limited English language proficiency (LELP). The addition of an educational video to the conventional verbal and written modes of teaching about general anesthesia in the patient's native language may reinforce information conveyed.

**Literature Review Analysis:** Language barriers are associated with increased adverse events in US hospitals. Patients with LELP experience decreased satisfaction with their provision of care. Also, studies have shown increased admission and readmission to the hospital, elevated rates of medication error, longer hospital stay, and a decreased comprehension with their diagnosis. These issues lead to poor adherence and additional diagnostic testing. Effective communication between patients and healthcare providers are associated with improved care with pain management, recovery time, emotional health, and functional status.

**Implement Evidence:** A 6-minute general anesthesia video was developed by the project investigator. It contained basic information disseminated every time to all patients during the perioperative process. Patients who randomized to the video group reported a high level of appreciation for the video. Interpreters, patients' advocates, and family members echoed the same satisfaction when asked if adding a video in a native language would be a good addition to practice? Arabic, Spanish, and Somali languages were selected for the video voice-over because these languages are frequently encountered in our facility.

**Conclusions:** At the conclusion of this presentation, the participants described the impact of video education, about general anesthesia in a patient's native language, and on the patient's anxiety and knowledge levels during their perioperative experience. Based on this information and evidence-based literature, this project suggested it is worthwhile to pursue providing video education in a patient's native language.

**Source of Funding:** No funding was required for this project. Support was provided by Mayo Clinic: Library Services, Survey Center, Office of Diversity and Inclusion, Media Support Services, Language Service, Center for Clinical and Translational Science, and Mayo Clinic Department of Anesthesiology and Perioperative Medicine.

## A108

### **The Effectiveness of Intracuff Lidocaine in Preventing Postoperative Sore Throat**

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**Introduction:** Postoperative sore throat is a common side effect of endotracheal intubation in the surgical population. It is thought to be as a result of friction between the endotracheal tube and tracheal mucosa, trauma during intubation (or with coughing and bucking), mucosal dehydration, and erosion of tracheal tissue from contact with the endotracheal tube cuff. Lidocaine, an amide local anesthetic, exerts its effect by blocking nerve impulses through inhibition of sodium ions. Semipermeable endotracheal tube cuffs allow for lidocaine's analgesic effects at the site of insult during the procedure and after extubation.

**Literature Review Analysis:** A literature review was completed via CLIO, PubMed, and CINAHL catalogs and databases. Key terms included: lidocaine, intracuff, endotracheal, and sore throat. The search yielded 3,460 results. Nine randomized controlled trials conducted from 2000 to 2014 met the inclusion criteria and were utilized in this review. Intracuff lidocaine's effectiveness at preventing sore throat postextubation was compared against that of air or saline in the endotracheal tube cuff, lidocaine jelly was placed on the exterior of the endotracheal tube, and intravenous lidocaine. One of the 9 studies found that intracuff lidocaine had a similar efficacy as comparable methods for decreasing the incidence of postoperative sore throat, whereas 7 studies concluded that intracuff lidocaine was superior.

**Implement Evidence:** Two types of intracuff lidocaine can be used to decrease the incidence of sore throat postoperatively in the surgical population: alkalized (with sodium bicarbonate) or nonalkalinized (standard). Alkalization of lidocaine with 8.4% sodium bicarbonate dramatically increases its diffusion across the endotracheal tube cuff. Regardless of the type of lidocaine used in this intervention, a nontoxic dose must be instilled in the cuff, should an inadvertent rupture occur. Care should also be taken to use a minimal occlusive volume (volume at which no palpable leak is heard over the trachea) of lidocaine to prevent excessive pressure on the tracheal mucosa.

**Conclusions:** Due to the high incidence (24%-90%) of postoperative sore throat, a safe and reliable method of prevention is necessary. Having a continuous diffusion of lidocaine via the endotracheal tube cuff into the tracheal mucosa appears to have promising results. Compared with intravenous analgesics and local anesthetics, intracuff lidocaine does not cause sedation or delayed awakening, and its duration of action continues up to 24 hours after extubation. Ongoing research is needed on intracuff lidocaine's safety profile. Future studies should utilize standard preparation methods, dosages, endotracheal tubes, and surgical duration to further strengthen the argument for implementation into practice.

**A109**

**The Effectiveness of Lung Protective Ventilation During General Anesthesia**

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**Introduction:** The induction of anesthesia along with endotracheal intubation and mechanical ventilation leads to alterations in normal lung physiology. It is unclear if implementing lower default tidal volumes on anesthesia ventilators is an effective strategy to motivate practitioners to implement lung protective ventilation. High inspiratory volumes have been associated with the release of inflammatory mediators, atelectasis, lung infection, acute lung injury, and increased length of hospital stay. The purpose of this work is to describe the evidence on the effectiveness of lung protective ventilation.

**Literature Review Analysis:** Two randomized controlled trials and 2 meta-analyses were critically appraised all showing benefits to the use of lung protective ventilation. The meta-analyses found at least 1 improved outcome with the use of lung protective ventilation indicating patients who received lung protective ventilation had a decreased risk of lung injury, atelectasis, and pulmonary infection. The randomized controlled trials consistently found that low tidal volume ventilation and the use of 5 cm H<sub>2</sub>O of positive end expiratory pressure improved outcomes. Pulmonary complications, decreased length of hospital stay, a lower incidence of acute respiratory failure, and lower levels of interleukin were all benefits of utilizing lung protective ventilation.

**Implement Evidence:** In a large university hospital setting, anesthesia machines were reconfigured to provide a default tidal volume of 300 mL as compared with 700 mL. This change was designed to remind anesthesia providers that more consideration should be given to tidal volumes. It was hypothesized that forcing anesthesia providers to assign higher tidal volumes would result in a decreased overall tidal volume use. Preintervention and postintervention data sourced from the Multicenter Perioperative Outcomes Group (MPOG) databases will be examined to determine whether there was an overall reduction in tidal volume use.

**Conclusions:** Based on findings from the literature, it is recommended that practitioners assign tidal volumes based on a range of 6 to 8 mL/kg of ideal body weight. Research indicates that this intervention results in a decreased risk of lung injury, atelectasis, and pulmonary infection. Lung protective ventilation also decreased pulmonary complications, length of hospital stay, incidence of acute respiratory failure, and levels of interleukin. Interventions aimed at educating providers on lung protective ventilation strategies will reduce associated postoperative costs and improve patient outcomes.

## **A110**

### **The Effectiveness of Multimodal Analgesia in Chronic Pain Patients Undergoing Spinal Surgery**

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University of North Florida

**Introduction:** An estimated 50 million Americans have chronic pain, and an estimated 85% experience low back pain at some point. Ketamine, an NMDA receptor antagonist, has been used for chronic pain patients who have hyperanalgesia and opiate intolerance. Acetaminophen is an analgesic that has been shown to manage pain. It is unclear if ketamine and IV acetaminophen as a multimodal approach is effective in reducing pain in spinal surgery patients. The purpose of this project is to describe the evidence on the effectiveness of ketamine and IV acetaminophen in chronic pain patients undergoing spinal surgery.

**Literature Review Analysis:** Three systematic reviews and 3 randomized controlled trials were critically appraised. The results of these studies consistently found that ketamine and IV acetaminophen were effective in reducing postoperative pain, particularly for chronic pain patients who are opioid tolerant and undergoing painful procedures, such as spine surgeries. These studies in patients who received intraoperative ketamine and IV acetaminophen consistently found decreased pain scores, increased time to first analgesia demand dose, and a decrease in total opioid consumption.

**Implement Evidence:** A clinical practice guideline on the use of multimodal analgesia using ketamine and IV acetaminophen will be developed and implemented once anesthesia providers have been educated on the evidence of the effectiveness of these drugs in lumbar spinal surgery. Education will be provided to anesthesia providers using email, handouts, and a PowerPoint presentation at an anesthesia staff meeting. The use of ketamine and IV acetaminophen in this target patient population will be measured prior to and after implementation to provide an evaluation of the acceptance of the clinical practice guideline.

**Conclusions:** It is recommended from this evidence that ketamine and IV acetaminophen be used as a multimodal approach in chronic pain patients undergoing lumbar spinal surgery. The use of multimodal analgesia in these surgical procedures aid in lowering cost by decreasing opioid use postoperatively. The use of ketamine and IV acetaminophen is attributed to a decreased length of stay and an increase in patient satisfaction due to lower pain scores.

## A111

### **The Effectiveness of Paravertebral Blocks in Reducing Chronic Pain Syndrome Following Breast Surgery**

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**Introduction:** Breast cancer surgeries (BCS), such as mastectomy and lumpectomy, are estimated to result in chronic pain syndrome (CPS) in 20% to 68% of patients undergoing these procedures. It is unclear if paravertebral block (PVB) use is effective in reducing CPS in this high risk patient population. Utilization of PVB may result in improved patient outcomes and decreased healthcare costs. The purpose of this project is to present current evidence and the impact of PVBs on reducing the occurrence of CPS in patients undergoing BCS.

**Literature Review Analysis:** Three randomized controlled trials and 1 retrospective cohort study examined the use of preincisional PVBs in patients undergoing BCS and the long-term impact on chronic postoperative pain. Assumed risk associated with PVB is no greater than that associated with BCS. Standardized pain assessment tools and subjective symptomology reports were used to evaluate the incidence of chronic pain and sequelae up to 17 months postoperatively. Overall, the studies found a reduction in incidence and severity of chronic pain and improvement in quality of life related to pain symptoms in patients who received PVBs.

**Implement Evidence:** Lack of provider knowledge regarding long-term benefits is a key factor limiting current PVB use. An educational session to help anesthesia providers become more familiar with PVB and the associated benefits for BCS patients was implemented. Improved understanding of the impact of PVBs on chronic pain syndrome following BCS can help bridge the gap between evidence and practice. An increased number of PVBs translates into the reduction of the incidence and severity of chronic pain in this patient population.

**Conclusions:** It is recommended from this evidence that PVBs be provided to BCS patients to improve pain management postoperatively. PVBs have demonstrated efficacy in decreasing incidence and severity of CPS and associated symptoms such as motion related pain, depression, and perceived quality of life. This correlates with improved long-term patient outcomes as well as a decrease in overall healthcare costs.

## A112

### **The Effectiveness of Patient Education for Cataract Surgery at Improving Satisfaction**

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**Introduction:** Cataract surgery is a common elective surgical procedure. Anxiety is a frequent negative emotion experienced by patients undergoing surgery and is a reliable predictor of postoperative mood and perception of pain. Patients undergoing cataract surgery experience fear and anxiety not only during the procedure but in the preoperative and postoperative periods as well. Psychoeducational interventions may decrease patient anxiety and improve satisfaction. The purpose of this work is to describe the effectiveness of a preoperative educational intervention on reducing perioperative anxiety and improving overall patient satisfaction following cataract surgery

**Literature Review Analysis:** One systematic review, 4 randomized controlled trials (RCTs), and 1 quasi-experimental study consistently found preoperative education for cataract surgery improved at least 1 outcome in each study. All 4 RCTs found that preoperative counseling about the potential intraoperative visual experience during phacoemulsification under topical anesthesia helped to reduce the fear from the visual sensations in patients having cataract surgery. In the systematic review, 2 of the 4 RCTs showed a significant reduction in anxiety level following education. Another study utilized a CD-ROM format that explained possible surgical outcomes and found less anxiety among the intervention compared with the control group.

**Implement Evidence:** In a surgery center setting, evidence regarding decreased anxiety and improved patient satisfaction scores following preoperative patient education for cataract surgery was presented to perioperative staff via presentation. A prior research proven and evidence-based educational tool (patient handout educational/instructional tool) was discussed with staff and distributed to patients undergoing cataract surgery age 65 and greater. The patients will be given a postoperative questionnaire to be filled out during their 24-hour follow-up appointment.

**Conclusions:** Based on these findings, it is recommended that preoperative education for patients aged 65 years and older scheduled for cataract surgery be administered to decrease patient anxiety and improve patient satisfaction. The results of these studies consistently found preoperative education improved outcomes such as a reduction in anxiety level. The addition of preoperative education is feasible because it is cost effective and positively impacts patient satisfaction with cataract surgery.

**A113**

**The Effectiveness of Perioperative NSAIDs in Reducing Recurrent Breast Cancer and Mortality Risk**

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**Introduction:** Most breast cancer relapses are found during 3 years after surgery. Removing a neoplastic tumor can induce inflammation leading to endothelial cells proliferation. These cells secrete specific cytokines stimulating growth of malignant cells that thrive in microenvironment created by surgery and anesthesia such as stress, immunosuppression, pain, inflammation, and hypothermia to support metastatic cancer process. Perioperative NSAIDs, acting on the transient systemic inflammation pathway, may improve overall disease survival and a lower rate of breast cancer recurrence postsurgery.

**Literature Review Analysis:** NSAIDs inhibit prostaglandin E2 via COX-1 and COX-2 and proinflammatory interleukins, platelet function, and extracellular matrix integrity, producing anti-inflammatory effects against the cytokine surge during surgery. It was also found that COX-2 expression is independently associated with worse prognosis in breast cancer patients possessing ER-positive tumors. The researchers in the first study observed that the intraoperative use of ketorolac reduced breast cancer recurrence ( $p=0.019$ ). The second study demonstrated reduced breast cancer recurrence rate (HR=0.17; 95% CI 0.04-0.43;  $p=0.0002$ ) and lower mortality (HR=0.25; 95% CI 0.75-1.08;  $p=0.01$ ) for patients who received perioperative ketorolac or diclofenac.

**Implement Evidence:** Currently, there are not many published research articles on the effect of perioperative NSAIDs on breast cancer relapses or overall survival after surgery. A higher level of evidenced-based research is needed to demonstrate the effectiveness of perioperative NSAIDs in reducing breast cancer recurrence. Nevertheless, for mastectomy and conservative breast surgery, it is worth considering giving the patients a single perioperative intravenous ketorolac or diclofenac to block the transient inflammation pathway that could lead to recurrent breast cancer after surgery.

**Conclusions:** One of the reviewed studies had statistically significant results when data of ketorolac and diclofenac were pooled together, while nonstatistically significant data resulted with only ketorolac. Though blocking prostaglandins at both COX-1 and COX-2, diclofenac has higher potency against COX-2 than ketorolac. COX-2 expression is an independent risk factor for worse prognosis for ER-positive tumor patients. Further randomized controlled trials need to be conducted to investigate the impact of perioperative COX-1 inhibitors versus COX-2 inhibitors on breast cancer relapses and overall survival.

## A114

### **The Effectiveness of Preoperative Carbohydrate Drink in Elective Surgery to Improve Outcomes**

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**Introduction:** Preoperative carbohydrate drinks have been recently provided to reduce length of hospital stay, improve insulin resistance, and increase patient comfort and satisfaction. It is unclear if having patients remain NPO after midnight reduces the risk of regurgitation and aspiration by the reduction of gastric acidity and volume. Preoperative fasting may actually increase the risk of complications. The administration of a preoperative carbohydrate drink may yield savings and improved patient outcomes. The purpose of this work is to describe the evidence on the safety and effectiveness of preoperative carbohydrate drinks.

**Literature Review Analysis:** Two randomized clinical trials, 3 meta-analyses, and 1 systematic review critically appraised found no increases in adverse events when patients consumed a carbohydrate drink prior to elective surgery. These studies found that patients undergoing major abdominal surgery who were administered a carbohydrate drink preoperatively, had reduced length of hospital stay, decreased insulin resistance, and improved patient comfort. The studies also found no increased risk of aspiration, regurgitation, or related morbidity compared with standard NPO after midnight. Based on these findings, it is recommended that an oral carbohydrate drink be administered to selected patients up to 2 hours before surgery.

**Implement Evidence:** In a hospital surgical setting, a policy was developed by preoperative staff including nursing, anesthesia providers, and a general surgeon. The evidence was disseminated to the perioperative staff via a presentation discussing how the change will take place and why the change is necessary to improve patient outcomes. Patient educational material was also developed. The implementation of the carbohydrate drink to surgical patients preoperatively will be monitored and evaluated with a patient questionnaire.

**Conclusions:** It is recommended from this evidence that it is safe to provide a preoperative carbohydrate drink to elective surgical patients up to 2 hours before surgery. The results of these studies found a shortened fluid fast did not increase the incidence of aspiration, regurgitation, or related morbidity compared with standard NPO after midnight protocols. In addition, reduced length of hospital stay, improved insulin resistance, and increased patient comfort and satisfaction was found. The administering of a preoperative carbohydrate drink may yield savings and improved patient outcomes.



A115

**The Effects of Blood Transfusion on Recurrence of Non-Small Cell Lung Cancer**

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**Introduction:** Immunosuppression from blood products may affect disease free and overall survival in patients with lung cancer. Transfusion related immune modulation (TRIM) describes immunosuppressive and proinflammatory effects associated with blood administration. This literature review investigates the effects of transfusion on recurrence of non-small cell lung cancer (NSCLC). An electronic database search of English language, peer reviewed human subject studies was performed. A total of 72 articles were identified. Four articles published within the last 15 years were selected for inclusion.

**Literature Review Analysis:** Three and 5-year recurrence-free survival (RFS) and overall survival (OS) rates were lower in patients who received allogeneic blood transfusion (ABT). Propensity score matching analysis did not confirm the association between ABT and poor RFS and OS (Cata et al, 2016). Forrest plot data for overall and RFS favored the nontransfused patients (Luan et al, 2014). Forrest plot data found overall survival, disease free survival, recurrence rate, and 5-year survival favored the nontransfused patients when compared with patients with ABT (Wang et al, 2014). Type of blood transfusion was not significant in the multivariate analysis. There was no significant impact of transfusion when pneumonectomy or advanced stage disease were eliminated (Rzyman et al, 2003).

**Implement Evidence:** Lung cancer is the leading cause of cancer related death in the United States according to the American Cancer Society. The effects of perioperative ABT on survival after cancer surgery have been investigated for several decades. Evidence for a direct causal relationship remains insufficient. Three and 5-year survival data examines long-term outcomes. Knowledge about the implications of our anesthetic practice in the perioperative period and beyond will allow for opportunities to improve patient outcomes. Providers need to be aware of the potential risk and minimize perioperative bleeding.

**Conclusions:** Reviewed studies were retrospective with varying disease stages and comorbidities. Randomized clinical trials with adequate power to detect minor survival differences are warranted. A variety of reasons makes this impossible. Major perioperative blood loss requiring ABT is unpredictable. Unnecessary exposure to ABT is not ethical nor is withholding a transfusion. A prospective, large-scale study where confounding variables are strictly balanced is necessary. The role of leukocytes and storage duration on tumor growth have been questioned and may be insightful areas for future research.

## A116

### **The Impact of Rotational Thromboelastometry Analysis in Postpartum Hemorrhage: Guiding Effective Management Before “The Clot Thickens”**

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**Introduction:** Coagulopathy due to postpartum hemorrhage (PPH) or its treatment is often underestimated and therefore remains untreated, potentially causing progression to more severe hemorrhage. While standard clotting assays just detect the starting time of clotting, thromboelastometry provides information on the whole kinetics of bleeding including clotting time, clot formation, clot stability, and lysis.

**Literature Review Analysis:** A literature search was conducted, and multiple databases were searched between the years 2010 and 2016 including Cochrane Library, MEDLINE, EBSCOhost, PubMed, CINAHL, and Google Scholar. Keywords searched included postpartum hemorrhage, coagulopathy, ROTEM, FibTEM, clot analysis, hemorrhage management, and obstetrics. A total of 7 articles determined to be topic specific were included in this literature review. According to the literature, fibrinogen depletion in early PPH is the single variable independently associated with progression to severe PPH. Early detection of this depletion, via rotational thromboelastometry (ROTEM), may be crucial to effectively manage PPH.

**Implement Evidence:** Persistent PPH is frequently complicated by coagulopathy even before the development of dilutional coagulopathy with the infusion of blood products, colloids, and crystalloids. If unnoticed, coagulopathy may contribute to massive hemorrhage and ultimately death. Studies are indicating that ROTEM results could improve clinical outcomes of women with persistent PPH in multiple ways: first as a predictor of severe PPH, and second as a diagnostic tool for coagulopathy. These results can guide management of coagulopathy associated with bleeding and the physiology associated with pregnancy.

**Conclusions:** Early assessment of coagulation status has been recommended to identify, and subsequently correct, coagulation abnormalities. The different parameters in ROTEM are dependent on the activity of the plasmatic coagulation system, platelet function, and fibrinolysis. Thus it is a more informative assay of the coagulation process in real time. ROTEM is rapidly available and can be an early indicator for progression of PPH. Future studies should evaluate its potential to guide management of coagulopathy associated with PPH in obstetrics.

**A117**

**The Influence of Production Pressure on Patient Safety in the Operating Room**

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**Introduction:** Production pressure affects perioperative providers. It's defined as the pressure to place priority on efficiency rather than patient safety and can arise from both internal and external sources. There is a paucity of evidence investigating production pressure in the delivery of anesthesia care. This literature review explores current data comparing production pressure and patient safety. A comprehensive electronic database search was performed. Seventy peer reviewed, English language articles published between 2000 and 2016 were identified. Three articles were included in the final analysis.

**Literature Review Analysis:** Christian et al found areas impacting patient safety included communication/flow of information and coordination of workflow. Whitson et al discovered high workload periods correlated with patient safety events, and respondents working within fee-for-service reported excessive weekly workload. Sedation practices modified to speed start of subsequent procedures by 14.5%. Freund et al found 47.8% reported observing a colleague alter normal practice patterns. Continuous quality improvement (CQI) report rate decreased during the time period from 1998 to 2000 indicating decreases in occurrence of critical incidents, patient injuries, and escalation of care. Post hoc analysis was conducted and increases in operational inefficiency/error rates was discovered in the high productivity period.

**Implement Evidence:** Patient volume will continue to rise (Weiser, 2015). Patient safety requires continuous improvements in training programs, education, and achieving compatible goals for efficiency and quality. Economic pressure has placed a priority on efficiency, risking a normalization of deviance from a culture of safety. Synchronization of competing tasks during periods requiring high levels of vigilance will require open communication. An ethical problem arises when looking to evaluate production pressure in the OR. To prospectively test the hypothesis requires placing patients at risk for unknown harm.

**Conclusions:** Reviewed articles that investigated operating room efficiency were without measures to quantify patient safety. Improvements are needed to develop benchmarking criteria for quality care. Christian and Whitson et al both found excessive workload periods to impact patient safety. Findings by Freund et al were limited by the decrease in CQI reporting. Future research must examine communication patterns and synchronization of competing tasks in high reliability cultures.

## A118

### **The Role of an Anesthesia Machine Cover in the Prevention of Spread and Transmission of Pathogenic Intraoperative Microorganisms**

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**Introduction:** The implementation of appropriate hygiene practices in the anesthesia workstation is among the most effective means of preventing healthcare associated infections (HAIs). HAIs transfer pathogenic organisms among patients in the intraoperative period. This is one of the leading causes of death in the anesthesia work area in the United States.

**Literature Review Analysis:** Research and evidence conducted on patients in the intraoperative period has consistently shown that a multimodal approach targeting improvements in intraoperative hygiene performance is necessary and may reduce the risk of HAI. Searches of the ProQuest, MEDLINE (via OVID, 1950 to present), PubMed (via FIU library systems), and CINAHL electronic databases returned 50 records, of which 30 met the inclusion criteria for this study. The proposed study will evaluate the effectiveness of an educational intervention using the Anesthesia Hygiene Organizer (AHO) in preventing contamination using high-fidelity simulators in a high-fidelity simulation center. A fluorescent dye will be used to determine what places of the anesthesia work area were contaminated by the student nurse anesthetists while conducting simulated induction, maintenance, and emergence of general anesthesia cases. The use of an anesthesia machine cover or the AHO is intended to help address both inconsistent hygiene practices as well as organization of anesthesia equipment during surgery. In the context of the proposed study, while anesthesia machine covers are not specifically mentioned, the evidence suggests that the strategy will be effective in reducing pathogen transmission since it will reduce pathogen reservoirs on the anesthesia machine, as well as contribute to reduced pathogen loads and hygiene practices especially when used within the context of a multimodal strategy that address the reservoirs and transmission vehicle for infections simultaneously. Use of the Anesthesia Hygiene Organizer in conjunction with other modalities that reduce pathogen reservoirs, growth, and transmission will be effective in preventing the spread and transmission of pathogenic intraoperative microorganisms. Routine use of the AHO is practical and potentially capable of preventing the transfer of pathogenic organisms among patients in the intraoperative period. Research and evidence conducted on patients in the intraoperative period has consistently shown that a multimodal approach targeting improvements in intraoperative hygiene performance is necessary and may reduce the risk of healthcare associated infections (HAI's). Microbial growth occurs on anesthesia machines, contributing to healthcare-associated infections, making it imperative that strategies to decontaminate them be explored.

**Implement Evidence:** A better understanding of knowledge deficits and the introduction of improvement strategies can help anesthesia providers recognize opportunities to prevent pathogen transmission between cases. Anesthesia providers caring for patients may potentially utilize the AHO as a means to prevent HAIs through the transfer and spread of pathogenic organisms in the anesthesia work area. If successful, this educational intervention will be part of future curricula for nurse anesthesia students, anesthesiology residents, and anesthesia providers.

**Conclusions:** Routine use of the AHO is practical and potentially capable of preventing the transfer of pathogenic organisms among patients in the intraoperative period. More research is needed to study the effects of the AHO, as well the guidelines for user implementation. This requires further investigation and experimental practice with the AHO through the intraoperative hospital setting among diverse operative procedures.

**A119**

**The Role of Oesophageal Doppler to Guide Fluid Therapy During Liver Transplantation**

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**Introduction:** Liver transplantation has become the standard of care for patients with end stage liver disease. Patients undergoing hepatic transplantation frequently display considerable physiological changes due to massive fluid shifts and changes in volumetric status. Traditional hemodynamic devices such as the pulmonary artery catheter do not provide precise measurements of adequate tissue perfusion and volume status. The oesophageal Doppler has been suggested for providing continuous cardiac output monitoring and real-time volume status during the critical phases of liver transplantation.

**Literature Review Analysis:** There were 5 articles that met the review criteria, supporting the use of oesophageal Doppler monitoring in hepatic transplantation to guide fluid therapy based on the individualized Doppler-guided fluid management algorithm. Use of oesophageal Doppler monitoring in patients undergoing hepatic transplantation has the potential to offer a quantitative means for individualized goal-directed fluid management. In 5 of the 7 studies, an oesophageal Doppler monitor detected cardiac output changes more rapidly than traditional hemodynamic monitors, which may reduce intraoperative morbidity and mortality, as well as improve quality of care, shorten hospital stay, and reduce healthcare costs in patients undergoing liver transplantation.

**Implement Evidence:** Anesthesia providers caring for patients undergoing hepatic transplantation, who are at risk for tissue hypoperfusion and volume overload, may benefit from the use of a minimally invasive cardiac output monitor such as the oesophageal Doppler for managing individual goal-directed fluid therapy. Implementation of the oesophageal Doppler as a standard of practice for intraoperative monitoring will lead to improved patient-centered, goal-directed fluid strategies and improved patient outcomes guided by an individualized goal-directed fluid algorithm.

**Conclusions:** The use of perioperative oesophageal Doppler monitoring during liver transplantation is a reliable tool for guiding goal-directed fluid therapy. Evidence-based practice research has demonstrated potential benefits such as shorter hospital stays, reduced morbidity and mortality, improved quality of care, and reduction in medical costs. Doppler monitoring during liver transplantation offers a method of measuring individualized goal-directed fluid management. Clinical trials and education for anesthesia providers on minimally invasive cardiac output monitoring is an area for future research.

## A120

### **The Use of a High-Fidelity Patient Simulator to Introduce an Evidence-Based Emergency Manual into Certified Registered Nurse Anesthetist Practice**

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**Introduction:** Certified Registered Nurse Anesthetists (CRNAs) administer anesthesia care for thousands of military beneficiaries each year. Despite a drastic decline in the incidence of patient death and injury while under anesthesia, low-frequency, high-risk perioperative critical events still occur. CRNAs have been expected to rely on memory alone to recall key actions during critical events. Evidence has established that use of an emergency manual (EM) increases the number of key actions completed by anesthesia providers during low-frequency, high-risk, perioperative critical events.

**Literature Review Analysis:** Multiple studies have demonstrated that healthcare providers perform poorly when relying solely on their memory to manage critical events either in real or simulated circumstances. Despite the safety of anesthesia increasing, perioperative critical events occur at a rate of 145 per 10,000 surgeries per year. These events are now rare enough that some providers may never experience these events in clinical practice. Cognitive aids such as EMs improve performance of key actions by individuals and teams.

**Implement Evidence:** Twenty staff CRNAs from Fort Belvoir Community Hospital (FBCH) participated in standardized high-fidelity simulation training involving low-frequency, high-risk anesthetic crises first without the use of an EM and then after receiving training and orientation to the EM based on a model used by Goldhaber-Fiebert and colleagues. Differences in perceptions were evaluated pre-training and post-training by using a 5-point Likert scaled questionnaire assessing individual perceptions of performance.

**Conclusions:** The increase in positive perceptions utilizing an EM has the potential to enhance the care CRNAs deliver to patients when confronted with critical events. The findings from this evidence-based practice project justify expansion of this simulation training on the EM across disciplines providing perioperative care. The use of standardized EMs is relatively new within the medical and nursing disciplines, and the best implementation is still up for debate. However, with proper training in their effective use, they have the potential to make a lasting positive impact in the care provided during low-frequency, high-risk critical events.

**Source of Funding:** US Army, Medical Material Command, Joint Program Committee-1, Medical Simulation and Information Sciences (MSIS) Grant - \$50,000.

## A121

### **The Use of Social Media: To Enhance Professional Knowledge and Improve Connectivity Among CRNAs and SRNAs**

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**Introduction:** Healthcare professionals neglect opportunity for collaborative learning and reasoning. The absence of collaboration is due to a lack of connectivity among a community. The inability to collaborate inhibits healthcare providers to gather multiple perspectives regarding clinical inquiries in order to gain a shared understanding in professional knowledge. Thus, through a professional organization, providing an outlet that allows easy access for communication regarding professional knowledge may provide a solution to improve connectivity and collaboration among healthcare professionals.

**Literature Review Analysis:** The use of social media among healthcare providers can provide an opportunity to exchange professional views and improve professional knowledge. The lack of connectivity among community members causes a gap in professional development and thus may even hinder a profession to continue to grow and evolve. A social media platform serves as a cost effective and quick accessible outlet for up-to-date knowledge. The ease and accessibility of a social media website promotes members to exchange clinical knowledge and form discussions regardless of geographic location. The use of a social media platform for professional education enhancement may provide a solution in improving connectivity among professional organizations.

**Implement Evidence:** The social media platform should be utilized to provide clinically relevant multiple-choice questions regarding anesthetic care. Evidence-based rationales to support correct answers should be provided immediately after a question is completed. This gives the participants the opportunity to share their thoughts, regarding the questions, on the social media platform. To ensure validity of the content created, the question writers should complete the NBCRNA item-writing course. Doing so ensures competence and upholds the standard to which all in the nurse anesthesia community are subject to.

**Conclusions:** The goal is to influence participants into high order thinking and encourage collaboration among providers. In utilizing the presented literature review and following suggestions for its implementation, one may improve connectivity and feasibility of members to elevate each other's professional practice without geographic and chronologic constraints. The successes and hindrances experienced by anesthesia communities on a local level can only serve as a foundation for the improvement of the nurse anesthesia community on a grander scale.

**A122**

## **The Use of STOP-Bang Questionnaire Can Help Reduce Overall Complications in OSA Patients**

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**Introduction:** The STOP-Bang questionnaire is an instrument used for the screening of patients for obstructive sleep apnea (OSA). Recognizing OSA in surgical patients is important because this condition increases the risk of overall complications such as desaturation and difficult intubation. Continued desaturation may lead to respiratory arrest, cardiac arrest, and even death. Difficult intubation is linked to a significant number of patients that are at high risk for OSA. There is great value in the use of the STOP-Bang questionnaire to aid in the recognition of OSA in surgical patients.

**Literature Review Analysis:** The retrospective matched cohort study conducted by Liao et al (2009), found that oxygen desaturation was the number 1 most commonly observed postoperative complication in patients with OSA. Vasu et al (2010) conducted a study that found that the STOP-Bang questionnaire was highly effective to identify patients predisposed to postoperative complications; a majority of patients that scored at a high risk for OSA were also found to exhibit postoperative complications such as desaturation (Vasu et al, 2010). Goudra et al (2014) found that the risk of desaturation perioperative and postoperative does not have a direct correlation with increased BMI, but it does directly correlate with a high STOP-Bang questionnaire score. Difficult intubation was found to have a strong connection with high scores on the STOP-Bang questionnaire (Acar et al, 2014).

**Implement Evidence:** There is a high prevalence of undiagnosed OSA in surgical patients. A change in practice has to take place in order to decrease the number of preventable overall complications in this population of patients. Implementation of a feasible diagnostic tool, such as the affordable and easy-to-use STOP-Bang questionnaire, can improve outcomes of surgical patients with OSA. The STOP-Bang questionnaire is concise and easy to administer in the preoperative setting. The use of the STOP-Bang questionnaire can help reduce overall complications in OSA patients.

**Conclusions:** Obstructive sleep apnea is a serious medical condition that is characterized by complete or partial upper airway obstruction for periods of time. Surgical patients that have OSA are at increased risk of developing overall complications. Recognition of OSA in surgical patients can be achieved by the use of the STOP-Bang questionnaire in the preoperative setting. The use of STOP-Bang questionnaire can help reduce overall complications in OSA patients.



**A123**

**Transthoracic Ultrasonography and the Benefits During Cardiopulmonary Resuscitation in the Perioperative Period**

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**Introduction:** Ultrasonography (US) has developed into one of the most valuable tools for diagnostic purposes. In the United States, 295,000 people suffer sudden cardiac arrest annually, with 7% to 8.5% survival. The mortality rate is more than Alzheimer disease, breast cancer, AIDS, colon cancer, motor vehicle accidents, assault with firearms, fires, suicides, and prostate cancer combined. Surgical patients' risk of cardiac arrest is 5.6 per 10,000 cases, with mortality of 58.4%. US enhances diagnostic clarity by deciphering accuracy of pulse checks, adequacy of compressions, accurate causes of arrest, and clinical management.

**Literature Review Analysis:** In a randomized, single-blinded study, 206 first responders evaluated 16 adult patients undergoing coronary artery bypass grafting. Results concluded sensitivity of pulse palpation to be 90%, with a specificity of 55% and only 65% accuracy rating. A 2009 prospective observational study investigated current CPR guidelines for hand positioning. Of the 34 patients undergoing CPR, transesophageal echocardiography concluded in all patients there was significant narrowing of the left ventricular outflow tract, 41%, or the aorta, 59%. One prospective study with 179 participants concluded US during resuscitation identified pulseless electrical activity type arrests, the cause, and ascertained a suitable treatment.

**Implement Evidence:** Utilizing the evidence, an ACLS algorithm will be developed from the current American Heart Association guidelines with the adjunct of ultrasound throughout resuscitation for implementation into the perioperative surgical setting. The feasibility of facility implementation will be assessed. Educational materials in the form of brochures will be presented to anesthesia providers during 2 monthly educational conferences. The benefits of US will be tailored for the perioperative surgical setting to increase survival rate from cardiac arrest by optimizing diagnosis and patient management.

**Conclusions:** US during CPR can aid in identifying reversible causes in the surgical patient during cardiac arrest, a vital tool already utilized in the emergency departments for trauma and shock resuscitation. US offers real time advantages due to its accuracy in identifying and guiding CPR without the need to interrupt chest compressions. With a mortality rate of greater than 50%, cardiac arrest has overwhelming consequences. US guided resuscitation management in the perioperative period may serve as a safe, rapid, and noninvasive tool to decrease morbidity and mortality.

**A124**

**Trigger Films in Nurse Anesthesia Education**

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**Introduction:** Unanticipated difficult airway (DA) and “can’t intubate, can’t ventilate” (CICV) situations are rarely encountered in anesthesia practice but present a high risk for adverse patient outcomes.

Training student registered nurse anesthetists (SRNAs) to manage these low-incidence, high-mortality (LIHM) events presents a unique challenge as DA and CICV are not routinely encountered in clinical training but must be managed quickly and correctly to prevent patient harm. While high-fidelity simulation (HFS) has demonstrated efficacy in improving provider recall in LIHM events, additional teaching methods such as trigger films (TFs) can also have a role in LIHM training.

**Literature Review Analysis:** As of January 2015, our search strategy resulted in 449 nonduplicate articles. Based on abstract/title and exclusion/exclusion criteria, a total of 12 articles were found to be relevant. Multiple themes appear throughout the literature suggesting the overall efficacy of TFs, discussing the similarities between simulation and TFs, discussing the inconvenient nature of simulation, providing details for how to produce quality films, and supporting the efficacy of TF in anesthesia education. Seven of the articles reviewed met criteria for a level of evidence of 3 or higher (O’Toole et al, 2013; Hartland, Biddle and Fallacaro, 2008; McLain, Biddle and Cotter, 2012; Boet et al, 2010; Hoyt et al, 1988; Kamin et al, 2003).

**Implement Evidence:** The purpose of this project was to develop, implement, and evaluate the effectiveness of a high-quality TF depicting a CICV scenario for enhancing simulated airway management performance in phase I SRNAs. A TF was created depicting an SRNA encountering a CICV scenario. Twenty-one phase I SRNAs viewed the TF and then participated in facilitated group discussion as part of their HFS difficult airway management curriculum. Using a pretest-posttest design, student performance measures were evaluated before and after viewing the TF. Time to perform critical actions improved in all areas measured, with a statistically significant improvement in time to call for help.

**Conclusions:** This evidence-based practice intervention demonstrates the value of TFs in DA education and training of SRNAs. To facilitate sustainment, the TF will be embedded in the DKI-GSN nurse anesthesia program curriculum. TFs are a cost-effective way to distribute high-yield learning materials to distance learners. They also can be utilized as an adjunct to improve the HFS learning experience. Trigger films offer another modality of learning in academia beyond text, PowerPoint, and lecture. Educators should consider introducing TFs to their curriculum, especially when performance is not improving with current methods.

**Source of Funding:** This evidence-based practice project received funding from TriService Nursing Research Program to develop a higher quality TF.

**A125**

**University of Cincinnati Nurse Anesthesia Mentor Program: An Implementation Analysis**

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University of Cincinnati

**Introduction:** An extreme level of stress and burnout are associated with nurse anesthesia programs, as evidenced by the capstone project “University of Cincinnati Nurse Anesthesia Mentor Program: A Prospective Analysis.” The goal of our project is to implement the guidelines set by our predecessors in the “University of Cincinnati Nurse Anesthesia Mentor Program: A Prospective Analysis,” as well as evaluate the effectiveness of said implementation and identify areas of improvement.

**Literature Review Analysis:** The AANA found that the primary causes of high attrition rates include academic failure, loss of motivation, and mental or physical health problems. They identified a need for mentoring programs among nurse anesthesia programs with the overall goal of keeping students motivated and progressing toward program completion. In 1 article, there was a drastic increase in retention (37.5%-100%) after implementing a mentor-mentee relationship. Another study found that the most beneficial aspect of such a program was the psychosocial support and career guidance obtained. The use of social support lowers levels of stress, improves health and wellness, and increases self-efficacy.

**Implement Evidence:** Based on the literature review and the results of surveys collected from the University of Cincinnati Nurse Anesthesia class of 2017, the majority of stress stems from clinical performance and the lack of knowledge surrounding operating room (OR) expectations. The following implementations were made as ways of facilitating the transition from critical care nurse to student registered nurse anesthetist: hospital tours, one-on-one machine check-out guidance, and standard anesthesia room, trauma, and neurotrauma room setup guidance.

**Conclusions:** Based on the postimplementation survey, primary clinical challenges and stressors were positively impacted by the mentor-mentee relationship. One hundred percent of the mentees felt they benefited from its implementation and recommend the program continue for future classes. The majority reported receiving didactic, clinical, and psychosocial support resulting in a more fluid role transition compared with the surveys taken prior to program implementation.

**A126**

**Value Analysis of Sugammadex Compared With Neostigmine**

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**Introduction:** Although sugammadex has consistently been shown to more rapidly and effectively reverse neuromuscular blockade, its relatively high cost compared with neostigmine limits its widespread use in many facilities. Our literature review investigates the potential cost saving benefit of sugammadex with reduced OR and PACU times by assessing the primary or secondary outcomes of studies that compared sugammadex and neostigmine.

**Literature Review Analysis:** While several studies demonstrated that time from reversal drug administration to discharge from the operating room suite was significantly shorter with sugammadex, an overall decrease in operating room time or anesthesia time was not consistently proven. We attributed this to the anesthesia provider administering sugammadex closer to the completion of the operation due to the short onset of the drug. There is evidence to suggest that sugammadex potentially reduces OR time in bariatric or laparoscopic cases that require deep muscular blockade until procedural conclusion.

**Implement Evidence:** Further studies, particularly cost analysis that include OR and PACU times, are needed before the financial impact of sugammadex can be readily assessed. Operating costs of the OR and PACU are multifactorial and will vary greatly based on institution. Additionally, a meta-analysis of sugammadex showed a decrease in pulmonary and cardiovascular postoperative complications, but these complications were minor and the cost implications were not discussed.

**Conclusions:** Studies have not consistently demonstrated a reduction in PACU and OR times with sugammadex, but current evidence points to potential benefit for select populations and procedures that require deep neuromuscular blockade until surgical completion.

A127

## **Vaping From an Anesthesia Provider's Perspective: The Recovery Profiles of Sevoflurane and Desflurane**

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**Introduction:** Multiple studies have shown quicker emergence with desflurane compared with sevoflurane, but the former is perceived to have higher incidences of upper airway irritation and morbidity. Quicker emergence can be beneficial in ambulatory surgery settings where reduced turnover and PACU time can lead to reduced costs. Cost savings initiatives have focused on limiting the availability of inhaled anesthetics, which alone may account for 20% of anesthesia drug expenses. But does the drive to contain anesthesia costs affect patient recovery and safety?

**Literature Review Analysis:** White et al hypothesized that using desflurane over sevoflurane would result in a quicker return to activities of daily living on postoperative day 1 and that the incidence of perioperative coughing would be higher with desflurane. De Oliveira et al compared the time to awakening and the incidence of upper airway events (coughing, laryngospasm, sore throat, or hoarseness) between desflurane and sevoflurane. Werner et al hypothesized that patients receiving desflurane would have faster emergence and earlier PACU discharge over patients receiving sevoflurane. Common among all 3 literature reviews is the propensity of desflurane to have shorter earlier outcomes over sevoflurane, but controversy still exists for late outcomes.

**Implement Evidence:** The choice of a volatile anesthetic affects recovery profile. However, the shorter times to early primary outcomes such as eye opening, following commands, being oriented, and ready for discharge from the PACU did not translate into earlier discharge times, shorter hospital stays, additional cases being performed, or cost savings to the institution. Quicker emergence with desflurane should not be the only deciding factor when selecting a volatile anesthetic, and facilities should continue to offer both sevoflurane and desflurane to the anesthetist's armamentarium.

**Conclusions:** Selecting a less soluble anesthetic may lead to earlier recovery and discharge times after ambulatory surgery and has the potential to reduce costs. However, it is imperative that the drive for quicker turnover times and a reduction in costs be balanced with patient comfort and, more importantly, patient safety. The choice of volatile anesthetic for the maintenance of anesthesia should be made by the experience of the anesthesia provider and not by emergence times or cost mandates of the healthcare institution.

**A128**

**What Could Go Wrong? It's Just a Break**

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**Introduction:** Improving the effectiveness of communication among caregivers is one of The Joint Commission's 2017 National Patient Safety Goals. Miscommunication between providers during intraoperative handovers contributed to near miss patient safety events at our institution. Handovers are complex events that provide critical information about the patient and are especially vulnerable to communication breakdown. We sought to identify the critical elements required for an effective handover and those that are commonly miscommunicated during handovers between anesthesia providers in order to develop a standardized handover tool.

**Literature Review Analysis:** A literature review was conducted using the resources of the Eskind Digital Library at Vanderbilt University Medical Center. The keywords searched were: anesthesia, handovers, communication, perioperative, intraoperative, and breaks. We concluded that there are critical elements required for an effective handover and suspected that our current culture did not address all of those required elements.

**Implement Evidence:** We formed a multidisciplinary committee of CRNAs and anesthesiologists to look at our current handover process. We sought to determine perceived required elements of a proper handover and develop a standardized intraoperative handover tool. Committee members observed 60 handovers, and a staff survey on the culture of the current handover system was sent to anesthesia providers. Staff were educated on the results and desired outcomes related to the implementation of a structured handover tool. A laminated copy of the tool was affixed to all clinical workstations as reference during handovers.

**Conclusions:** Over 95% of staff reported the inclusion of airway and allergies as critical elements of a handover, yet 31% to 35% of the time they were not communicated during the handover. Similar findings were noted with hemodynamic goals, IV access, analgesia, and neuromuscular blockade. Only 35.4% were satisfied with the current intraoperative handover process, and only 44.6% felt it was safe. We plan additional observations and surveys after implementation of the handover tool. We expect to see a significant improvement in handoff quality, and we theorize fewer complications related to miscommunication.

**A129**

## **Anesthetic Implications for Patients With Hereditary Hemorrhagic Telangiectasia**

*Brittaney Ross, RN*

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**Introduction:** Hereditary hemorrhagic telangiectasia is a rare genetic vascular disease resulting in multiorgan formation of abnormal vascular communications known as arteriovenous malformations (AVMs). An understanding of disease pathophysiology and its anesthetic implications is imperative to appropriately deliver a safe anesthetic and avoid potential devastating complications of the disease.

**Literature Review:** The AVMs affect the mucous membranes, lungs, liver, and central nervous system (CNS). The most common presenting symptom is frequent nose bleeds commonly resulting in iron deficiency anemia. Lung AVMs cause right to left shunting of blood. There is a high risk of cerebral embolic events due to the absent pulmonary capillary bed. Liver and CNS AVMs less commonly produce symptoms. Practice recommendations regardless of disease manifestations include avoidance of nasal instrumentation, use of IV filter attachments, and prophylactic antibiotic administration.

**Description of Case:** A 33-year old female with hereditary hemorrhagic telangiectasia (HHT) presented for embolization of multiple pulmonary AVMs. Her past medical history included recurrent epistaxis, ACVLR1 gene mutation, HHT, and pulmonary AVMs. Diagnostics included a positive bubble study for extracardiac shunt, normal hematology and iron levels, and a current type and screen. The procedure was performed under general anesthesia with noninvasive monitoring. Two 18-gauge IVs were attached with in-line filters. The ventilator was adjusted to maintain SpO<sub>2</sub> > 95% and EtCO<sub>2</sub> 35 to 40 mm Hg. Prophylactic antibiotics were administered. The procedure was completed without complication. The patient was extubated and transported to the PACU in stable condition.

**Conclusions:** The multiorgan effects of hereditary hemorrhagic telangiectasia can prove anesthetically challenging. An understanding of the pathophysiology is essential in developing an anesthetic plan. A thorough preoperative assessment and workup will identify the degree of organ involvement. Intraoperatively, precautions to minimize bleeding and embolic events are essential for all patients with this disease. The anesthetic should be tailored according to disease sequelae. Neuraxial anesthesia is controversial. Although it has been performed successfully, neurologic complications have been reported.

**A130**

## **Anesthetic Management for Posterior Lumbar Spinal Fusion With Pedicle Screws**

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**Introduction:** A remifentanyl infusion is typically used during neurosurgery in the absence of muscle relaxants to achieve a deep anesthetic while facilitating rapid emergence. Opioid infusions decrease minimum alveolar concentration (MAC) requirement of volatile anesthetics while having minimal impact on evoked potential monitoring. Patients with chronic pain can develop opioid tolerance and are at risk for opioid-induced hyperalgesia (OIH). This case report discusses failure of high doses of different opioids in combination with ketamine, dexmedetomidine, methadone, acetaminophen, and dexamethasone to provide postoperative analgesia after multilevel lumbar fusion.

**Literature Review:** Current literature suggested the anesthetic plan should have been limited to the use of 1 or 2 opioids while implementing an intraoperative infusion of nonopioid adjunct ketamine or dexmedetomidine. Titrating a sufentanil infusion instead of remifentanyl infusion could have minimized the risk of OIH associated with remifentanyl. Alternatively, combining a remifentanyl infusion with a dexmedetomidine or ketamine infusion could have provided a deeper anesthetic depth and facilitated a smoother emergence. Ketamine, in particular, can blunt central sensitization associated with chronic pain while attenuating the development of opioid tolerance and OIH.

**Description of Case:** A 57-year-old male presented for a 4-hour posterior lumbar fusion of T12 to S1. Current scheduled oral pain medications included gabapentin, oxycodone, hydrocodone/acetaminophen (10 mg/325 mg), tramadol, methadone, and cyclobenzaprine. Decision was made to supplement remifentanyl, propofol, and 0.6 MAC of sevoflurane with boluses of sufentanil and dexmedetomidine during maintenance following standard induction with fentanyl, lidocaine, propofol, and succinylcholine. The patient also received ketamine, methadone, hydromorphone, acetaminophen, and dexamethasone prior to incision. The patient was agitated upon emergence and thrashing all extremities due to pain, requiring additional midazolam and fentanyl administration in the recovery unit.

**Conclusions:** Opioids are still the main component of a balanced anesthetic or total intravenous anesthetic for neurosurgery without muscle relaxants. Using a high-dose opioid technique, however, can provide inadequate postoperative analgesia following prolonged spinal surgeries that often produce significant pain. Supplementing opioids with an intraoperative infusion of a nonopioid adjunct in a multimodal analgesic regimen becomes valuable in the anesthetic management of chronic pain of neurosurgical patients following extensive spinal surgeries.



**A131**

**Anesthetic Management of the Obstructive Sleep Apnea Patient**

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**Introduction:** Obstructive sleep apnea is prevalent in the United States. It is commonly associated with obesity. The complications that can arise from this pathology when providing anesthesia to this patient population can be dire. There are multiple recommendations, but no clear guidelines for the anesthetist in providing anesthesia for this patient population. The purpose of this poster was to provide valid research findings the anesthetist can utilize when providing care to the patient with obstructive sleep apnea.

**Literature Review:** After disseminating the current evidence, the following methods would be prudent choices to aid the anesthetist in avoiding adverse respiratory events in the obstructive sleep apnea patient: (1) the use of continuous positive airway pressure in the preoperative and postoperative period, (2) implementing an obstructive sleep apnea protocol to guide the anesthetist in selecting the most appropriate anesthetic technique, and (3) sugammadex administration for antagonism of neuromuscular blockade. These techniques serve as one model that may improve anesthetic outcomes in the aforementioned patient population.

**Description of Case:** A 53 year-old male (157 kg, 183 cm, body mass index of 46.8) presented to the hospital for left shoulder arthroscopy repair of torn rotator cuff. His medical history included obstructive sleep apnea and obesity. He was classified as a Mallampati 3. His anesthetic induction was uneventful, and the trachea was intubated easily with a GlideScope (Verathon Inc, Bothell, Washington). Upon emergence train-of-four, was assessed and the patient followed commands. Neostigmine, 5 mg, was intravenously administered. The trachea was extubated, and the patient quickly began to show signs of respiratory distress. The trachea was reintubated, and the patient was transferred to the postanesthesia care unit and connected to a mechanical ventilator.

**Conclusions:** When applicable, a regional anesthetic approach appears safer for the obstructive sleep apnea patient. Perioperative continuous positive airway pressure serves to maintain patency of the impaired airway musculature. An obstructive sleep apnea protocol guides the anesthetist in selecting a safe anesthetic for those who have either diagnosed or undiagnosed sleep apnea. When available, sugammadex should be administered for antagonism of neuromuscular blockade due to the evidence supporting its superior efficacy when compared with neostigmine.

**A132**

**Case Study: iCast Stent Use in Interventional Bronchoscopy**

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**Introduction:** Vanderbilt Medical Center utilizes interventional pulmonology to diagnose and treat numerous disease conditions. One is tracheobronchial stenosis following lung transplant, which requires the use of a stent to open narrowed passages. Until recently, this procedure used general anesthesia with muscle relaxation and rigid bronchoscopy to complete, carrying many risks including airway damage, vocal cord injury, bleeding, trauma, and complications of muscle relaxation use. The newly approved iCast stent allows for general anesthesia with a laryngeal mask airway (LMA) for placement, eliminating risks from rigid bronchoscopy.

**Literature Review:** Complications related to therapeutic rigid bronchoscopy were reported as bleeding, pneumothorax, hypoxemia, significant airway injury, hypotension, respiratory failure, arrhythmia, cardiac arrest, and death. Reported complications also showed significant higher level care requirements postoperatively. Hypoxemia, respiratory failure due to hypercarbia or lost airway, and significant airway injury were reported as associated with rigid bronchoscope and barotrauma from jet ventilation. Muscle relaxation use shows increased risk of postoperative weakness and subsequent PACU reintubation.

**Description of Case:** A 56-year-old male had double lung transplant on December 12, 2016 with postoperative complications including pneumonia, prolonged intubation, dysphagia requiring G-J tube feedings, early donor specific rejection, and bronchoscopy, which showed notable stenosis of the Right Middle and Left Lower Lobes. Patient presented for dilation and stenting. General anesthesia was induced with lidocaine and propofol per IV and #3 i-gel LMA placed. Anesthesia was maintained with propofol infusion and fentanyl boluses. Bronchoscopy was performed under fluoroscopy with placement of iCast stents into RML and LLL stenosis. Stent positions were easily adjusted via flexible scope and dilations were successful. Following confirmation, the patient was awakened, LMA was removed, and the patient was taken to the PACU for recovery. No complications occurred.

**Conclusions:** Until iCast stent approval, interventional bronchoscopy required rigid bronchoscope for placement. The associated risks related to rigid bronchoscopy, jet ventilation, and muscle relaxation are uncommon but considerable and potentially life changing or life threatening. Without the necessity of rigid bronchoscopy, the ability to place a stent via an LMA reduces and could eliminate the associated complications. The overall effect of iCast stent usage for anesthesia providers is a reduction in postoperative complications and hospital length of stay.

**A133**

## **Enhanced Recovery After Rectal Surgery**

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**Introduction:** There is currently a paradigm shift to the process in which major bowel surgery is performed. With the advent of enhanced recovery after surgery (ERAS), focus is being placed on minimizing the surgical stress response and early return of normal function. ERAS protocols are specific to type of surgery due to variability in best practice outcomes. ERAS has the potential to reduce hospital length of stay by 3 to 5 days. The following is the ERAS protocol for rectal surgery as it relates to a case report. Identification for improved adherence to ERAS in the case study is explored.

**Literature Review:** The following are improvements that could have been made to the patient's (TP's) care: shorter NPO time with glucose solution administration, use of a noninvasive cardiac output monitor to guide fluid administration, utilization of BIS monitor, no use of nasogastric tube, begin oral intake within 24 hours of surgery, Foley catheter removed within 24 hours of surgery, and avoid neostigmine.

**Description of Case:** TP is a 62-year-old male who undergoes abdominal perineal resection. TP is counseled, receives mechanical bowel preparation, and remains "nothing by mouth" (NPO) for 6 hours prior to surgery. A thoracic epidural is utilized intraoperatively and postoperatively. A nasogastric tube is used to decompress TP's stomach. Preoperative antibiotics are administered. Eighty percent inspired oxygen with low tidal volumes is given. Over 3 liters of crystalloid is administered. Phenylephrine is used to support his blood pressure. TP is paralyzed and reversed with neostigmine prior to extubation. Epidural and Foley catheter are left in place until postoperative day 3. TP is kept NPO for 2 days and receives intravenous maintenance fluid replacement.

**Conclusions:** It is recommended that patients undergoing major bowel surgery be cared for in adherence to ERAS protocol. The closer that one adheres to the protocol the better the patient outcome. In the case of TP, barriers to full ERAS adherence included provider education and access to appropriate monitoring devices, such as an esophageal Doppler. Educating providers on ERAS interventions could significantly improve adherence to the protocol. The education may also lead to access to tools needed to adhere to ERAS standards. As we make leaps in best practice, ERAS is an area where education has the potential to have an amplified effect on patient outcomes.

A134

## **Lumbar Artery Puncture During Office-Based Lipectomy: Case Study of a Rare Life-Threatening Complication**

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**Introduction:** Lipectomy is the most commonly delivered cosmetic surgery worldwide. The procedure has cited a low risk of adverse events, thus is most often performed in the office-based and surgery center settings. However, lipectomy is not void of clinically significant complications that may be difficult to identify and manage. Inadvertent lumbar artery puncture is a rare and major adverse event that may occur during lipectomy. Rapid recognition of resultant internal hemorrhage is crucial in preventing shock and death in a setting with resources that are limited when compared with the hospital setting.

**Literature Review:** A literature search was conducted via MEDLINE, PubMed, and CINAHL databases using the search terms lipectomy, liposuction, complications, adverse events, and artery puncture. Evidence supports the potential for major adverse events following lipectomy including pulmonary embolism, viscera perforation, lidocaine toxicity, necrotizing fasciitis, deep venous thrombosis, hemorrhage, and death. Fourteen records retrieved cited the rare incidence of visceral perforation during liposuction. No records were retrieved describing the rare occurrence of accidental lumbar artery puncture during lipectomy.

**Description of Case:** A 28-year-old healthy female underwent lipectomy at a surgery center. During surgery, 3 L aspirate was removed, and 2 L of IV fluid was given. Blood loss was an estimated 200 mL. As the patient was prepared for discharge, she began to report dizziness and was hypotensive and tachycardic. This was only mildly responsive to fluid resuscitation using colloids and autologous blood for transfusion. She was taken to the ER, and on arrival her abdominal garment was removed, provoking a state of cardiac arrest. She was resuscitated with fluids and medication and was later noted to have a Hgb of 2 mg/dL. She received 13 units of PRBC in a 24-hour period. A lumbar artery puncture was discovered, and embolization was done. She was discharged home in 48 hours.

**Conclusions:** Although lumbar artery puncture has not been previously cited as a complication of lipectomy, a case of this potentially fatal adverse event has been demonstrated. Blood loss associated with lipectomy has remained highly debated and has been found to occur largely at the level of the tissues. These hidden losses present a challenge for provider blood loss estimations and fluid resuscitation measures. Major complications, such as visceral perforation and lumbar artery puncture result in internal hemorrhage that may only be detectable once instability is appreciated via vital sign alterations.

A135

## **Maxillofacial Surgery: Enhanced Recovery Using Dexmedetomidine and Remifentanil**

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**Introduction:** Trauma-induced maxillofacial surgery advances recovery to a perilous period of significant soft tissue inflammation and swelling. Maxillofacial surgery renders the anesthetic challenging due to surgical, anesthesia, and patient-specific implications that further compound recovery risks. Using general anesthesia adjuncts with preemptive multimodal mechanisms such as dexmedetomidine and remifentanil can blunt surgical stress, optimize quality of care, and enhance recovery. The anesthesia practitioner can enhance recovery delivering well-balanced general anesthesia adjuncts dexmedetomidine and remifentanil countering implicated high-risk maxillofacial surgery challenges.

**Literature Review:** Priority recommendations of both patient-specific care and preemptive multimodal adjuncts are evidenced quality improvement initiatives, reducing quantity and quality of adverse outcomes in high-risk surgery. Deliberate hypotension, crystalloid fluid restriction, immobilization, and surgical stimulation blunting were concise without labile hemodynamics. Dexmedetomidine reduces norepinephrine-related tachycardia, hypertension, pain, stress, inflammation, organ-tissue ischemia, hyperalgesia, and vomiting. Remifentanil exhibits superior opioid quality without prolonged adverse outcomes, which enhances safety, specifically for chronically ill high acuity patients.

**Description of Case:** A 21-year-old male was admitted for mandibular ramus and anterior segmental osteotomy, maxillary osteotomy, and lip mass excision. The patient exhibited moderate anxiety/fear with macro-prognathia and Mallampati 3. The surgeon ordered deliberate hypotension and deliberate crystalloid fluid restriction. He received a standard uneventful induction and nasotracheal intubation. Sevoflurane 1.2 minimum alveolar concentration and infusions of dexmedetomidine 1 mcg/kg/h and remifentanil 0.5 mcg/kg/min initiated then decreased by half per goals. The 463-minute procedure had 1,000 mL estimated blood loss and 2,300 mL crystalloid fluid. A wide-awake cognition extubation achieved and continued dexmedetomidine 0.2 mcg/kg/min. The patient was calm and maintained airway patency and gentle clearing of blood. No adverse outcomes occurred.

**Conclusions:** A preemptive multimodal balanced general anesthetic with dexmedetomidine and remifentanil significantly interrupted the anticipated anesthesia-specific, procedure-specific, and patient-specific implications. The individual agent costs were not compared and considered negligent to the cost of an adverse outcome in a maxillofacial osteotomy. The primary recommendation is focus on quality perioperative intervention incorporation. Utilizing dexmedetomidine and remifentanil enhances recovery in high-risk maxillofacial procedures. A future priority of the anesthesia practitioner will be to research, educate, audit, and implement evidenced quality enhanced recovery recommendations that can and should be delivered.

## A136

### **Novel Use of Pulse Oximetry With an Oral Airway and a Disposable Pulse Oximetry Sensor in a Critically Ill Burn Patient During Debridement and Grafting**

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**Introduction:** Pulse oximetry is a standard monitor in anesthetics. At times, monitoring sites will not be available due to reasons such as burn, crush, amputation, poor perfusion, or presence in a surgical field. In the case presented here, all known monitoring sites were eliminated resulting in the need to obtain an oral pulse oximetry measurement from the hard and soft palate.

**Literature Review:** During the course of preparing this case study, it was identified in more than 1 source that esophageal oximetry was used successfully in burn and shock patients with limited options for traditional peripheral sites. Other sources described a pulse oximeter taped to a laryngeal mask airway, and another source was found detailing the patent on a pacifier that measured SaO<sub>2</sub> in pediatric populations (although nothing was found in describing the clinical use).

**Description of Case:** A 45-year-old male suffered critical burns from a propane tank explosion, sustaining 80% total body surface area (TBSA) full-thickness burns. During surgical debridement, the pulse oximetry sensor had to be moved so that the operation could continue. No traditional site was available; therefore, the only remaining option was to obtain oxygen hemoglobin saturation measurements from the mouth using an oral airway and a disposable pulse oximetry sensor.

**Conclusions:** The oral airway method of monitoring obtained a consistent waveform and oxygen hemoglobin saturations that correlated with arterial blood gases. This novel approach to monitoring could be considered and used when the standard, more traditional sites are not an option.

**A137**

**Roll the DISE - A New and Unique Opportunity to Help Direct the Care of OSA Patients**

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**Introduction:** Drug-induced sleep endoscopy (DISE) is a powerful tool for examining the dynamic airway in a sleeping patient with obstructive sleep apnea (OSA). DISE has been shown to identify areas of obstruction that can guide the otolaryngologist to determine future interventions for patients with OSA. The anesthetic considerations for a DISE is one of the most important factors in a successful examination. We sought out to implement a DISE anesthetic care pathway that would be safe for the patient and produce a successful examination.

**Literature Review:** A literature review was conducted using the resources of the Eskin Digital Library at Vanderbilt University Medical Center. The review of literature gave much insight into the anesthetic management of DISE cases. In the past, some DISE procedures had been completed using midazolam for sedation. However, propofol has shown to better mimic physiologic sleep patterns, which is very important during the procedure. In addition, De Corso et al showed success in monitoring the sedation level by using a bispectral index (BIS) monitor during the procedure. This review, as well as surgical input, helped to develop our protocol.

**Description of Case:** The data collected for this small sample size of procedures was part of a quality improvement initiative within the Division of Ambulatory Anesthesiology, Department of Anesthesiology, Vanderbilt University Medical Center. In collaboration with our surgeon colleagues and our review of literature, we developed a simple anesthetic care pathway for the DISE procedure performed on 12 patients in our ambulatory surgery center. (Care pathway will be displayed on poster.) The following data was obtained: the ability to successfully complete the examination, total procedure time (minutes), and recovery room stay (minutes).

**Conclusions:** Our retrospective data analysis showed that the average procedure time was 37 minutes and the average PACU length of stay was 38.9 minutes. We defined a successful examination to be when the patient maintained spontaneous ventilation throughout as well as the surgeon being able to identify the sight of obstruction as a meaningful diagnostic tool that would inform future care. All patients had a successful examination.

**A138**

**ROTEM Guided Treatment in Postpartum Hemorrhage with Disseminated Intravascular Coagulation**

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**Introduction:** To understand the incidence and prevalence of maternal postpartum hemorrhage (PPH) to describe patient management of postpartum hemorrhage complicated by DIC to explain the role of ROTEM in guiding blood product therapy.

**Literature Review:** PPH is defined as the loss of more than 500 mL or 1,000 mL of blood within the first 24 hours following childbirth. It is the leading cause of maternal morbidity and mortality worldwide with the World Health Organization estimating a rate of 1,000/100,000 live births. In the United States, the American College of Obstetricians and Gynecologists reports 7 to 10 in 100,000 live births or 140,000 deaths per year. ROTEM is a point of care test allowing for goal directed therapy to reduce required transfusions, ICU admission, length of stay, and mortality. It assists the clinician by identifying clotting time, clot formation, clot stability, and lysis that impacts choice of blood product therapy.

**Description of Case:** Our patient was a 30-year-old female, G1P0 with twin gestation, presenting with premature rupture of membranes at 18+2 weeks. After induction of labor, she developed chorioamnionitis and was started on gentamicin and clindamycin. Delivery was complicated by retained placenta for 3 hours. The obstetrician asked to perform D&C to get the placenta out. She was taken to OR for emergent D&C while transitioning to fulminant (DIC) with almost 2,000 cc blood loss. Starting resuscitation with crystalloid and colloids (500 cc) of albumin until the blood is available. Blood transfusion of 3 units of PRBCs, 3 FFP, and 1 unit of platelets and decided to perform ROTEM to assess the coagulopathy.

**Conclusions:** ROTEM allowed goal directed therapy, minimized required transfusions, and prevented the need for hysterectomy in this patient. While this point of care test is relatively new and requires further research into its impact on reducing transfusions, ICU admission, length of stay, and maternal mortality is required.



**A139**

**Severe Atelectasis on Induction of General Anesthesia: A Case Report**

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**Introduction:** Prior to anesthesia induction, ventilating with 100% oxygen has become a standard of practice primarily due to its effect of increasing the time to oxyhemoglobin desaturation during a period of apnea; however, this practice may also contribute to increased risk of atelectasis. Atelectasis on induction of anesthesia occurs in about 90% of healthy patients and the most important determinate of atelectasis during anesthesia induction is preoxygenation. This case report and literature review aims to clarify whether the risk of absorption atelectasis outweighs the benefit of preoxygenation.

**Literature Review:** Déry et al showed significant decrease in functional residual capacity volumes, decreased arterial oxygen tension, and increased dead space in patients preoxygenated with 100% oxygen versus 50% oxygen and 50% nitrogen. Edmark et al noted 10 times the amount of atelectasis in the group preoxygenated with 100% oxygen versus 80%. Joyce et al developed a mathematical model that demonstrated that 3 minutes of preoxygenation resulted in collapse 4 times faster than without preoxygenation. These studies did not report any intraoperative respiratory compromise due to absorption atelectasis.

**Description of Case:** A 34-year-old, 104-kg, ASA 3, female presented for a diagnostic laparoscopy. After failed initial attempt at intubation, the patient became cyanotic and difficult to mask ventilate. Once an airway was established, the patient required excessive positive pressure ventilation with gradual improvement in oxygenation. The patient was transported to CT scan, which indicated complete collapse of the right upper lobe and left lower lobe of the lungs with no indication of pulmonary embolus, mucous obstruction, or malposition of endotracheal tube. The patient's presentation was consistent with large lung volume loss due to absorption atelectasis compounded by mildly prolonged intubation period, the patient's body habitus (BMI 43), and supine position.

**Conclusions:** Preoxygenation with 100% oxygen causes absorption atelectasis. This degree of atelectasis does not normally result in respiratory compromise unless other confounding factors are present. Research recommendations include preoxygenating with 80% oxygen in populations in which there is greater risk of respiratory compromise; however, this must be weighed against the benefit of preoxygenation increasing time to desaturation. The method of preoxygenation must be individualized to the patient and coexisting risk factors. Recruitment maneuvers and PEEP are beneficial in treating atelectasis.

**A140**

**Sphenopalatine Ganglion Block: A Minimally Invasive Alternative Management for Postdural Puncture Headache**

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**Introduction:** Postdural puncture headache represents a known complication of neuraxial anesthesia and diagnostic lumbar punctures. Treatment measures range from conservative to the invasive, gold standard epidural blood patch. More recently, clinicians have begun to detail the efficacy of a sphenopalatine ganglion block for the treatment of postdural puncture headache. This case report details the application of a sphenopalatine ganglion block for the treatment of postdural puncture headache and examines the current literature regarding the treatment's efficacy and practicality.

**Literature Review:** In a study of 32 patients who received a sphenopalatine ganglion block, 69% were saved from having to receive an epidural blood patch for symptom relief. A retrospective analysis found that patients who received a sphenopalatine ganglion block achieved relief of symptoms at a faster rate than those who received the epidural blood patch. The literature presented, as well as the case reported, demonstrate successful clinical application of the sphenopalatine ganglion block for treating postdural puncture headache. A larger population controlled study is necessary; however, the results thus far are promising.

**Description of Case:** A 40-year-old female presented to the emergency department complaining of a throbbing, 9/10, progressively worsening headache with an onset of approximately 2 days prior. She underwent a diagnostic lumbar puncture 48 hours prior secondary to complaints of a headache, neck stiffness, photophobia, and an elevated white blood cell count and body temperature. Considering the patient's likely undiagnosed infection, an epidural blood patch was contraindicated. The patient received a sphenopalatine ganglion block. Immediately postprocedure the patient reported a pain level of 3/10 and stated her symptoms were "significantly more tolerable."

**Conclusions:** The minimally invasive and low-risk nature of the sphenopalatine ganglion block yields strong consideration for this procedure as a first-line treatment. Further in-depth studies are necessary to obtain a better understanding of the sphenopalatine ganglion block and the level of symptom resolution achieved. At the very least, until such studies are completed, a sphenopalatine ganglion block should be carefully ruminated prior to performance of an epidural blood patch, as the risks involved and skill required are demonstrably different.

## A141

### **Uneventful Induction: Trisomy 21 With 2 Prior Episodes of Severe Bradycardia on Induction of Anesthesia**

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**Introduction:** Inhalation induction with sevoflurane is the most common method of anesthesia induction in the pediatric patient at our institution. Peripheral intravenous catheters are typically inserted after the patient has passed through stage 2 of anesthesia. Hemodynamic changes may be seen with inhalation induction. Patients that have a diagnosis of trisomy 21 may have an increased incidence of bradycardia and hypotension with inhalation induction.

**Literature Review:** Children with trisomy 21 are noted to have an overactive vagal tone by 50% and have cardiac dysfunction and blunting of sympathetic activation with or without cardiac disease (Bai, Voepel-Lewis, Malviya, 2010; Boreland, Colligan, Brandom, 2004; Kreamer et al, 2010). Two studies noted anesthesia related bradycardia in patients with trisomy 21 to be less than 4% (Borland et al, 2004; Keenan, Shapiro, Kanr, Simpson, 1994). A retrospective study noted the overall incidence of bradycardia and hypotension in Down syndrome to be 57% compared with 12% for the control group (Kraemer et al, 2010).

**Description of Case:** This case study describes an inhalation induction without severe bradycardia for a patient with trisomy 21 presenting for repair of gastrocutaneous fistula with repaired congenital heart disease. Careful review of the anesthesia records showed severe bradycardia during induction of anesthesia by both novice and experienced practitioners. In this case study, altering the induction technique from prior anesthetics resulted in absence of severe bradycardia and hypotension.

**Conclusions:** Increasing awareness that bradycardia occurs frequently during inhalation induction of patients with trisomy 21 may guide the anesthetist to have increased vigilance when providing anesthesia for this vulnerable population. More research would be needed to determine whether altering inhalation induction technique would prevent bradycardic episodes in patients with trisomy 21.

**A142**

## **Vasoplegic Syndrome in Patients Taking ACEIs and ARBs**

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**Introduction:** Hypertension (HTN) affects approximately 60 to 65 million people in the United States leading to an increase in surgery patients taking antihypertensive medications. First-line drugs for HTN include angiotensin-converting enzyme inhibitors (ACEI) and angiotensin II receptor blockers (ARB). The frequency of hypotension during anesthesia rises significantly when a patient takes a medication that blocks the renin-angiotensin-aldosterone-system (RAAS). Refractory hypotension from RAAS antagonists is identified as vasoplegic syndrome (VS). The purpose of this case report is to examine various treatment modalities for VS and refractory hypotension in patients taking ACEIs or ARBs preoperatively.

**Literature Review:** VS is characterized as hypotension (mean arterial pressure < 60 mm Hg) with decreased systemic vascular resistance and central venous pressure, normal cardiac output, and resistance to conventional therapy such as fluid boluses, phenylephrine, and ephedrine. The two main culprits responsible for VS include activation of ATP-sensitive K<sup>+</sup> channels in vascular smooth muscle and activation of inducible nitric oxide (NO) synthase. Surgical trauma leads to an inflammatory response and endothelial cells release inflammatory mediators which cause arginine to convert into nitric oxide (NO) via NO synthase. NO activates guanylate cyclase into cyclic guanosine monophosphate (cGMP) which then causes systemic vasodilation and decreased myocardial contractility.

**Description of Case:** A 66-year-old, 87-kg, 170-cm, man was scheduled for placement of a left arm brachio basilic arteriovenous fistula. The patient's past medical history included end-stage renal failure, congestive heart failure and hypertension. The patient took his ARB, losartan 50mg, the night before surgery. Induction of anesthesia was achieved with etomidate 15 mg and propofol 50 mg intravenously (IV). A laryngeal mask airway (LMA) size 4.5 was inserted and sevoflurane was delivered at 1.5% with 3 L/min of O<sub>2</sub>. Patient's post-induction heart rate was 65 beats/min, non-invasive blood pressure was 55/38 mm Hg. Sevoflurane was decreased, patient was placed in Trendelenburg position, ephedrine, phenylephrine and a fluid bolus were administered, but the case was cancelled as MAP remained <60 mm Hg. Sevoflurane was turned off and O<sub>2</sub> was delivered at 12 L/min, MAP improved to 91 mm Hg, and LMA was removed. The patient was transported to the postanesthesia care unit (PACU) for further monitoring.

### **Conclusions:**

HTN is a common chronic disease process seen in patients undergoing general anesthesia and anesthesiologists must be cognizant of patients' antihypertensive medications especially ACEIs and ARBs. Anesthesiologists need to remain vigilant in recognizing patients at risk for VS and refractory hypotension and be prepared to treat it. Refractory hypotension and VS are serious complications and can cause death due to hemodynamic instability since normal compensatory mechanisms are blocked. Recommendations for preventing refractory hypotension includes holding ACEI or ARBs 24 hours prior to surgery. If conventional hypotension interventions fail, treatment of VS includes vasopressin or methylene blue. Anesthesia management of patients on antihypertensive medications requires the anesthesia provider to critically think and use alternative interventions if conventional therapies do not restore blood pressure to maintain hemodynamic stability.