2020 Annual Congress Poster Abstracts

Oral Posters
Quantitative Research

Exploration of Predictive Modeling of Defense Health Agency and Veterans Affairs Beneficiaries' Dietary Supplement Use

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Introduction: Empirical data are essentially nonexistent related to predictive modeling of dietary supplement (DS) use in patients who are undergoing anesthesia and surgery. The purposes of this study were the following: (1.) Explore predictors of DS use among Defense Health Agency and Veterans Affairs beneficiaries who were scheduled for surgical procedures and (2.) Investigate potential predictors of overall health and fitness perceptions among these populations who take DS.

Theoretical Framework: The authors developed and validated a data collection tool to obtain quantifiable data regarding demographic information in preoperative patients to identify potential predictive modeling in DS use.

Literature Review: Over 50% of patients in the United States use DS and the surgical population appears to use DS more frequently than the general population. In addition, studies describe a higher prevalence of use among military personnel compared to the civilian population.

Research Design: This was an experimental quantitative multi-center study. A convenience sample of at least 2,400 adult subjects (400 subjects × 6 medical centers) was calculated. After IRB exemption, data collection occurred preoperatively via SurveyMonkey. Participation was voluntary and data were unidentifiable.

Methods: Data were collected in preoperative clinics during preanesthetic evaluations, or in surgery holding areas immediately prior to surgery, using a validated data collection tool. The total convenience sample size was 2,623 subjects from six medical centers. Data were voluntarily, anonymously, and verbally obtained from subjects using SurveyMonkey.

Data Collection: Anonymously and verbally collected data included: sex, age, rank, education level, beneficiary status, race, body mass index (BMI), tobacco use, marital status, participation in exercise, health perception, and knowledge of DS side effects and drug interactions.

Results and Data Analysis: For predictive modeling of DS use, multiple logistic regression were performed for binary and ordinal outcomes via SPSS. For binary logistic regression the predictors were significant for the following outcomes: taking DS (education, sex, age, and race); knowledge of side effects (age, race, and rank); and participation in aerobic or strength training (education, age, BMI, and rank). For ordinal regression: education, age, and BMI were significant predictors for general health; and gender, age, and BMI significantly predicted overall fitness.

Discussions and Conclusions: Understanding DS use is central to predict and anticipate potential negative sequelae in patient outcomes in anesthesia. College education, females, Caucasians, and increasing age are indicators for greater DS use. These results provide opportunities for CRNAs to improve preoperative assessments, design patient-specific anesthesia, and enhance patient education. Further research is recommended.

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

Posterior Cul de Sac Catheter Proven Superior When Compared to Transversus Abdominis Plane Blocks for Patients Undergoing Laparoscopic Robotic Hysterectomies

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Introduction: Postoperative pain is typically managed with opioids despite known complications. Regional anesthesia is recommended as an opioid-sparing approach. Transversus abdominis plane (TAP) blocks are the gold standard despite mixed evidence of efficacy. There is a knowledge gap regarding the efficacy of posterior cul de sac (PCDS) catheters on postoperative pain management for subjects undergoing robotic-laparoscopic hysterectomies.

Theoretical Framework: The aim of this study is to compare the effectiveness of a PCDS catheter to a TAP block in postoperative opioid consumption in patients undergoing a laparoscopic robotic hysterectomy.

Literature Review: To date, no research has been conducted on PCDS catheters. This study serves as a pilot to determine efficacy. TAP blocks are currently the regional technique of choice, despite mixed reviews and limitations.

Research Design: A retrospective chart review was conducted on 56 patients who underwent a laparoscopic robotic hysterectomy between June 2018 and November 2019 at Phelps Health. With an ERAS protocol implemented to maintain homogeneity, subjects were divided into a control group (TAP) and an experimental group (PCDS).

Methods: The primary outcome measured was opioid consumption in the PACU. Secondary outcomes measured include demographics, opioid consumption (intraoperatively, POD 0, and total admission), incidence of PONV, pain scores, length of stay, and 30-day postoperative ED and hospital readmission rates. A two-tailed *t* test was used for the statistical analysis.

Data Collection: A retrospective chart review was conducted on 56 patients who underwent a laparoscopic robotic hysterectomy between June 2018 and November 2019 at Phelps Health. Subjects were divided into a control group (TAP) and an experimental group (PCDS).

Results and Data Analysis: Statistical analysis confirmed that patients who received a PCDS catheter consumed significantly less opioids in the PACU in comparison to subjects who received a TAP block (2.879 ± 2.730 mg vs 7.633 ± 7.324 mg respectively; $P = 0.026$). In addition, the experimental group had decreased: opioid consumption (on POD 0 ($P = 0.010$) and total during admission ($P = 0.004$)), postoperative pain scores after 15 minutes ($P < 0.05$), length of stay ($P = 0.028$), incidence of PONV ($P = 0.007$), and 30-day postoperative ED ($P < 0.001$) and hospital readmission rates ($P < 0.001$).

Discussions and Conclusions: Patients who received a PCDS catheter had decreased opioid consumption, reported decreased pain scores, were 5.5 times less likely to experience PONV, were 21 times less likely to return to the ED, and 41.4 times less likely to be readmitted to the hospital. This study concludes that the PCDS catheter was superior to the TAP block for patients undergoing a robot-laparoscopic hysterectomy.

Oral Posters
Evidence Based Practice

A Context-Based Review of Debriefing Methods for Novices

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Introduction: Despite the crucial role of debriefing, many educators struggle to master the skill of debriefing resulting in individual variability confounding the efficacy of the session. The use of a debrief framework functions to standardize facilitator variability by providing a framework to guide a balanced and effective debrief.

Methods: PICO: The problem was (P) selecting the optimal debriefing method following simulation based education events. The intervention was (I) identifying the strengths and drawbacks of each debriefing method. The context was (C) for the novice debriefer. The outcome was (O) optimizing the debriefing experience for the debriefer and learner. This review followed a nonsystematic, critical review approach. PubMed, CINAHL, and Google Scholar were searched using the search terms "debrief*" and "simul*" and "method." The reference lists of articles that addressed the research question were examined for additional sources using the ancestry approach. Given the nature of this review, no attempt was made to quantitate results or grade the levels of evidence for debriefing methods.

Analysis of the Evidence: At the time of this review, there is no evidence preferentially supporting one debriefing method over another, leaving space for educators to choose the technique to fit their situation. The authors noted a gap in the literature wherein no toolkit existed for educators to personalize their selections of a debriefing method. In response to this gap, the authors developed a table complete with common contexts around which educators may choose to structure their simulation debrief. The authors organized these elements into macro-categories of four "W's" - who (population), what (methods/content), where (environment) and when (timing), and then further divided into subcategories.

Recommendation for Practice: Although use of a debrief framework is suggested for best practice, the method should match its intended context. The two contexts which most readily bisect the eight debrief methods discussed pertain to debriefer experience levels and the use of a scripting infrastructure. To optimize both debriefer and learner experience, the novice debriefer should consider methods that provide optimal support for their facilitation. For the inexperienced debriefer, the authors recommend selecting a method both engineered for novice use and supported by a scripted infrastructure. Of these methods, the 3D model and AAR are recommended for quick implementation, while PEARLS and Diamond are for skillset improvement.

Emergency Manual for Anesthesia Crises

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Introduction: Due to the infrequency of occurrence and high level of stress during OR crises, it may be difficult for an individual anesthesia provider to remember every appropriate life-saving intervention. The purpose of this project was to determine if emergency manuals (EMs) could be beneficial to anesthesia providers at William Beaumont Army Medical Center (WBAMC) to improve patient outcomes.

Methods: In WBAMC anesthesia staff, how does high-fidelity OR simulation with an EM compared to staff memory affect performance in key tasks and satisfaction scores during critical events? A literature search of observational studies, clinical trials, meta-analyses, and systematic reviews was performed using PubMed, CINAHL, EBSCO Academic Search Premier, Wiley, and the Cochrane Library database with an "all fields" search of "Emergency Manual", or "crisis checklist", or "cognitive aid" that yielded 2,216 results. These results were further filtered, and four articles were selected for review per the inclusion criteria.

Analysis of the Evidence: Despite small differences in the four selected studies, overall outcomes were favorable for the use of an EM in managing high-risk, low-volume operating room emergencies. St. Pierre et al showed that EM presence improved overall task performance to 87.5% with a manual, from 59% without. Arriaga et al revealed that 23% of critical steps were missed without checklists available, whereas only 6% were missed with checklists available. Ziewacz et al demonstrated a 24% failure rate when the checklist was not used compared to a 4% failure rate with the use of a checklist. While Harrison et al revealed the top-performing teams used a cognitive aid extensively throughout the simulation.

Recommendation for Practice: A series of high-fidelity simulations were conducted to determine if the use of an EM would increase critical task adherence in an OR crisis. Participants were assigned to manage one scenario with an EM and one by memory alone. The analysis of 21 participants revealed the average percentage of critical tasks completed without using the EM was 55.3%. With the EM, 78.69% of critical tasks were completed. This increase was a difference of 23.39% (+/- 15.82, P <0.001). This project demonstrated a statistically significant improvement in completion of critical interventions and provider satisfaction, which could lead to overall improved patient safety if an EM is used during an OR crisis.

General Posters
Quantitative Research

An Exploration of Nurse Anesthesia Program Administrators' Perception of the Use of Lab Simulations in Lieu of Clinical Experiences for Student Nurse Anesthetists' Knowledge and Skill Acquisition

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Introduction: This study explored the perceptions of 43 nurse anesthesia program administrators (directors and assistant directors) in the United States on the use of simulation, the impact of simulation on student registered nurse anesthetist (SRNA) technical skill and knowledge, and the dependency of the simulated experiences in meeting clinical training requirements in lieu of actual clinical experiences.

Literature Review: There are many studies on the use of simulation and its effectiveness as an educational tool. Many field use simulation from aviation to medicine. There are multiple studies on the perception of CRNAs and SRNAs of the role of preceptor on simulation but no data on nurse anesthesia program administrators perceptions.

Theoretical Framework: This was an exploratory study to determine nurse anesthesia program administrators perception on the use of simulation.

Methodology: This study utilized a 19-question survey consisting of 6 demographic questions and 13 Likert scale questions on Program Administrators perception of simulation.

Data Collection and Methods: The Nurse Anesthetist Program Administrators' Perception Data Collection Tool, designed by the researcher was used to collect data after Georgetown University IRB approval. The survey consisted of questions to determine program administrators perception on simulation. Emails were sent to 120 CRNA program administrators (directors and assistant directors) inviting them to take the survey via SurveyMonkey. The study was interpreted using descriptive analysis. The sample consisted of 43 responses, all program administrators (ie, program director or program assistant director). Thirty-two program directors and 11 assistant program directors.

Results and Data Analysis: Program Administrators had mixed perceptions toward simulated central lines and fiber optic intubations in lieu of clinical experiences. However the majority (79%) did not approve of simulated epidural placements. Nearly half of respondents felt the COA's 2022 change to remove simulation from clinical requirements would negatively impact the program. Certain regions struggle with achieving skills in the clinical setting more than others.

Discussion and Conclusions: With advancements in technology and shifts in healthcare trends the COA should re-evaluate the availability of student opportunities for fiber optic intubations and central lines in today's practice environment. Anticipated changes made by the COA in regards to clinical requirements must be further explored and re-evaluated as they may disproportionately impact regions and delay graduation.

An Exploration of the Strategies Certified Registered Nurse Anesthetists Employ to Maintain Monitoring Vigilance and Alertness During Surgical Procedures

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Introduction: There is limited research regarding the factors that maintain CRNA vigilance and alertness throughout surgery. Identification of these factors is important in order to ensure patient safety through effective intervention and timely identification of potential complications.
Literature Review: Alertness and vigilance studies in the field of anesthesia are scarce, suggesting a gap in anesthesia-specific knowledge. Reading and breaks are the few identified factors that maintained vigilance and alertness.
Research Design: This study was conducted using an exploratory design. Data were collected to identify whether there is a relationship between CRNA gender, experience, hours worked per shift, hours worked per week, type of surgery, and the known factors that affect vigilance and alertness
Methods: Data were collected via online survey. A random sample generated from the AANA's Research Division was used. Inclusion criteria to select the sample were currently practicing CRNAs, both certified and re-certified who were members in the AANA, and had not opted out of the mass e-mail communication.
Data Collection: A de-novo survey tool "Intraoperative Vigilance Assessment Tool" was used to collect the data. The tool consisted of 23 questions divided into 3 sections. Survey questions were presented in Likert scale and "select all that apply" format.
Results and Data Analysis: Focusing on patient care, having more than 6 hours of sleep prior to work, and providing monitored anesthesia care helped maintain alertness. Only two factors were identified as beneficial in maintaining monitoring vigilance: room temperature and patient medical history. A statistically significant relationship was found between experience and breaks. CRNAs with > 20 years of experience tend to agree that breaks impacted their ability to maintain monitoring vigilance ($P = 0.02$), but they were less likely to take a break when their vigilance was waning ($P = 0.017$).
Discussions and Conclusions: The conflicting result between breaks and experience was possibly due to the presentation of the survey question. CRNAs were not asked how breaks impacted their monitoring vigilance, rather they were asked whether breaks had an impact on their vigilance. Breaks may have a negative impact to those with more experience, which explains why experienced CRNAs were less likely to take a break when their vigilance was waning.
Funding Sources: The Georgetown University School of Nursing and Health Studies DNAP Project Research Award.

Analyzing Prophylactic Antibiotic Administration in Patients Undergoing Cesarean Delivery Who Have a Penicillin and/or Cephalosporin Allergy

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Introduction: Patients with antibiotic allergies may not receive prophylactic antibiotics per recommended timing. This investigation aimed to determine whether having a penicillin and/or cephalosporin allergy increased a patient's risk for not receiving prophylactic antibiotic within the recommended 60 minutes prior to skin incision when undergoing cesarean delivery (CD).

Theoretical Framework: It has been found that patients with a non-IgE mediated reaction to penicillin can safely receive cephalosporins, yet it continues to be under prescribed.

Literature Review: Nearly 10% of the population reports a penicillin allergy. Current practice of many obstetricians is to avoid cefazolin for any patient presenting with a penicillin and/or cephalosporin allergy.

Research Design: Retrospective study

Methods: All pregnant women who underwent CD from a 10 year span were identified and divided into two groups, those with and without documented penicillin and/or cephalosporin allergy. Each patient's prophylactic antibiotic, administration time of that antibiotic, incision time, and patient characteristics such as ASA status and medical record number were recorded.

Data Collection: Patients undergoing CD were identified by retrospective query.

Results and Data Analysis: Of the 818 patients with a documented penicillin and/or cephalosporin allergy, 75 (9.2%) did not receive their prophylactic antibiotic within 60 minutes prior to skin incision. Conversely, 347 (7.2%) of the 4,826 patients without a documented penicillin and/or cephalosporin allergy did not receive their prophylactic antibiotic within 60 minutes prior to skin incision ($P = 0.037$). Patients undergoing an emergent CD were also at an increased risk of not receiving their prophylactic antibiotic within 60 minutes prior to skin incision ($P < 0.001$).

Discussions and Conclusions: Patients with a documented penicillin and/or cephalosporin allergy were more likely than those patients without a documented penicillin and/or cephalosporin allergy to not receive their prophylactic antibiotics within the recommended 60 minutes prior to skin incision.

Anesthesia for Patients Who Self-Report Cannabis (Marijuana) Use Prior to Esophagogastroduodenoscopy: A Retrospective Review

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Introduction: Increasing amounts of patients are using cannabis prior to procedures that require anesthesia. Cannabis use has been associated with negative cardiovascular and respiratory sequelae, as well as cross-tolerance to anesthetic agents. Both are of significant concern to anesthesia providers. This study describes findings in patients who self-reported cannabis use prior to anesthesia.

Theoretical Framework: Neuman's Theory incorporates four nursing metaparadigms with a goal to maintain a line of defense, prevent stressors, enable coping strategies, and minimize adverse patient outcomes.

Literature Review: Limited studies of similar nature have been conducted, primarily due to classification of cannabis as a Schedule I drug by the Food and Drug Administration. Studies that have been conducted suggest anesthetic agent (propofol) cross-tolerance.

Research Design: A retrospective chart review was conducted to evaluate 635 patients undergoing anesthesia for esophagogastroduodenoscopy (EGD) between September-November 2018. Self-reported cannabis users were cross matched with nonusers for comparison purposes. Descriptive and nonparametric testing was used.

Methods: A total of 635 patients were reviewed. Forty-seven self-reported cannabis users were identified and 23 included for cross-matched comparison with nonusers. Patient and procedural data were analyzed. The Wilcoxon Signed Rank Test was used to measure differences in propofol administration and the McNemar's Test was used for fentanyl and ketamine.

Data Collection: Data collected include pertinent patient demographics and procedural information, such as diagnoses and duration. Dosing of anesthetic agents, incidence of cardiopulmonary events, and overall levels of satisfaction were also recorded.

Results and Data Analysis: The Wilcoxon Signed Rank Test revealed no statistically significant differences observed between groups in the amount of propofol (mg) administered ($P = .820$), nor when adjusted for weight and procedure duration ($P = .702$). The McNemar's Test revealed no statistically significant differences for administration between groups for fentanyl ($P = .41$) or ketamine ($P = .32$). No cardiopulmonary events were noted within 30 days for either group. The overall levels of patient satisfaction were similar between the two groups.

Discussions and Conclusions: Although some suggest higher anesthetic requirements for cannabis users, our study does not confirm this finding. This study was specific to EGD procedures of short duration and larger studies are needed to confirm results of no consequence in cannabis users undergoing anesthesia. Future studies should consider cannabis users who undergo anesthesia for diverse procedure types of various durations.

Funding Sources: This work was supported by the Tufts Clinical and Translational Science Institute, funded through National Institutes of Health Award Number UL1TR001064.

Buffered Lidocaine as an ETT Cuff Media in Immediate Post-operative Cardiac Surgery Patients and Its Effect on Sedative Requirements: a Prospective Pilot Feasibility Study

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Introduction: Tracheal mucosal irritation caused by endotracheal tubes (ETT) may result in ETT intolerance and post-intubation emergence phenomena (EP). Sedative and analgesic agents used to mitigate symptoms may contribute to prolonged intubation and increased morbidity. The study aim was to determine feasibility and efficacy of intracuff lidocaine in reducing EP and sedatives without major adverse events.

Literature Review: Lidocaine instilled into the ETT cuff diffuses through the semi-permeable membrane inducing anesthetic action in the trachea. Intracuff lidocaine for prevention of EP has been extensively studied over the past 25 years. Alkalinization of lidocaine quickens the onset, duration, and efficacy. Gaps in evidence exist with cardiac surgery patients, ASA>2, and impact on sedatives and analgesics.

Developmental Design or Methodology: This randomized control pilot study explored the feasibility and potential efficacy of instillation of buffered lidocaine as an ETT cuff medium in adult rapid recovery eligible cardiac surgical patients. Thirty-two patients were randomized to the intervention (1.8% lidocaine/0.76% sodium bicarbonate) or control (air) group. Data were collected regarding emergence phenomena and sedative requirements.

Proof of Concept/Results: Data were analyzed using median, standard deviation, Wilcoxon rank sum, mean±SD, two-sample *t*-test, and Fisher's exact test. The intervention arm demonstrated a trend towards a reduction the incidence of cough at ICU arrival (0 versus 22%). Pharyngitis was reduced in the intervention arm at all time intervals with a significant difference at 1-hour post-extubation (P =0.05). Propofol requirement was reduced in the intervention arm (345±248 mg versus 1158±1426 mg). There were no adverse events.

Discussions and Conclusions: In support of current evidence, our study utilized alkalinized lidocaine as the intervention arm and collected EP data. Unlike prior research, this study measured opioids and sedation requirements in cardiac surgery patients. The key finding is that intracuff buffered lidocaine is feasible while exhibiting trends toward a reduction in EP and sedatives. Results show the need for further large-scale studies to confirm the efficacy and feasibility of buffered lidocaine as an ETT cuff medium.

Funding Sources: This project was funded by the Mayo Clinic Foundation.

Correlation of Ondansetron Timing in Postoperative Nausea and Vomiting: A Retrospective Evaluation Amongst Adult Patients Receiving General Anesthesia

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Introduction: Addressed as a national quality initiative, postoperative nausea and vomiting (PONV) continues to be a vexing problem. Intraoperative antiemetic timing is an avenue to combat this complication. This project's goal was to examine the current practice at two associated facilities for intraoperative ondansetron administration and the correlation of PONV incidence at 2, 6, and 24 hours postoperatively.

Theoretical Framework: The theoretical framework that guided this project was Jean Watson's theory of Human Caring. This framework emphasizes patient safety, which is critical for optimizing postoperative outcomes.

Literature Review: Current literature recommends ondansetron to be given 30 minutes prior to emergence of anesthesia. This recommendation conflicts with GlaxoSmithKline, manufacturer of Zofran (ondansetron), to administer before the induction of anesthesia.

Research Design: A retrospective observational evidence-based practice project was conducted at Providence's Sacred Heart Medical Center and Holy Family Hospital on adult general surgery patients. After IRB exemption, the timing of intraoperative ondansetron administration and the incidence of PONV was identified.

Methods: Surgical procedures conducted from October, 1, 2018, to September 30, 2019 that received general anesthesia with an advanced airway were included for analysis. Descriptive data analysis was completed and stratified by ondansetron timing. Independent risk factors were determined and controlled for using binary logistic regression.

Data Collection: Data was extracted from the electronic medical record, de-identified, and stored in a secure database. Of the initial 9,028 cases, 8,365 met project criteria and were incorporated into a data set for statistical analysis.

Results and Data Analysis: The incidence of ondansetron administration with induction was 29%, versus a 71% administration rate with emergence from anesthesia. Bivariate results depicted a statistically significant 10% reduction in PONV if ondansetron was given upon emergence from anesthesia ($P < 0.0001$). A fully adjusted model controlling for lurking variables confirmed this finding of PONV reduction when ondansetron was provided on emergence.

Discussions and Conclusions: The research evidence consistently identifies intraoperative administration of ondansetron on emergence as an effective evidenced-based strategy for reducing PONV incidence. Deployed 71% of the cases, ondansetron administration on emergence correlated with a 10 % reduction in PONV ($P < 0.0001$). This project serves as a foundation for further examination of perioperative ondansetron practices.

Dose-Dependent Effects of Sevoflurane Administration on Neprilysin and Amyloid-Beta Concentrations in Differentiated PC-12 Cells

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Introduction: Older patients are at increased risk for postoperative cognitive decline (POCD), a condition highlighted by decreased mental aptitude following surgical intervention. Alzheimer disease (AD) and POCD share similar etiologies, characterized by the presence of senile plaque composed of Aβ. NEP is a regulator of Aβ peptides. It has been shown that NEP and Aβ share an inverse relationship.

Theoretical Framework: Our research is based on scientific theory that abnormal accumulation of Aβ peptides results in the disruption of neuronal synapses, leading to degeneration and AD pathology.

Literature Review: Studies have shown clinically relevant concentrations of sevoflurane may have a significant impact on Aβ accumulation and NEP activity in the brain, causing cognitive impairment, impaired learning, behavioral changes, and cerebral injury.

Research Design: The research design is a quantitative, in vitro design using differentiated pheochromocytoma (PC)-12 cell models. Cellular NEP and Aβ concentrations were measured after exposure to sevoflurane concentrations of 1, 1.5, 2, and 3%. A validated ELISA assay was used to quantify cellular NEP and Aβ concentrations.

Methods: PC-12 cells were cultured and differentiated with nerve growth factor at a concentration of 50 ng/ml for 2-3 days, with at least 80% differentiation prior to sevoflurane exposure. Sevoflurane at concentrations of 1, 1.5, 2, and 3% were administered once, for 1 hour in duration, to designated treatment groups. Control groups remained unexposed.

Data Collection: Lowry protein and ELISA assays were conducted to determine NEP and Aβ concentrations in treatment and control groups post-sevoflurane exposure. Statistical analysis of data was performed using Graph Pad Prism Software Version 8.

Results and Data Analysis: One-way ANOVA and post-hoc Tukey's tests were utilized. When NEP & Aβ were normalized to total protein concentrations, no statistical difference was found following 1, 1.5, 2 or 3% sevoflurane administration; NEP ($P = 0.055$), Aβ ($P = 0.0767$).

Discussions and Conclusions: PC-12 cells exposed to sevoflurane at 1, 1.5, 2, and 3% for 1 hr did not significantly alter NEP or Aβ concentrations immediately post-exposure. Our results contradict a previous study by Liu et al (2013), who showed decreased NEP levels and increased Aβ levels in the hippocampus of older rats with sevoflurane exposure. Further research is warranted to determine the time-dependent effects.

Funding Sources: Webster University Department of Nurse Anesthesia, St. Louis, Missouri.

Effect of Sevoflurane on Neprilysin Concentrations in Differentiated PC12 Cells at Various Time Intervals

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Introduction: Previous studies have shown an increase in beta amyloid (Aβ) levels following sevoflurane exposure in rats. High Aβ levels result from decreased neprilysin (Nep) levels. Prior research has identified a significant decrease in Nep concentration in differentiated pheochromocytoma (PC)12 cells following one-hour exposure to 2% sevoflurane. The duration of this effect is unknown.

Theoretical Framework: Nep acts to clear Aβ plaques that are implicated in postoperative cognitive decline (POCD) [VC1] and Alzheimer Disease. Therefore, a decrease in Nep would indicate an increase in Aβ and ultimately POCD.

Literature Review: Research has shown decreased Nep levels following sevoflurane exposure. Increased Aβ levels with sevoflurane exposure were greater with increasing age, and on rats with a previously elevated Aβ. Multiple studies have shown sevoflurane as a precursor to POCD.

Research Design: A quantitative, in vitro design with differentiated PC12 cell model was used to assess Nep concentrations after exposure to 1 or 2% sevoflurane vs. room air at four time intervals [VC2]. Statistical analysis was completed with ANOVA and Tukey's post-hoc test.

Methods: PC12 cells were treated with nerve growth factor until 80% neurite growth was noted. For each of 8 experiments, 8 flasks were randomly sorted into control (n = 4) and experiment (n = 4) After exposure to 1 or 2% sevoflurane or air, cells were lysed, and Lowry protein and enzyme-linked immunosorbent assays (ELISA) were performed at 12, 24, 36, or 48 hours.

Data Collection: Sample size was estimated via direct cell count. Concentration of Nep enzyme was measured via ELISA. Albumin was measured via Lowry Protein Assay. The concentration of Nep was then normalized to µg of protein.

Results and Data Analysis: There was no statistical difference in the number of cells per flask ($P > 0.05$), cell viability ($P > 0.05$), or media pH ($P > 0.05$). No statistical difference ($P > 0.05$) in Nep was noted at 12, 24, 36, or 48 hours after exposure to 1 or 2% sevoflurane compared to control. In the experiments run at 1% sevoflurane exposure there was a statistical difference in both the control and sevoflurane exposed flasks at 24 hr ($P < 0.05$) when compared to those run at 12, 36, and 48 hours. A similar trend was noted in the 2% sevoflurane experiments but not at a significant level.

Discussions and Conclusions: Previous research confirms an increase in Aβ oligomers following sevoflurane that may be attributed to other mechanisms, but this research shows no evidence of Nep involvement. A trend was noted in Nep levels with a spike at 24 hours with decline at 36 and 48 hours. Future research could investigate what factors affect Nep concentrations that are not influenced by sevoflurane, and if Aβ concentrations correlate.

Effects of Cardiopulmonary Bypass Flow Rates Paralleling Cardiac Index and the Incidence of Acute Kidney Injury

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Introduction: Acute kidney injury (AKI) following cardiopulmonary bypass (CPB) is a well-known complication, yet the causative relationship is yet to be understood. The development of AKI following CPB is associated with increases in infectious complications, hospital length of stays, and higher mortality rates. The aim of this retrospective analysis is to determine if CPB flow rates paralleling cardiac indexes reduce the occurrence of postoperative AKI.
Theoretical Framework: Based on the review of the literature, a gap in knowledge remains and CPB perfusion pressures and its effects on AKI remains to be examined.
Literature Review: Research has been completed in various areas including arterial blood pressure, pharmacological, and nonsurgical strategies, CPB time, perioperative changes in creatinine concentrations, low oxygen delivery, HCT levels, and pulsatile perfusion.
Research Design: The research study was a single center, retrospective design.
Methods: A retrospective chart review was performed by the researcher to determine the incidence of acute renal injury in subjects undergoing CPB when CPB flow rates parallel predefined cardiac index groups. A total of 643 charts were reviewed, and data were collected from 405 participants charts during the researched timeframe.
Data Collection: The remaining 405 subjects were then categorized into six groups based on the CPB flow rates they received intraoperatively.
Results and Data Analysis: No significance was observed between the six CI groups and AKI staging (no AKI, AKI stage 1, AKI stage 2, and AKI stage 3) ($p = 0.670$). No statistical significance was observed between the six CI groups and a significant decrease in GFR ($X2 = 0.051$), an acute increase in SCr > 0.3 mg/dL ($X2 = 0.997$), nor a significant increase in SCr compared to the subject's preoperative SCr ($X2 = 0.903$). There was no significance between the six CI groups and UOP during hours 0 – 6 ($P = 0.943$), 0 – 12 ($P = 0.350$), or 0 – 24 ($P = 0.827$) postoperatively.
Discussions and Conclusions: The incidence of AKI following CPB was found to not be statistically significant among the six CI groups examined. The researcher found insufficient evidence that the use of higher CI flow rates decreased the occurrence of postoperative AKI following CPB.

Effects of Neuraxial Anesthesia on Readiness for Ambualtion following Total Knee Arthroplasty

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Introduction: Early postoperative ambulation is necessary following a total knee arthroplasty (TKA). Few studies have addressed low-dosage recommendations to achieve the goal of an outpatient procedure. This study aims to improve patient outcomes by identifying correlational relationships between the type and doses of neuraxial anesthesia and the patient's readiness for postoperative ambulation.

Theoretical Framework: The Rosswurm and Larrabee model of evidence-based practice was selected to guide the implementation of this scholarly project.

Literature Review: There is a body of research supporting the use of neuraxial anesthesia compared to general anesthesia. Few studies identify and compare dosage recommendations for neuraxial anesthesia outcomes and their impact on early ambulation following TKA.

Research Design: A retrospective chart review was used identifying correlational relationships between the type and dose of anesthetic approach in patients undergoing neuraxial anesthesia for total knee replacement and the patient's readiness for ambulation as determined by neuro-motor assessments by staff nurses.

Methods: This study included all patients presenting for primary, elective unilateral TKA during 2018. Patient demographics, type, dose, and time of neuraxial anesthesia administration, ad time to moderate dorsiflexion and plantar flexion were recorded for analysis. Hourly postoperative TKA neuro-motor assessments were performed by the nursing staff.

Data Collection: A convenience sample of 209 (76%) patients met inclusion criteria. Seventy-three percent received varied doses of 0.75% bupivacaine spinal anesthesia and 27% varied doses of 2% lidocaine epidural anesthesia. Central tendency observed 12 mg and 19 mL, respectively.

Results and Data Analysis: Using a Pearson's Correlation, there was no significant difference in the time to ambulation (260 minutes) between any epidural dose of 2% lidocaine or a spinal anesthetic dose less than 12mg of 0.75% bupivacaine. A two-tailed independent samples *t*-test identified a significant difference in the time to ambulation between 7.5 mg-10.5 mg (215 minutes) and 11.25 mg-15 mg (281 minutes) categories of 0.75% bupivacaine spinal anesthesia ($P = 0.003$). There was no difference in time to ambulation with varying epidural doses of 2% Lidocaine ($P = 0.662$).

Discussions and Conclusions: The outcome of this study has added to the arsenal of available knowledge for anesthesia providers to confidently choose the most appropriate type of neuraxial anesthetic with a knowledge of dosing patterns to achieve a desired time to ambulation. There is a potential to adjust current practice techniques to optimize the implementation of outpatient TKA clinical pathways.

Effects of Sevoflurane on Dopamine in White Eye Drosophila Melanogaster

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Introduction: While sevoflurane is widely used in surgery, the molecular mechanism and downstream effects are not well understood. Little is known about how sevoflurane affects neurotransmitters in the brain. This study examines the effects of sevoflurane on dopamine levels in Drosophila melanogaster immediately and 24 hours post-exposure.

Theoretical Framework: Neuroinflammatory hypothesis suggest that alterations in neurotransmitters, such as an excess release of dopamine, may have a role in development of postoperative delirium.

Literature Review: Dysregulation in dopamine leads to disorders such as Parkinson's disease, schizophrenia, depression, drug addiction, and delirium. Studies in animal models have shown that sevoflurane affects dopamine release in rat brain slices ex vivo.

Research Design: This research is a quantitative laboratory research study using white eye Drosophila melanogaster as the model organism. The dependent variable is dopamine concentration in the whole head homogenate. The independent variable is exposure to 1% sevoflurane.

Methods: White eye Drosophila were exposed to 1% sevoflurane or room air for 30 minutes. The heads were dissected immediately or at 24 hours post-exposure, homogenized, and filtered before high-performance liquid chromatography analysis with electrochemical detection. Peak heights were measured on chromatogram to determine dopamine concentrations.

Data Collection: Control and sevoflurane-exposed samples were collected immediately and 24-hours post-exposure. Dopamine concentrations were determined by comparison to known standards and normalized to internal standard and sample protein concentration.

Results and Data Analysis: Immediately after exposure, the sevoflurane-treated Drosophila had a lower level of dopamine compared to control Drosophila (mean 68.32 pg/ug protein and 82.48 pg/ug protein respectively, $P = 0.2416$, n =10). 24 hours post-exposure, the sevoflurane-treated Drosophila had similar level of dopamine compared to controlled Drosophila (mean 42.40 pg/ug protein and 42.40 pg/ug protein respectively, $P = 0.6676$, n = 8). Statistical analysis was performed using GraphPad Prism 6 software. Significance was calculated using two-tail *t*-test.

Discussions and Conclusions: In this animal model coupled with high-performance liquid chromatography, we were able to detect dopamine in the heads of white eye Drosophila. The results of this study suggest that sevoflurane causes a small transient but not statistical significant decrease in dopamine levels in white eye Drosophila that is resolved by 24 hours.

Funding Sources: This research is funded by Webster University Nurse Anesthesia Program.

Endotracheal Administered Epinephrine Is Effective in ROSC Within a Pediatric Swine Hypovolemic Cardiac Arrest Model

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Introduction: Early administration of epinephrine increases the incidence of ROSC and improves outcomes among pediatric cardiac arrest victims. Rapid endotracheal (ET) intubation can facilitate early administration of epinephrine to pediatric victims. No studies currently evaluate the use of ET epinephrine in a pediatric hypovolemic cardiac arrest model to determine the incidence of ROSC.

Theoretical Framework: Intravenous access can be difficult to obtain within pediatric patients experiencing hypovolemic shock and cardiac arrest. ET administration of epinephrine would facilitate rapid administration.

Literature Review: Controversy exists concerning ET administration of epinephrine in pediatric patients. Recent animal studies focus on neonatal models with conflicting results with regards to the dosing and efficacy of ET administrated epinephrine.

Research Design: This prospective, experimental study evaluated the pharmacokinetics and/or incidence of ROSC in ET administered epinephrine and compared it to the following groups: intravenous (IV) administered epinephrine, a cardio-pulmonary resuscitation only (CPR), and a CPR + defibrillation (CPR + Defib).

Methods: Animals were sedated, intubated, and subjected to general anesthesia during experimentation. After monitors and invasive line placement, the subjects were exsanguinated and put into cardiac arrest. Hi-quality CPR with mechanical compression commenced according to PALS guidelines, which included defibrillation and epinephrine administration.

Data Collection: Blood samples were collected at 0, 30, 60, 90, 120, 150, 180, 240, and 300 seconds after epinephrine administration. High Performance Liquid Chromatography quantified plasma epinephrine concentrations. Also, the incidence of ROSC was recorded.

Results and Data Analysis: ET administered epinephrine at the Pediatric Advanced Life Support (PALS) recommended dose was not significantly different than IV administered epinephrine in maximum plasma concentrations (Cmax), time to maximum plasma concentrations (Tmax), area under the curve, or ROSC between the IV and ET group, or at mean plasma concentrations various time points ($P > 0.05$). The odds of ROSC in the ET group were 2.4 times greater than the IV group. The onset to ROSC in the ET group was significantly shorter than the IV group ($P < 0.0001$).

Discussions and Conclusions: These data support ET epinephrine administration as an initial alternative to IV administered epinephrine and faster at restoring ROSC among pediatric hypovolemic cardiac arrest victims. Although further research is required to determine long-term outcomes of high-dose ET epinephrine administration, these data highlight a therapeutic potential for early ET administration prior to IV access.

Funding Sources: Tri-Service Nursing Research Program

In-Situ Simulation of Intraoperative Emergencies: An Exploration of Prevalence in Certified Registered Nurse Anesthetists' Workplaces and Satisfaction with the Experience

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Introduction: Intraoperative emergencies are rare, yielding knowledge decay. Therefore, in-situ simulation-based education (SBE), or simulation that occurs in the actual work setting could be an effective tool in addressing gaps in practice, but little data exists. This research explored the prevalence of in-situ SBE of intraoperative emergencies in CRNAs' workplace and their satisfaction with such simulations.

Theoretical Framework: Kolb's Experiential Learning Theory states that learning is a cyclical process that moves from concrete experience to active experimentation and can serve as a scaffold in designing in-situ SBE.

Literature Review: The actual management of rare intraoperative emergencies can be onerous to CRNAs. In-situ SBE has been shown to be effective in addressing individual knowledge and skills deficits, enhancing team performance, and detecting latent safety threats.

Research Design: The research design of this study was exploratory and descriptive. This study evaluated CRNAs' participation in in-situ SBE of intraoperative emergencies at their workplaces, as well as their satisfaction with previously attended in-situ SBE.

Methods: After approval from Georgetown University's Institutional Review Board, an application for electronic survey was submitted to the AANA's Research Surveys, Services and Assistance department. An online survey was then created and disseminated via SurveyMonkey to 2,844 randomly selected, actively practicing CRNA members of the AANA.

Data Collection: The researcher created a 24-question data collection tool de novo that included 4 sections: demographics, management of intraoperative emergencies, prevalence of in-situ SBE of intraoperative emergencies, and satisfaction with in-situ simulation.

Results and Data Analysis: Data were analyzed using both R studio and SPSS Software. Results indicated that 66.9% (89/133) of CRNAs participated in some form of SBE and 29.5% (26/88) reported prior in-situ SBE experience at their workplace. Also, 65.4% (17/26), agreed that previous in-situ SBE helped prepare them in responding to intraoperative emergences and felt satisfied (80.7%, 21/26) with their experience. Additionally, 80.9% (106/131) of CRNAs would like to participate and 76.3% (100/131) of CRNAs believe that they should participate in in-situ SBE in their workplace.

Discussions and Conclusions: Despite evidence showing the efficacy of in-situ SBE, data from this study indicated that CRNAs have limited opportunities to practice in situ SBE in their primary place of practice. However, the majority of respondents that did participate in in-situ SBE report feeling satisfied with the experience and better prepared to manage infrequently occurring intraoperative emergencies.

Funding Sources: This research was partially funded by Georgetown University School of Nursing and Health Studies DNAP Project Research Award.

Intraoperative Dexmedetomidine Use on Adult Surgical Patients at Providence Sacred Heart Medical Center

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Introduction: Opioids continue to be the mainstay for acute pain management but yield significant unfavorable outcomes. These unfavorable outcomes have challenged anesthesia providers to identify evidenced based strategies to minimize opioid exposure. The aim of this project is to examine the occurrence of intraoperative dexmedetomidine and identify areas for anesthesia practice improvement.

Theoretical Framework: The theoretical framework guiding and evaluating this project is the Structure-Process-Outcomes (SPO) model by Donabedian. The SPO model provides quality assessment for future practice improvement.

Literature Review: The synthesis of the research evidence favors intraoperative dexmedetomidine as an attractive non-opioid alternative for reducing 24-hour postoperative opioid consumption.

Research Design: This is a retrospective, observational project. Exemption was deemed by the IRB. This study determined the occurrence of intraoperative dexmedetomidine over a 5-year period. Statistical analysis concluded surgical and patient characteristics receiving intraoperative dexmedetomidine.

Methods: This retrospective, observational project was conducted at a large academic medical center on adult surgical patients from January 1, 2015 to December 31, 2019. All surgical procedures and case types were included for analysis. The proportion of intraoperative dexmedetomidine and narcotic administration were calculated.

Data Collection: Extracted data included 78,712 cases. Excluded cases include intranasal route, > 200 morphine milligram equivalence in 24 hours, patients not admitted, length of stay < 24 hours and length of stay > 14 days. Total analysis yielded 26,990 cases.

Results and Data Analysis: Results identified a 2.5% occurrence of intraoperative dexmedetomidine administration and 96.3% occurrence of intraoperative narcotic administration. Statistical analysis concludes independent risk factors for patients receiving intraoperative dexmedetomidine administration occurs statistically significantly higher on males, ASA physical status 4 and service lines of cardiothoracic, ENT and neurosurgery.

Discussions and Conclusions: The research evidence consistently identifies intraoperative dexmedetomidine is an effective nonopioid evidence-based strategy for reducing opioid consumption. An increase in intraoperative dexmedetomidine administration was identified with each subsequent year, over the past 5 years. The utilization of intraoperative dexmedetomidine is not a common practice at Providence Sacred Heart Medical Center.

Intraoperative Hypotension and Acute Kidney Injury in Noncardiac Surgery at Providence Sacred Heart Medical Center

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Introduction: Acute kidney injury (AKI) is a serious complication that increases a patient's risk for morbidity and mortality. Evidence indicates that intraoperative hypotension (IOH) exposure increases AKI risk in noncardiac surgery. This project aimed to identify the rate and risk factors for AKI following IOH at Providence Sacred Heart Medical Center (PSHMC). Describing AKI may encourage heightened attention to AKI prevention strategies.

Theoretical Framework: Donabedian's Structure, Process, Outcome model identifies areas for healthcare quality improvement. This framework guided the project in examining anesthesia practice surrounding IOH and AKI.

Literature Review: The research evidence reveals a strong relationship between IOH and postoperative AKI. A graded relationship exists between length and severity of IOH exposure and the risk for developing postoperative end organ injury.

Research Design: This retrospective, observational, descriptive project was deemed exempt from human subjects testing by the institutional review board. This project described the rates and risk factors for postoperative AKI following various mean arterial blood pressure (MAP) thresholds.

Methods: Adults undergoing general anesthesia for noncardiac surgery at a tertiary hospital from 2015-2019 were included in this project. Participants had pre- and postoperative serum creatinine values to evaluate for AKI and MAPs recorded within 5-minute intervals to evaluate for IOH. Obstetrics, urology and preoperative dialysis cases were excluded.

Data Collection: Deidentified and encrypted data from 69,383 patient records was securely extracted and stored in a HIPAA compliant REDCap database. After exclusion criteria was applied, 4,603 records were included in the analysis.

Results and Data Analysis: Statistical analyses were performed with Microsoft Excel, MedCalc and G*Power platforms on PSHMC designated computers. An a-priori power analysis revealed that 2,181 records would adequately power findings (1-β=0.80, α=0.05, Df=1, W=0.06). Of 4,603 patients, 8.9% experienced postoperative AKI. The risk for AKI increased from 7.7% to 11.3% with exposure to MAPs less than 60 mmHg for at least ten minutes (RR 1.47, 1.19-1.83, p=0.001). In a fully adjusted model, IOH was identified as an independent risk factor for AKI (OR 1.52, 1.12-1.94, $P < 0.001$).

Discussions and Conclusions: While the literature describes AKI rates of 5-7.5%, rates of AKI following IOH at PSHMC were higher. Accordingly, provider attention to risk factors for AKI and limiting IOH exposure may mitigate end organ injury and improve patient outcomes. Describing AKI at PSHMC helps identify possible areas of anesthesia practice improvement and inform further research surrounding AKI.

Intratracheal Lidocaine and Postoperative Sore Throat Among Intubated General Anesthesia Patients at Providence Sacred Heart Medical Center and Providence Holy Family Hospital

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Introduction: Postoperative sore throat (POST) is a common complication from general anesthesia and can significantly impact patient satisfaction, contributing to discomfort during recovery. Intratracheal lidocaine is an evidence-based intervention that anesthesia providers can utilize to prevent POST. The purpose of this study was to report incidence rates of POST and describe intratracheal lidocaine use.

Theoretical Framework: The theoretical framework guiding this study is Katharine Kolcaba's "Theory of Comfort."

Literature Review: The incidence of POST ranges from 30% to 70%. Intratracheal lidocaine has been shown to reduce POST. Literature on laryngotopical anesthesia and lidocaine gel is limited, however several studies affirm the use of intra-cuff lidocaine for preventing POST.

Research Design: This is a retrospective, observational, multicenter EBP project. All data were securely collected, deidentified, and stored. Data were analyzed on approved institution laptops. The outcome of POST was assessed. The exposure variables were various intratracheal lidocaine modalities.

Methods: This retrospective, observational, multicenter study was conducted at a level II and level III trauma hospital in Washington state. Adult patients undergoing general anesthesia with an endotracheal tube over a one year time span were included. All patients were assessed for POST and for intratracheal lidocaine administration.

Data Collection: Deidentified information from 12,839 cases was extracted from the electronic medical record and stored in a secure database. Of those cases 1,500 had a document indication for postoperative sore throat (Y/N), providing a final n=1,500.

Results and Data Analysis: The incidence of POST was 21%. Of those patients, 81% did not receive any form of intra-tracheal lidocaine. Bivariate analysis showed that 4% LTA (RR 0.94, 95% CI 0.87-1.02, P =0.14), 2% gel (RR 0.75, 95% CI 0.52-1.05, P =0.02), 5% gel (RR 0.95, 95% CI 0.55-1.67), and 2% intracuff (RR <0, 95% CI 0.02-3.49, P = 0.05) reduced POST. Binary logistic regression analysis identified ENT surgery, multiple patient positions, and succinylcholine use to be statistically significant independent risk factors for POST.

Discussions and Conclusions: The incidence of POST was common, but lower than the research. There was demonstrable reduction in POST with administration of intratracheal lidocaine, but it lacked statistical significance. This study describes POST and shows that intratracheal lidocaine use is rare. Some limitations include inconsistent documentation of both POST and intratracheal lidocaine in the electronic medical record.

Neostigmine Versus Sugammadex and the Relationship to Reintubation Rates in the PACU

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Introduction: Reintubation following surgery is a serious event that leads to an increase of mortality by 50%. This study aimed to identify the rate of reintubation at a Providence Sacred Heart Medical Center and Holy Family Hospital. Additionally, this study explains any relationship to reintubation when using neostigmine versus sugammadex in order to bring awareness to possible prevention strategies.

Theoretical Framework: James Reason's Swiss Cheese theoretical framework was used to guide this project by identifying safeguards and accident causation that is multifactorial rather than from a single defined factor.

Literature Review: There currently is an absence of any high-level quality research on a possible relationship between choice of neuromuscular blockade reversal agent (NMBRA) and reintubation in the post-anesthesia care unit (PACU) following general anesthesia.

Research Design: This retrospective, observational, research study was deemed exempt from human subjects research by the institutional review board. This study determined the rate of reintubation and described the relationship between reintubation and neuromuscular blockade reversal agent.

Methods: Adults undergoing general anesthesia of all service lines at a multi-center tertiary hospital setting from 2013-2019 were included. All participants had a documented endotracheal tube (ETT) at start of case and was extubated prior to leaving the operating room (OR). Those that remained intubated at end of case were excluded.

Data Collection: De-identified and encrypted data from 84,582 patient records were extracted and stored securely in a HIPPA compliant REDCap database and accessed through designated laptops. All participants were analyzed as they did not meet any exclusion criteria.

Results and Data Analysis: Descriptive analyses were completed and reported a total of 89 cases (0.001%) of reintubation in the PACU. Bivariate analyses revealed no difference in risk of reintubation when comparing neostigmine and sugammadex (RR 1, CI 0.62-1.81, $P = 0.84$). When controlling for confounding variables via binary logistic regression, choice of NMBRA was still insignificant ($P = 0.95$). However, high risk patients (OR 1.67, CI 1.08-2.56, $P = 0.01$) and those undergoing non-elective cases (OR 1.96, CI 1.25-3.09, $P = 0.003$) were at higher risk of reintubation.

Discussions and Conclusions: Current research describes reintubation in PACU as a rare event. The rates of reintubation at PSHMC and HFH are similar to what is reported in the literature. This study demonstrated no relationship between NMBRA choice and reintubation. By reporting these findings, it encourages CRNAs to remain vigilant in identifying high risk patients and those undergoing non-elective surgery.

Opioid Consumption After Scheduled Cesarean Delivery Following Implementation of Enhanced Recovery After Surgery

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Introduction: In 2017, the Kaiser Family Foundation reported 47,600 opioid overdose-related deaths in the United States, which is a crisis of national concern. The aim of this study was to determine if implementation of Enhanced Recovery After Surgery (ERAS), specifically the use of multimodal analgesia, was associated with a decrease in cumulative opioid use among women undergoing scheduled cesarean delivery.

Theoretical Framework: Watson's Theory of Caring highlights human caring and overall health instead of simply diagnosis and sickness. Effective pain management is an important aspect of providing this type of holistic care.

Literature Review: Literature indicates that multimodal analgesia can provide postoperative pain control while minimizing opioid use. However, data remain limited regarding the use of multimodal analgesia in obstetrics.

Research Design: A single-center retrospective observational cohort study was conducted. IRB exemption was granted and measures were taken to protect human subjects.

Methods: This study compared women undergoing scheduled cesarean delivery pre- and post-implementation of ERAS at Providence Sacred Heart Medical Center, a large academic facility. All administered opioids were converted into an oral morphine milligram equivalent (MME) for comparison.

Data Collection: Data were extracted from an electronic charting system, de-identified, anonymized and securely stored for analysis. A total of 718 women met study criteria.

Results and Data Analysis: Bivariate analyses were performed on continuous and categorical data, with statistical significance determined either by independent samples *t*-test or Mann Whitney *U* test. The multivariate analysis was conducted with an interrupted time series. The pre-implementation group (n=461) consumed a cumulative 72-hour median of 88 oral MME [IQR 37.5-157.5], while the post-implementation group (n=257) used 74.6 oral MME, [IQR 33.8-131.3] (P =0.02). This was a difference of 13.4 oral MME, or a 15% reduction.

Discussions and Conclusions: The use of multimodal analgesia led to a sustained MME decrease in women utilizing postoperative opioids. Multimodal analgesia is an effective means of managing pain following scheduled cesarean delivery while also reducing the need for opioids.

Outcomes in Ambulatory Central Veno-arterial Extracorporeal Membrane Oxygenation Patients: A Single-center Experience Compared to the Extracorporeal Life Support Organization (ELSO) Registry

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Introduction: Patients requiring VA-ECMO as a bridge to cardiac transplant historically have required sedation and mechanical ventilation. At Mayo Clinic, Rochester, MN, VA-ECMO pre-transplant patients are centrally cannulated, extubated and rehabilitated. This study evaluates whether this care model increases success of cardiac transplant, ECMO success, and hospital mortality compared to the ELSO registry.

Literature Review: Limited research is available regarding patients who require centrally cannulated VA-ECMO as a bridge to cardiac transplantation. Early extubation and active participation in rehabilitation may lead to improved cardiac transplant and morbidity and mortality outcomes.

Developmental Design or Methodology: Researchers queried the ELSO registry for all pre-transplant VA-ECMO patients 40 years of age or less from 2011-2017. Outcomes of interest included ECMO duration, "ECMO success" defined as decannulation with expected recovery, transplant rates and hospital mortality. Patients were assigned an acuity score based on reported Pre-ECLS support. Each Mayo patient was matched to 2 ELSO patients based on age group, diagnosis, and total acuity score.

Proof of Concept/Results: One hundred fifty eight pre-transplant centrally cannulated VA-ECMO patients were identified from the ELSO registry and compared to 16 Mayo patients. Thirty registry patients were subsequently matched with 15 Mayo patients. ECMO success in the registry group vs Mayo group was 83.3% vs 73.3% ($P = 0.454$), hospital death 27.6% vs 26.7% ($P = 1$), and transplant rate 26.7% vs 60% ($P = 0.06$) respectively. Median ECMO duration in the registry group was 118 hours vs 2,706 hours in the Mayo group ($P < 0.001$).

Discussions and Conclusions: This study suggests that central ECMO cannulation with active rehabilitation is feasible and allows for support of pre-transplant patients without a resultant decrease in transplant success rates or increase in mortality.

Funding Sources: Research grant recipient from the Extracorporeal Life Support Organization (ELSO).

Patient-Specific Factors Associated with Surgical Delay

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Introduction: Each minute in the OR is estimated to cost as much as $62. Surgical delays can lead to financial losses, as well as negatively impact patient outcomes. Literature explaining the role of the patient in surgical delays is lacking. Understanding what patient-specific factors cause delay will facilitate evaluation and implementation of focused and appropriate interventions.

Theoretical Framework: A systems-based healthcare model of 4 layers, with the Patient at the center, followed by the Care Team, the Organization and the Environment breaks down the possible causes for surgical delay.

Literature Review: Surgical delay is often attributed to administrative, facility, or provider causes. Despite studies attributing up to 17% of surgical delays on the patient, literature explaining which patient-specific factors are at fault are lacking.

Research Design: A retrospective, correlational study using existing data from the electronic health record (EHR) examined the relationship between patient-specific factors and surgical delay.

Methods: The final sample consisted of 36,543 cases occurring from May 2012 and April 2017 at a large, acute care hospital in Los Angeles, California. Independent variables included patient-specific factors. The dependent variable was defined as surgical delay.

Data Collection: All patient-specific factors were extracted from the EHR with the assistance of the IT department at the study facility. Surgical delay was collected from a quality improvement project database.

Results and Data Analysis: There were 18,504 (50.6%) delayed cases. Bivariate analysis identified patient-specific factors significantly correlated with surgical delay. These variables were entered into a logistic regression model. The following variables had an increased odds of surgical delay: self-pay/uninsured, MAC anesthesia, ASA=>3, Black race, renal failure, insulin, steroid, Medicaid, Other Race, Medicare, and 6 surgical specialties. The following variables were associated with an on-time or early start: cardiovascular anesthesia, obesity, and inpatient status.

Discussions and Conclusions: CRNAs can use these data to save cost by improving efficiency with optimal scheduling and improve patient satisfaction and outcomes by preventing delays. By anticipating those patients most at risk for delay, issues can be addressed proactively. Because prior studies attributed a much higher proportion of surgical delays to patient causes than this model explains, further studies are needed.

Funding Sources: Doctoral Fellowship Grant, AANA Foundation; Jonas Scholarship, Jonas Foundation

Platelet Transfusion: The Effects of a Fluid Warmer on Platelet Function

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Introduction: The research team would like to clarify ambiguous recommendations about the administration of platelets and contribute evidence-based, best practice guidelines for platelet transfusion. Our aim was to identify any in vitro changes in platelet function, using platelet aggregometry and thromboelastography (TEG), as a result of infusion of apheresis platelets through a fluid warmer.

Theoretical Framework: The authors hypothesized there will be no significant change in platelet function- measured by platelet rich plasma (PRP) aggregometry and TEG– after the warming of platelets through a blood/fluid warmer.

Literature Review: Little research is available addressing the effects of platelet function when transfused through a warming device. However, recently three small in vitro studies have shown no change in platelet function when transfused through a warming device.

Research Design: This was a quasi-experimental study with a one-group pretest-posttest design.

Methods: Thirty one, 5-7 day old, apheresis platelets units were obtained from the hospital blood bank. A 23 mL sample of each unit was collected; the unit was then infused through a Ranger blood warming device. A subsequent 23 mL warmed sample of each unit was obtained. PRP aggregometry and TEG testing was then immediately performed on all samples.

Data Collection: Twenty millileter samples were used for PRP aggregometry and performed with 3 different agonists; Arachidonic Acid, Adenosine Diphosphate, and Collagen. Three mL samples were used for TEG testing. Results from the control group were compared to the warmed.

Results and Data Analysis: The difference between conditions (control vs warmed) was assessed using a paired *t*-test. The agreement between measurements obtained was further quantified using Lin's concordance correlation coefficient. There were no differences in any of the aggregometry results before and after infusion of the platelets through the blood warmer. There was a statistically significant reduction in the TEG maximum amplitude (MA) and α angle after infusion of the platelets through the blood warmer, though values remained within normal range.

Discussions and Conclusions: This study showed no evidence of platelet dysfunction measured by PRP aggregometry after transfusion through a Ranger blood warmer. The authors did detect a statistically significant, but not clinically significant, reduction in TEG MA and alpha angle values. These results, along with others, would suggest that the ban of platelet transfusion though blood warming device warrants reconsideration.

Funding Sources: This work is supported by funds from the Mayo Clinic School of Health Science's Doctor of Nurse Anesthesia Practice Program and the Department of Anesthesiology Mayo Clinic College of Medicine.

Postoperative Length of Stay Following Enhanced Recovery After Surgery Protocol Implementation for Scheduled Cesarean Deliveries

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Introduction: The benefits of Enhanced Recovery After Surgery (ERAS) have been documented in numerous surgical services but its use and implementation for cesarean deliveries hasn't been well studied. The purpose of this retrospective, observational study is to determine if ERAS protocol implementation following cesarean delivery is associated with a decrease in postoperative length of stay (LOS).

Theoretical Framework: The theoretical framework guiding this study is Donabedian's Structure-Process-Outcome (SPO) model, which provides a basis for evaluating and improving quality of care.

Literature Review: Few studies have evaluated the use of ERAS for cesarean deliveries and its impact on the recovery process. Of the studies available, there seems to be an association between ERAS protocol implementation and a decreased postoperative LOS.

Research Design: This is a retrospective, longitudinal, observational cohort study deemed exempt by the IRB for human subjects research. This study compares the median post-operative length of stay following scheduled cesarean delivery pre- and post-ERAS protocol implementation and includes a time series analysis.

Methods: This retrospective, observational study was conducted at tertiary care facility. The pre-ERAS group included all scheduled cesarean deliveries in the defined year: 7/1/17-6/31/18; the post-ERAS group included those for 6 months following ERAS implementation: 7/1/19-12/31/19. Postoperative LOS was defined as time of delivery to time of discharge.

Data Collection: Anonymized data from 1,290 scheduled cesarean deliveries of women age 18+ were extracted. Deliveries during a defined run-in period (year between pre and post ERAS) were excluded. A total of 731 cesarean deliveries were included for analysis.

Results and Data Analysis: The pre-ERAS group (n=477) had a median postoperative LOS of 52.3 hours (IQR 48.1-67.4). The post-ERAS group (n=254) had a median LOS of 50.9 hours (IQR 46.2-62). A Mann-Whitney U test was used to examine group differences in postoperative length of stay and found the post-ERAS group's average decrease of 1.4 hours to be statistically significant with a *P* value of 0.01. Bivariate analysis confirmed parturient characteristics to be similar among the pre- and post-ERAS groups.

Discussions and Conclusions: This facility's postoperative LOS following cesarean delivery was found to be low but was further decreased following ERAS implementation by an average of 1.4 hours. The clinical and financial impact of this decrease requires further investigation, but these findings suggest that mothers and other facilities could benefit from the use of ERAS implementation for cesarean deliveries.

Postoperative Nausea and Vomiting with Low-Dose Propofol Infusions in Patients Undergoing Gynecological Surgeries with Volatile Anesthetics at Providence Sacred Heart Medical Center and Providence Holy Family Hospital

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Introduction: Postoperative nausea and vomiting (PONV) is a common complication following general anesthesia with volatile anesthetics in female patients undergoing gynecological surgery. Propofol is known to have antiemetic properties. In this study, the authors aim to describe the incidence rates of intraoperative low dose propofol infusions and baseline characteristics associated with its use.

Theoretical Framework: The theoretical framework guiding this study is Donabedian's "Structure, Process, Outcome" model which provides a strategy for evaluating the quality of care and identifies areas for improvement.

Literature Review: Females undergoing gynecological surgery are known to have the highest rates of PONV. Propofol has antiemetic properties and current research literature supports the utilization of low-dose propofol infusions in treating PONV in high-risk patients.

Research Design: This is a retrospective observational evidenced-based practice project deemed exempt by the IRB for human subjects research.

Methods: This study was conducted at two Providence hospitals in Washington State. Adult patients (≥18 to 90 years of age) undergoing gynecological surgery from January 2014 to December 2019 that were hospitalized for at least 24 hours and no more than 14 days were included. Patients receiving a low-dose propofol infusion of ≤25 μg/kg/min were identified.

Data Collection: Anonymized health data were extracted from the electronic medical record to a secure database. The project included patients receiving general anesthesia with volatile anesthetics and excluded patients with TIVAs (propofol infusion >25 μg/kg/min).

Results and Data Analysis: This multi-year evidenced-based practice project examined 499 cases and found that intraoperative low-dose propofol infusions were used 45 times accounting for 9% of the total sample. Bivariate analysis revealed that age, BMI, case duration, ASA status, smoking status, and post-op opioids did not influence whether a patient received an intraoperative low-dose infusion. The bivariate analysis did show a statistical significance with a history of PONV ($P = 0.04$). Similar findings were demonstrated in a multivariable model.

Discussions and Conclusions: PONV remains a complication and females patients undergoing gynecological surgery are at the highest risk. Low-dose propofol infusions were vastly underutilized accounting for only 9% of total cases despite patients having multiple risk factors for PONV. Results identify areas for care improvement and CRNA education.

Prophylactic Phenylephrine Infusion to Mitigate Intraoperative Hypotension After Spinal Anesthesia Among Orthopedic Patients

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Introduction: Intraoperative hypotension (IOH) is common after spinal anesthesia (SA) among orthopedic patients. A prophylactic infusion of phenylephrine is associated with a risk reduction of IOH after SA. This evidence-based project aims to report the incidence of IOH at multiple absolute mean arterial pressure thresholds after SA and identify current IOH treatment regimens at Providence Sacred Heart Medical Center (PSHMC).

Theoretical Framework: Donabedian's "Structure-Process-Outcome" model is guiding this research and provides a strategy for evaluating the quality of care and areas in need of improvement.

Literature Review: IOH is common after spinal anesthesia and is associated with an increased risk of end-organ damage. A prophylactic infusion of phenylephrine decreases the severity and duration of hypotension after spinal anesthesia in the orthopedic population.

Research Design: This retrospective, observational evidence-based study was deemed exempt by the IRB for human subjects research. This study determined the rate of IOH according to severity and duration, and the utilization of a prophylactic infusion of phenylephrine following spinal anesthesia in the orthopedic population.

Methods: This study included 3,745 adult patients undergoing SA for elective orthopedic surgery at a large academic medical center in Washington state over a 5-year period. IOH was calculated by quantifying the duration of MAP under specific absolute thresholds, and the time to first MAP <60 mmHg was estimated using the Kaplan-Meier estimator.

Data Collection: Deidentified health data from 3,855 cases were extracted from the electronic medical record to a secure database. Cases in which blood pressure was not measured at least every 5 minutes were excluded, yielding a total of 3,745 cases for analysis.

Results and Data Analysis: In this study, 16% of patients received a prophylactic infusion of phenylephrine. Patients not receiving an infusion following SA were associated with a significant risk of experiencing a MAP <60 mmHg for <10 minutes (RR 3.42, 2.55-4.62, $P < 0.001$). Bivariate analysis revealed the relative risk of IOH with no infusion to be significantly higher in females (RR 2.71, 95% CI [2.33-3.15], $P < 0.001$), a BMI <30 kg/m^2 (RR 1.18, 95% CI [1.05-1.34], $P < 0.01$) and total hip arthroplasty procedure (RR 1.50, 95% CI [1.33-1.70], $P < 0.001$).

Discussions and Conclusions: IOH is common following spinal anesthesia. The results suggest that a significant reduction in the duration and severity of IOH following SA is realized when a prophylactic phenylephrine infusion is utilized. Anesthesia providers should consider tailoring the administration of a prophylactic phenylephrine infusion to orthopedic patients following spinal anesthesia at PSHMC.

Rate of Unscheduled Administration of an Epidural Bolus Among Pregnant Women Receiving Labor Epidurals

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Introduction: Labor epidurals are commonly employed in managing pain associated with labor and delivery. Inadequate analgesia is a significant complication of labor epidurals that is typically managed with the administration of an unscheduled epidural bolus. The purpose of this project was to describe the rate of unscheduled epidural bolus administration in pregnant women receiving continuous labor epidurals.

Theoretical Framework: Donabedian's "Structure-Process-Outcome" model was selected as the guiding framework for evaluating the quality of healthcare delivery relating to labor epidurals.

Literature Review: The reported rates from the literature vary significantly but one randomized control trial with epidural practices comparable to our institutions revealed rates of 22.2% - 30.7% while an observational study revealed a rate of 14.4%.

Research Design: This evidenced based practice project is retrospective in design and descriptive in nature. Approval was granted by the facilities' research council and deemed exempt from human subject's research by the IRB.

Methods: Sample data consisted of parturient women age ≥18 that had a labor epidural between January 2015 and December 2019 at Providence Sacred Heart Medical Center and Providence Holy Family hospital. An unscheduled provider administered epidural bolus was used as an objective measurement of inadequate analgesia following epidural initiation.

Data Collection: De-identified data were extracted and stored in a HIPAA compliant REDcap database and analyzed on facilityapproved devices.

Results and Data Analysis: *T* tests and Mann-Whitney *U* analyses were used to detect group differences for continuous data and chi tests for categorical data. Cox Proportional Hazards examined fully adjusted models for time to provider administered bolus. Gravida one, elective case type, increased BMI and labor epidural duration were identified as independent risk factors for receiving a provider bolus. Kaplan Meier analysis was performed on the time to the first unscheduled epidural bolus stratified by vaginal delivery and unscheduled cesarean section.

Discussions and Conclusions: In this study 36.7% of women required at least one unscheduled provider administered epidural bolus. Gravida one was the most significant independent risk factor, having a 1.23 increased risk of requiring an unscheduled provider administered epidural bolus (HR 1.23; 95% CI 1.15 – 1.31; $P < 0.001$). More in-depth analysis of contributing patient and provider factors is warranted.

Rates of Ondansetron Administration Prior to Spinal Anesthesia: Evaluating the Practice of Prophylactic Attenuation of Spinal-Induced Hypotension and Bradycardia

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Introduction: The research evidence has identified prophylactic ondansetron to be associated with reducing spinal-induced hypotension (SIH) and bradycardia. The aim of this project is to examine the proportion of prophylactic ondansetron and rate of rescue treatment interventions.
Theoretical Framework: The Donabedian model of Structure-Process-Outcome was used to guide this project. This model provides framework for assessing healthcare services and quality of care.
Literature Review: Four meta-analysis and two randomized controlled trials were included for review. The pooled analysis demonstrates when combining all surgical services, ondansetron administered prior to spinal anesthesia reduced the incidence of SIH and bradycardia.
Research Design: This retrospective, multicenter, observational project was deemed exempt by the IRB for human subject research. This project reported the practice of ondansetron prophylaxis for SIH and bradycardia and the rate of rescue treatment in obstetric and orthopedic surgery patients at two large facilities.
Methods: This project was conducted at two Providence medical centers in Spokane, Washington. Adult patients undergoing obstetric and orthopedic surgery whom received spinal anesthesia over a 2-year period were included in this project. Ondansetron administered prior to spinal block were considered SIH and bradycardia prophylaxis.
Data Collection: Anonymized data were extracted from the electronic medical record and stored in a secure HIPAA-compliant database. Final data analysis included 3,157 obstetric and orthopedic spinal anesthesia cases over the calendar years of 2018 to 2019.
Results and Data Analysis: The descriptive time series demonstrated a gap in practice between facilities and service lines. The rate of ondansetron prophylaxis at Providence Sacred Heart Medical Center (PSHMC) for obstetric surgery has increased, with the highest quarterly administration rate reaching 73%. Obstetric surgery at PHFH had quarterly administration rates of 12% to 62%. Quarterly administration rates among orthopedic surgery at PSHMC and PHFH were 8% to 21%. Findings revealed rates of rescue treatment for hypotension were higher in orthopedic surgery receiving prophylactic ondansetron.
Discussions and Conclusions: This project demonstrates a gap in practice for prophylactic ondansetron to attenuate SIH and bradycardia. Limitations to this project includes the inability to differentiate the use of ondansetron prophylaxis for SIH or PONV, and confounding factors that may influence the rate of rescue treatment. This project suggests evidence-based practice improvements for the use of ondansetron prior to spinal anesthesia.

Reducing Fentanyl Costs Within the Anesthesia Department Through Provider Education

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Introduction: The purpose of this study was to demonstrate the economic impact of an educational intervention on price awareness to one division of an anesthesia department at a large teaching hospital.

Theoretical Framework: Providers play a vital role in helping to reduce healthcare costs. Little has been published regarding the cost of opioids in the context of syringe volume and associated waste.

Literature Review: A thorough literature review was performed to guide the best approach to healthcare-specific staff education. There was minimal support for one specific method of education when comparing various approaches; multiple methods should be considered.

Research Design: This is a quasi-experimental research study that took place in a large tertiary teaching hospital.

Methods: The study contained three distinct phases: (1) Three month pre-education data collection; (2) Educational intervention; (3) Three months post-education data collection. Anesthetic records of male and female patients, 18 years and older, American Society of Anesthesiology physical status I-IV, undergoing various surgical procedures were reviewed.

Data Collection: The monetary cost of fentanyl (amount removed, wasted, and given) was calculated for each patient during the pre-education months and again during the post-education months. The data were analyzed and pre and post-education timeframes were compared.

Results and Data Analysis: Data regarding fentanyl use (syringe volumes removed from stock, fentanyl waste) were collected over a 3-month period prior to and following the educational intervention. Comparison was made between the pre and post-education months through two-sample *t*-test, or rank sum test as well as two-tailed tests with $P < 0.05$ denoting statistical significance. Data were analyzed using the SAS software and summarized using mean±SD. The study results did not demonstrate a cost savings; however, may be beneficial in other patient care settings.

Discussions and Conclusions: Research demonstrates that sustainability of cost-savings initiatives by using cost display alone is unlikely. Based on the results of this project, education and the implementation of an algorithm to aid in decision making when choosing syringe sizes did not result in a cost savings. Further studies looking at cost reduction in controlled substances should be considered.

The Dose and Time-Dependent Effect of Dexmedetomidine on Tau Concentration in Differentiated PC12 Cells

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Introduction: The pathophysiology behind the cause of postoperative cognitive decline (POCD) is unclear, but is thought to be similar to the hyperphosphorylation of tau seen in Alzheimer disease (AD). Anesthetic agents have been linked to POCD by triggering the hyperphosphorylation of tau. Dex, a novel alpha-2 agonist, could have a different effect on tau compared to other anesthetic agents

Theoretical Framework: This research is based on the scientific theory that the neurodegeneration in AD is caused by the accumulation of hyperphosphorylated tau (HT) and amyloid-beta plaques.

Literature Review: Studies have shown Dex to have possible antidelirium and neuroprotective effects, reduce the amount of other intraoperative general anesthetic agents, and reduce the incidence of POCD, but in cell cultures cause the hyperphosphorylation of tau.

Research Design: A quantitative, in vitro design, using pheochromocytoma (PC12) cells as human neuron models to analyze tau concentration after Dex administration, was used. Treatment groups were exposed to Dex, with the control group unexposed. Pellet preparation for enzyme studies was performed post-exposure.

Methods: Nerve growth factor (NGF) causes PC12 cells to differentiate into sympathetic-like ganglion neurons. Cells were exposed to 50 ng NGF for 1-7 days to stimulate differentiation of neurites. Once cells achieved at least 75% differentiation, Dex was administered at three concentrations (10, 100, 300μM) and three time intervals (4, 12, 24 hr).

Data Collection: Lowry protein assay and enzyme-linked immunosorbent assay (ELISA) were used to determine the concentration of protein and tau in each sample. Data from nine experiments were recorded and analyzed using statistical software GraphPad Prism version 8.

Results and Data Analysis: A one-way analysis of variance (ANOVA) was performed followed by a post hoc Tukey's test to compare means of tau concentration in Dex vs. control group. A *P*-value <0.05 determined significance. When standardized for overall protein concentration, there was no statistical difference in tau concentration at all time intervals following the administration of Dex 10 μM (4 hr, P =0.334; 12 hr, P = >0.999; 24 hr, P =>0.999), Dex 100 μM (4 hr, P = 0.>0.999; 12 hr, P = 0.153; 24 hr, P =>0.999), and Dex 300 μM (4 hr, P =0.811; 12hr, P =0.998; 24 hr, P =0.182).

Discussions and Conclusions: There was no significant correlation between increasing dose and time-dependent effects on the concentration of tau after the administration of Dex. This contradicts a previous study by Whittington et al (2015), that found Dex increased tau phosphorylation in a dose-dependent manner in SH-SY5Y cells. Future studies with a larger sample size are warranted to decrease the possibility of outliers.

Funding Sources: This research project was funded by the Department of Nurse Anesthesia at Webster University.

The Effects of Cannabidiol on Acute Nociception in Drosophila Melanogaster: A Pilot Study

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Introduction: In the face of an opioid abuse epidemic, the research community is obligated to identify viable options for analgesic management for those experiencing acute and chronic pain. CBD has demonstrated modulation of several receptors, including the opioid receptors, resulting in analgesic effects of opioids at lower concentrations with reduced risk of dependency and tolerance.

Theoretical Framework: In 2018 the FDA approved CBD products containing less than 0.3%. D. Melanogaster were used for this study because of their homogeneity to humans and history of utilization in nociceptive research.

Literature Review: Animal models support analgesic effects in both THC and THC/CBD compounds but have not been consistently reproduced in humans. CBD indirectly alters CB1 and CB2 receptors, and the effects of CBD may be derived through TRPV1 receptor activation.

Research Design: This study is a prospective quantitative design modifying a previously developed model for thermal nociception in D. Melanogaster

Methods: Wild type D. Melanogaster were treated with CBD oil in an acute, chronic, or developmental manner at varying CBD dose levels. The specimens were then exposed to nociceptive stimuli and observed for avoidance behavior.

Data Collection: The percentage of specimen to exhibit nociceptive avoidance behaviors were documented. Data analysis was then preformed using prism data analysis software.

Results and Data Analysis: The objective of the short-term exposure to CBD over 30 and 60 minutes was to determine if the presence of CBD reduced nociceptive response. While the intermediate dose of (0.1 mg/L) CBD generated significant nociceptive reduction in the 60-minute ($P = 0.018$) feed time group. D. melanogaster chronically exposed for one week with .3 mg/L had a $P = 0.0001$. D. Melanogaster larvae exposed to high doses (0.3 mg/L) of CBD throughout their development demonstrated significant reduction in acute nociceptive response compared to control group ($P = 0.0001$).

Discussions and Conclusions: The primary researchers reject the null hypothesis. The results of this study demonstrate CBD's potential as acute analgesic agent. CBD derived the greatest effect when administered over a prolonged period of time. Research regarding the efficacy of CBD as an analgesic for acute pain continues to be an understudied field. Future recommendations include time for emergence of pretreatment with CBD.

Funding Sources: All funding support came from the Webster University Nurse Anesthesia program.

The Effects of Sevoflurane on Gene Expression in Drosophila melanogaster

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Introduction: Further research is warranted to understand the temporal effects of sevoflurane on gene expression to determine its role in neurodegenerative processes.

Theoretical Framework: The following research question is addressed: "Is slo expression in Drosophila melanogaster decreased 24, 48, 72, and 168 hours following sevoflurane exposure at the predetermined minimum anesthetic concentration (MAC) of 0.6%?" Common volatile anesthetics increase the occurrence of neurodegenerative processes such as postoperative cognitive dysfunction. Sevoflurane decreases slo expression in Drosophila melanogaster.

Literature Review: Slo and KCNMA1 encode high-conductance potassium channels, which regulate action potential frequency, electrical excitability, and neurotransmitter release. KCNMA1 is implicated in a glutamate neurotransmission pathway involved in memory and learning.

Research Design: Slo expression was quantitatively measured using RT-PCR at designated time intervals following sevoflurane exposure.

Methods: Drosophila melanogaster were divided into no treatment and treated groups of 12 flies (n = 4). Groups were exposed to sevoflurane 0.6% for 30 minutes and observed for recovery times. Groups were frozen to -20oC at 24, 48, 72, and 168-hours following exposure. Quantitative RT-PCR was performed on extracted RNA with slo expression normalized to actin.

Data Collection: Early and extensive recovery times were observed and recorded. The Biorad CFX machine calculated the threshold cycles and performed statistical analysis and relative gene expression. Prism software was also utilized for statistical analysis.

Results and Data Analysis: The compiled RT-PCR results exhibited decreased slo expression in the 24, 48, and 72-hour groups compared to the no treatment groups normalized to actin. Slo expression in the 168-hour group was not significantly decreased. Compared to the no treatment group, the 24-hour group: mean difference (MD) 2.761, adjusted $P < 0.0001$; the 48-hour group: MD 3.289, adjusted $P < 0.0001$; the 72-hour group: MD 3.732, adjusted $P < 0.0001$; the 168-hour group: MD 1.278, adjusted $P = 0.1125$. ANOVA: F=20.93, $P < 0.0001$, r2=0.5518. Brown-Forsythe: F=6.120, $P = 0.0003$.

Discussions and Conclusions: The effects of sevoflurane on gene expression warrant further research. Sevoflurane alters slo expression and may also alter the expression of KCNMA1, contributing to POCD and other neurodegenerative processes. Anesthesia practitioners should be cognizant of the effects of sevoflurane and utilize current evidence-based practice guidelines to facilitate the delivery of quality anesthesia care.

Funding Sources: Webster University Nurse Anesthesia Program, St. Louis, Missouri

The Efficacy of Docusate Sodium and Senna Glycoside for the Treatment of Constipation After Rotator Cuff Repair: A Randomized Controlled Study

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Introduction: While stool softeners and laxatives are commonly prescribed for post-operative constipation, it is unclear if they are effective. This study was aimed to investigate the efficacy of docusate sodium, senna glycoside, and no treatment to prevent constipation following RCR. The data gained may be beneficial for anesthesia providers when assessing and evaluating the surgical patient pre-operatively.

Theoretical Framework: The Plan Do Study Act (PDSA) framework is applied to this randomized controlled study. A concise hypothesis was established, data were collected, a conclusion was obtained, and findings are discussed.

Literature Review: PubMed, Cochrane, Google Scholar, and Guidelines.gov were accessed for evidence. The inclusion criteria included full text systematic reviews and studies appearing in peer-reviewed journals or on governmental websites.

Research Design: Five evidence sources met the inclusion criteria (3 randomized controlled trials, a quasi-experimental study and a prospective observational study). All of the sources suffered from various methodological problems related to instrument reliability, blinding, randomization, and sample size.

Methods: A total of 107 adult patients were enrolled in this trial, with 38 patients in the docusate group, 36 patients in the senna group, and 33 patients in the control group. Patients were in a hospital out-patient setting, were instructed to begin taking the medication in the PACU and to continue the medication for at least 10 post-operative days.

Data Collection: Constipation was assessed pre-operatively, 2 weeks and 6 weeks post-operative using the PAC-SYM and PAC-QOL. Measures scored on a 5-point Likert, absent of symptoms to very severe symptoms. Medication satisfaction was assessed 2 weeks later.

Results and Data Analysis: The mean age of participants was 59.3 ± 8.9 years, 67% experienced constipation. No difference in the prevalence of constipation in the docusate, senna and control group. No differences at 6 weeks using the PAC-SYM, nor PAC-QOL scores ($P > 0.05$). Subgroup analysis of constipated patients showed the docusate group had worse 2 week post-operative PAC-SYM scores than the senna (0.91 vs 0.45; $P < 0.01$) and control group (0.91 vs 0.23; $P < 0.01$). PAC-QOL scores in the docusate group were significantly worse than the senna and control groups.

Discussions and Conclusions: During the first two post-operative weeks, participants of this study experience a significant increase in constipation symptoms and a decrease in quality of life (QOL). Docusate sodium nor senna glycoside reduce the prevalence of constipation; improve constipation symptoms, or quality of life. The use of docusate sodium may worsen constipation symptoms and QOL. Further research is necessary.

The Impact of Simulation-Based Training on Situational Awareness in Student Registered Nurse Anesthetists: A Pilot Study

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Introduction: Faults in situational awareness (SA) may increase chances for error to occur. This is relevant in nurse anesthesia where decisions are made in dynamic settings that can impact patient morbidity and mortality. Still, evidence-based methods to teach SA to student registered nurse anesthetists (SRNAs) have not been established. The purpose of this study was to evaluate the effects of a simulation-based training program on SA in SRNAs.

Literature Review: Errors in SA leave novice clinicians vulnerable to mistakes and to the consequences of their basic misinterpretations or cognitive limitations. Errors in SA are also the leading causes of avoidable intraoperative incidents created by anesthetists. Simulations are a tool that can be used to assess and develop SA in a controlled environment.

Theoretical Framework: Endsley's theoretical model of SA is the most accepted model in literature. It was constructed based on the idea that SA is essential for decision-making and performance in dynamic systems.

Methodology: IRB approval was obtained through Georgetown University to conduct a quasi-experimental pilot study using a convenience sample to evaluate the effects of a simulation-based training program on situation awareness in SRNAs.

Data Collection and Methods: This study was completed in a five-step process that involved self-assessment questionnaires, a didactic presentation, and two simulations with accompanying debriefing sessions. The questionnaires were used to obtain data that reflected SRNA perceptions of situation awareness and the program experience. A validated tool, the Anesthetists' Non-Technical Skills (ANTS) system, was used to measure performance in the simulations for pre- and post-intervention comparison. This allowed for evaluation of the effectiveness of the program on impacting situation awareness in the SRNA.

Results and Data Analysis: Paired sample *t* tests show that SRNAs had an increased understanding of the concept of SA as it pertains to nurse anesthesia, $M = 3.1$ ($SD = 0.9$) to $M = 4.7$ ($SD = 0.5$), $t(8) = 4.603$, $P = .002$. SRNAs expressed increased ability to apply SA to the intraoperative management of patients, $M = 2.7$ ($SD = 0.7$) to $M = 4.1$ ($SD = 0.9$), $t(8) = 4.914$, $P = .001$, and total ANTS scores increased from $M = 7.3$ ($SD = 1.8$) to $M = 10.3$ ($SD = 1.0$), $t(8) = 4.47$, $P = .0023$.

Discussion and Conclusions: This study revealed that the simulation program improved SA performance in SRNAs and that they perceived it to be an effective method to teach it. SRNAs perceived an enriched understanding of SA and its application to their practice. Furthermore, SRNAs revealed an increase in the value they placed on SA after this educational intervention.

Outcomes in Ambulatory Central Veno-arterial Extracorporeal Membrane Oxygenation Patients: A Single-center Experience Compared to the Extracorporeal Life Support Organization (ELSO) Registry

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Introduction: Patients requiring VA-ECMO as a bridge to cardiac transplant historically have required sedation and mechanical ventilation. At Mayo Clinic, Rochester, MN, VA-ECMO pre-transplant patients are centrally cannulated, extubated and rehabilitated. This study evaluates whether this care model increases success of cardiac transplant, ECMO success, and hospital mortality compared to the ELSO registry.

Literature Review: Limited research is available regarding patients who require centrally cannulated VA-ECMO as a bridge to cardiac transplantation. Early extubation and active participation in rehabilitation may lead to improved cardiac transplant and morbidity and mortality outcomes.

Developmental Design or Methodology: Researchers queried the ELSO registry for all pre-transplant VA-ECMO patients 40 years of age or less from 2011-2017. Outcomes of interest included ECMO duration, "ECMO success" defined as decannulation with expected recovery, transplant rates and hospital mortality. Patients were assigned an acuity score based on reported Pre-ECLS support. Each Mayo patient was matched to 2 ELSO patients based on age group, diagnosis, and total acuity score.

Proof of Concept/Results: One hundred fifty eight pre-transplant centrally cannulated VA-ECMO patients were identified from the ELSO registry and compared to 16 Mayo patients. Thirty registry patients were subsequently matched with 15 Mayo patients. ECMO success in the registry group vs Mayo group was 83.3% vs 73.3% ($P = 0.454$), hospital death 27.6% vs 26.7% ($P = 1$), and transplant rate 26.7% vs 60% ($P = 0.06$) respectively. Median ECMO duration in the registry group was 118 hours vs 2,706 hours in the Mayo group ($P < 0.001$).

Discussions and Conclusions: This study suggests that central ECMO cannulation with active rehabilitation is feasible and allows for support of pre-transplant patients without a resultant decrease in transplant success rates or increase in mortality.

Funding Sources: Research grant recipient from the Extracorporeal Life Support Organization (ELSO).

The Pathophysiological Mechanism of Amniotic Fluid Embolism: The Effect of Amniotic Fluid on Platelet Activation and Serotonin Release

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Introduction: Despite decades of research, the pathophysiology of amniotic fluid embolism (AFE) is still unknown. Three theories currently exist: mechanical obstruction, immunologic, and platelet activation. The A-OK protocol (atropine, ondansetron, ketorolac) is based on the platelet activation theory: the purpose of this study was to investigate this theory, specifically the release of serotonin (5-HT) from platelets.
Theoretical Framework: The theory by Leighton of platelet activation due to amniotic fluid (AF) exposure as a cause of AFE served as the framework for this investigation.
Literature Review: The platelet activation theory demonstrates a relationship between 5-HT release and resulting pulmonary vasoconstriction and cardiopulmonary collapse. Based on this theory, use of the A-OK protocol has led to successful AFE resuscitation.
Research Design: The research design for this study was an ex vivo laboratory experiment utilizing matched AF and venous blood samples from consented parturients undergoing scheduled cesarean section (CS).
Methods: Platelet rich plasma (PRP) from 12 parturients undergoing CS were analyzed for 5-HT release after exposure to various concentrations of matched AF (0.6 ug, 1.8 ug, 6ug), fluoxetine, sodium chloride, and thrombin (0.5 u/mL, 1.0 u/mL). Levels of 5-HT were measured using high performance liquid chromatography (HPLC) with electrochemical detection.
Data Collection: Samples of whole blood were collected from each parturient following successful collection of AF. Protein concentrations of AF were determined by Lowry protein assays. An internal standard, 5-hydroxy-n-methytryptamine (5-HNMT), was used.
Results and Data Analysis: Samples were standardized to represent levels of 5-HT per 100,000 platelets. A one-way ANOVA with a Tukey test compared the amount of 5-HT found in the plasma and platelets of the samples compared to a control. The mean plasma 5-HT content was not statistically different in the control group compared with the AF groups ($P > 0.05$). The mean platelet 5-HT content was not significantly different in the control group compared with the AF groups ($P > 0.05$).
Discussions and Conclusions: We accepted our null hypothesis that platelets exposed to matched AF had no effect on 5-HT release. Case studies by Leighton et al and Rezai et al reported successful reversal of cardiopulmonary manifestations of AFE after utilizing the A-OK protocol. 5-HT may be still be released from platelets after exposure to AF, and further investigation is warranted.
Funding Sources: The research was funded by a Webster University Faculty Research Grant.

Tibial Intraosseous Administration of Epinephrine Is Effective in Restoring ROSC in a Pediatric Normovolemic But Not Hypovolemic Cardiac Arrest Model

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Introduction: Thousands of children receive out-of-hospital CPR each year. PALS guidelines suggest that tibial IO (TIO) catheters can establish intravascular access for anesthesia resuscitative care. Use of TIO catheters has become common practice in emergency care, however the pharmacokinetics of TIO administered epinephrine and its efficacy toward ROSC in euvolemic and hypovolemic conditions are unknown.

Theoretical Framework: Concurrent hypovolemia and cardiac arrest pathophysiology will increase peripheral vasoconstriction and reduce perfusion to the tibia, which may alter the pharmacokinetics of TIO administered drugs.

Literature Review: Currently, no studies have compared the efficacy of TIO administered epinephrine in restoring ROSC and corresponding plasma concentrations of epinephrine in a pediatric hypovolemic or normovolemic cardiac arrest models.

Research Design: This study was a prospective, randomized experimental design. Swine were assigned to TIO Normovolemia and TIO Hypovolemia as the primary comparison, while IV Hypovolemia, TIO Normovolemia with Spontaneous Circulation, CPR only, and CPR + Defibrillation groups served as controls.

Methods: Animals were sedated, intubated, and subjected to general anesthesia during experimentation. After monitors and invasive line placement, the subjects were exsanguinated and put into cardiac arrest. Hi-quality CPR with mechanical compression commenced according to PALS guidelines, which included defibrillation and epinephrine administration.

Data Collection: Blood samples were collected at 0, 30, 60, 90, 120, 150, 180, 240, and 300 seconds after epinephrine administration. High Performance Liquid Chromatography quantified plasma epinephrine concentrations. Also, the incidence of ROSC was recorded.

Results and Data Analysis: The TIO Normovolemia cardiac arrest group all experienced ROSC. Subjects experiencing hypovolemia and cardiac arrest were significantly less likely to experience ROSC when epinephrine was administered TIO. The TIO Hypovolemia group exhibited lower plasma epinephrine concentrations vs. IV Hypovolemia at 60, 90, 120, and 150 seconds, ($P < 0.05$). Though the maximum concentration of plasma epinephrine was similar, the TIO Hypovolemia group exhibited significantly slower time to maximum concentration times vs. TIO normovolemia subjects ($P = 0.004$).

Discussions and Conclusions: TIO administration of epinephrine restored ROSC among normovolemic cardiac arrest subjects. TIO administration of epinephrine was ineffective in restoring ROSC among subjects experiencing hypovolemia and cardiac arrest. Intravenous access should not be abandoned after successful TIO placement in the resuscitation of patients experiencing concurrent hypovolemia and cardiac arrest.

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General Posters
Evidence Based Practice

A Community Hospital's Experience Applying an ERAS Protocol for Opioid-Addicted Parturients Continuing Buprenorphine to Improve Patient Outcomes

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Introduction: Opioid abuse is an epidemic with 130 people in the United States dying each day of opioid overdose, and those with opioid use disorder (OUD) often continue to use in pregnancy. Medication-assisted therapy such a buprenorphine (BUP) shows promise, but due to partial agonist and high affinity, some discontinue. An Enhanced Recovery After Surgery (ERAS) protocol with BUP could allow women to continue treatment and have a C/S with decreased pain.

Methods: A literature search was performed using Cochrane, CINAHL, Medline databases for *ERAS* or *enhanced recovery after surgery + addiction* or *substance abuse* or *drug abuse*, which returned 0 results. A gap in the literature was identified surrounding the application of a buprenorphine-specific optimization protocol for addicted parturients. A tailored protocol was developed from the findings. Does a buprenorphine-specific protocol for the opioid-addicted parturient impact opioid consumption following caesarian section in the perioperative period?

Analysis of the Evidence: Two-tailed *t*-testing showed no statistical difference ($P < 0.05$) in parturient age, BMI, hospital length of stay, gestational age of infant delivered, initiation of prenatal care, or total number of pregnancies. Two-tailed *t*-tests showed significane at the $P < 0.05$ level for maternal rescue opioid consumption, pain scores POD 0-4, infant birth weight, length, head circumference and NAS for infant's first day of life. Chi-squared testing showed significance at the $P < 0.05$ level for infant disposition to mother versus state custody and breastfeeding on discharge. A significant difference at the 0.05 level was found between the ERAS-treated opioid-addicted parturients undergoing c-section.

Recommendation for Practice: More research is indicated, however with our study we have shown that one is able to implement an ERAS protocol to keep parturients on buprenorphine treatment program without increasing their pain.

A Comparison of the Safety and Efficacy of Norepinephrine and Phenylephrine for Treatment of Post-spinal Hypotension in Parturients Undergoing Cesarean Delivery

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Introduction: The current vasopressor of choice in treating post spinal hypotension in women undergoing cesarean delivery is phenylephrine. Phenylephrine is an alpha 1 agonist with unwanted side effects of reflexive bradycardia and a subsequent reduction in cardiac output. For this reason, other medications have been explored. Many recent studies suggest norepinephrine as an adequate alternative.

Methods: A literature search of PubMed through the Schaffer Library at Albany Medical College was conducted from May 31, 2019 to June 8, 2019. Inclusion criteria included publications within 5 years, written in English, utilizing human subjects, with a primary outcome of maintenance of maternal, post-spinal, hypotension, comparing phenylephrine, and norepinephrine. Exclusion criteria consisted of articles that were not peer reviewed and those that did not achieve statistical significance. Four articles were selected.

Analysis of the Evidence: These four articles found equivalent control of blood pressure when norepinephrine was used compared to phenylephrine. In addition, norepinephrine provided less incidence of bradycardia, less reduction of cardiac output, and less incidence of nausea and vomiting. Fetal pH and fetal Apgar scores were similar when comparing norepinephrine and phenylephrine.

Recommendation for Practice: Norepinephrine can safely and effectively be utilized as an alternative to phenylephrine in preventing post spinal hypotension during cesarean delivery.

A Comparison of the Sedation Depth, Recovery Time, and Cardio-Respiratory Stability of Dexmedetomidine-Ketamine versus Propofol-Ketamine and Midazolam-Dexmedetomidine Combinations

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Introduction: Dexmedetomidine and ketamine are two anesthetics utilized heavily in procedural sedation due to their minimal effects on respiratory rate and hemodynamic variables, although rarely together. The purpose of this research is to compare the sedation depth, recovery time, and cardiopulmonary stability of IV dexmedetomidine-ketamine versus other commonly utilized procedural sedation modalities.

Methods: A systematic review of literature was performed utilizing the databases PubMed, CINAHL, and Embase. Keywords included "dexmedetomidine- ketamine" and "procedural sedation." Full-text English language articles published between 2006 and 2020 were included. Initial search results yielded 71 articles. Thirty-nine articles remained after duplicates were removed. Inclusion criteria consisted of either a propofol-ketamine or midazolam-dexmedetomidine comparison group. Exclusion criteria consisted of general anesthesia, non-intravenous route of administration, sample-size less than forty, and lack of a comparison group. After screening, seven articles were included. Six articles are prospective randomized trials and one is a computerized bibliographic search of the literature.

Analysis of the Evidence: Dexmedetomidine-ketamine (DK), when administered as IV bolus and/or maintenance infusion, compared to propofol-ketamine (PK), midazolam-dexmedetomidine (MD), and midazolam-dexmedetomidine-fentanyl (MDF) combinations, results in: milder depth of sedation as measured by Ramsey Sedation Scale, comparable post-operative recovery times, superior hemodynamic and respiratory stability, and lower risk of complications.

Recommendation for Practice: IV dexmedetomidine-ketamine should be considered for procedures requiring mild-moderate sedation, outpatient procedures due to its comparable recovery time to other procedural sedation modalities, and patients that cannot tolerate a drop in BP >20%, rise in HR >20%, or drop in SpO_2 >5%. Dexmedetomidine-ketamine IV infusion should not be considered for procedures requiring deep sedation as it may result in an inadequate depth of sedation and analgesia, as well as decreased patient, anesthesiologist, and surgeon satisfaction.

A Pilot Study of an Innovated Flexible Extended-Length Airway to Relief Upper Airway Obstruction: The McMurray Enhanced Airway

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Introduction: Respiratory adverse outcomes from inadequate ventilation and oxygenation are the most reported monitored anesthesia care (MAC) closed claims. There is a growing need for an airway device that can sufficiently open the obstructed airway and improve patient outcomes. The purpose of this pilot survey study was to evaluate a new airway device's clinical performance in patients with airway obstruction.

Literature Review: Deep sedation use is increasing, due to decreased operating/recovery room time and less physiologic disruption for patients. Maintaining a spontaneous breathing airway in a sedated patient is challenging, especially with obese, obstructive sleep apneic, or older patients who are at higher risk for upper airway obstruction. Existing airway devices have shortcomings and reveal adverse effects.

Developmental Design or Methodology: This proof of concept survey study was granted IRB exemption. Anesthesia providers from 14 different surgery locations throughout the United States were instructed on McMurray Enhanced Airway (MEA) use and trialed the airway in adult patients experiencing an upper airway obstructive under deep sedation/MAC. Anesthesia providers then completed 78 surveys consisting of 6 questions on MEA performance and provider satisfaction.

Proof of Concept/Results: Data were analyzed utilizing descriptive statistics. The MEA decreased airway obstruction and eliminated the need for chin lift or jaw thrust maneuvers in 100% of the patients. Ninety-one percent agreed that the MEA was easy to place and 95% were very satisfied with the new airway for deep sedation. When asked if the new MEA device would improve airway management practice and patient outcomes, 92% indicated yes. Ninety-four percent stated they would recommend the MEA for deep MAC airway obstruction and respiratory compromise.

Discussions and Conclusions: This pilot survey demonstrates that the MEA is performing as expected and initial users are satisfied. The MEA diameter and flexibility eases placement while MEA length displaces redundant pharyngeal tissue and frees providers' hands to tend to other tasks. The MEA fills a void in airway management and may reduce airway workarounds and litigation risk. As more patients undergo procedures with deep sedation, the MEA is a safe and efficient device to improve airway management.

Acute and Chronic Post-thoracotomy Neuropathic Pain: At-Risk Population, Prevention, and Treatment

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Introduction: Thoracic surgery can cause severe and chronic post-operative pain. Intercostal nerve damage has long been implicated in the development of symptoms. These include burning, shooting, and aching sensations at or around the surgical site. Chronic pain can cause insomnia, loss of appetite, and incapacitate patients, which can make daily activities unbearable.

Methods: PICOT questions: "What patients are at risk for developing acute and chronic neuropathic pain post-thoracotomy within the first two months after surgery? What are prevention and treatment strategies for these patients during the first two post-operative?" Publications for review were identified through searches in PubMed and CINAHL databases. Search terms used included *neuropathic pain* coupled with either *thoracotomy, post-thoracotomy, open thoracotomy* or *video-assisted thoracotomy*. Inclusion criteria were peer-reviewed publications in English, from 2010 to present. The articles consisted of 2 systematic reviews, 2 randomized control trials, 1 cohort study, 4 retrospective studies, 6 prospective observational studies, and 2 case reports.

Analysis of the Evidence: At-risk populations for acute neuropathic pain include a diagnosis of cancer, previous pain, and preoperative use of hypnotic medication. Procedural risk factors include open thoracotomy, duration of surgery greater than 2.5 hours with open approach, and lobectomy. Post-thoracotomy pain syndrome risk factors include those with low American Society of Anesthesiologist (ASA) scores, pre-operative pain in any location but more so in the thoracic region, high average pain score during 5 post-operative days at rest and on coughing, pain at discharge, post-operative pain lasting six weeks, female gender, young age, number of drains, brush allodynia, and sensory loss distal to the surgical scar.

Recommendation for Practice: Prevention for acute pain: paravertebral block of 0.5% bupivacaine 0.3 mL/kg and dexmedetomidine 1mcg/kg after induction, use of video-assisted approach, intravenous or epidural ketamine intra-operatively, and magnesium sulfate with induction at 40 mg/kg over 10 minutes followed by an infusion for 24 hours at 10 mg/kg/hr. Treatment: pregabalin 50 mg/day starting in post-operative day 2 and a standardized analgesia regimen. Prevention of chronic pain: dexmedetomidine infusion of 0.7 µg/kg/hour, total intravenous anesthesia, and magnesium sulfate intervention described above. Treatment: surgical intercostal neurolysis, spinal cord stimulation system, and subcutaneous injections of botulinum toxin.

Adverse Events in Patients Undergoing MAC Anesthesia: Review of Risk Factors and Identification of Evidence-Based Prevention and Treatment

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Introduction: ASA Closed Claims Database reported MAC anesthesia accounted for 69% of non-operating room anesthesia claims from 2000 to 2012. Patients who experienced sedation-related adverse events had longer hospital stays, higher medical costs, and higher risks of adverse events. Analysis of current literature can identify predictors, prevention, and treatment of adverse events to improve patient safety.

Methods: Four electronic databases were searched, including CINAHL, PubMed, Medline Ovid database, and TRIP medical database. Search included randomized controlled trials, observational studies, retrospective studies, systematic literature reviews, and meta-analyses of patients who underwent procedural sedation. Search was limited to peer-reviewed scholarly articles from 2006 to 2020 with defined study designs and outcomes. Keywords and search terms included: "monitored anesthesia care (MAC)," "procedural sedation," "propofol sedation," "non-operating room anesthesia (NORA)," "monitoring," "adverse events," "complications," "injuries," "medical errors," "morbidity," and "mortality."

Analysis of the Evidence: Synthesis of 30 articles reported sedation-related adverse events can lead to longer hospital stays, increased costs, increased readmissions, and higher risk of mortality. Main predictors of these complications were older age, obesity, and higher ASA status. The most common adverse events were oxygen desaturation and hypoxia. Management of sedation-related complications began with a thorough pre-procedure assessment. Early detection of respiratory depression, achieved through the use of capnography or novel non-invasive respiratory ventilation monitoring (RVM), can reduce adverse events. High-flow nasal cannula (HFNC) use has shown to prevent desaturation, but further studies are needed.

Recommendation for Practice: A comprehensive approach should be adapted to reduce incidence of sedation-related adverse effects. Thorough preoperative assessment (with emphasis on known predictors of adverse events) can reduce incidence of complications. Anesthetic plan should include accessible emergency equipment and medications. Continuous assessment of oxygenation, ventilation and cardiovascular stability should be performed throughout procedure. Early detection of apnea and prompt intervention from least to most invasive methods can further mitigate adverse events. Additional studies are necessary for efficacy of novel methods for identification and prevention of respiratory depression, such as use of RVM and HFNC.

Airway Management in the Setting of Oropharyngeal Flooding with Blood or Vomit

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Introduction: Currently, no airway algorithms address context-sensitive management in the setting of oropharyngeal flooding with blood or vomit. Although video laryngoscopy (VL) has been proven to be an excellent alternative to direct laryngoscopy (DL) in emergency situations, more research is required to determine the functionality when airway soiling obscures relevant anatomy and causes lens contamination.

Methods: "In patients who have an unanticipated difficult airway secondary to oropharyngeal contamination with blood or vomitus, is VL superior in establishing early airway securement when compared to standard DL?" EBSCOhost (via MEDLINE and CINAHL), PubMed, and GoogleScholar databases were searched using the terms "vomit," "soiled," "blood," "hemorrhage," "contaminated," "suctioning," "oropharyngeal flooding," "video laryngoscopy," "direct laryngoscopy," "simulation," "training," and "difficult airway." Ten primary articles, published within the last 7 years, were chosen for the final review.

Analysis of the Evidence: Literature suggests that the GlideScope, McGRATH, and CMAC are just as, if not more successful than DL in the setting of oropharyngeal contamination. Conflicting evidence surrounds the utility of the Pentax Airway Scope (AWS) suggesting that success may be dependent on suctioning methods. Suctioning methods may have impacted intubation success rates to a greater degree than the actual device selection. Additionally, clinical exposure does not provide the acquired skills necessary to gain superior outcomes in low-frequency, high-acuity crisis events. However, simulation training improved intubation success rates and increased provider confidence in managing a flooded airway.

Recommendation for Practice: Explicit comparison of VL and DL intubation success in the presence of airway contamination is a gross generalization. Design features of a VL are necessary to determine utility and performance in the contaminated airway setting. Evaluation of the ease and/or speed of a device in isolation from clinical outcomes may provide a false or incomplete representation of true device success. Overall, suctioning strategies and simulation training/education should not be overlooked as potentially higher yielding research areas that could improve patient outcomes.

Alternative Peripheral Nerve Block to Provide Effective Analgesia and Minimal Phrenic Nerve Paralysis in Patients Undergoing Unilateral Shoulder Surgery

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Introduction: The gold-standard anesthetic for shoulder surgery, the interscalene block, produces nearly 100% phrenic nerve paralysis. This 25% reduction in diaphragmatic function leads to respiratory complications in pulmonary compromised patients. The superior trunk and suprascapular-axillary nerve blocks are alternative techniques proposing to provide noninferior analgesia and less phrenic nerve paralysis.

Methods: MedLine, CINAHL, and EMBASE databases were searched to answer the PICO question: "In patients undergoing unilateral, elective, shoulder surgery, does a superior trunk (STB) approach or suprascapular-axillary (SSAX) approach to regional blockade compared to an ISB approach lead to less phrenic nerve paralysis and noninferior analgesia?" Six RCTs and two case studies were included in this review. Inclusion criteria included articles published in English from 2010-present, human subjects, RCTs or case studies, subjects over the age of 18, peripheral nerve block for elective, unilateral shoulder surgery, and primary outcomes, such as analgesic effectiveness and phrenic nerve complications (eg, dyspnea, hemidiaphragmatic paralysis).

Analysis of the Evidence: Eight studies included in this systematic review comprised an overall sample size of 505 patients. Four articles found 10-15 mL of 0.25-0.5% ropivacaine or bupivacaine administered as a STB prior to shoulder surgery provides sufficient analgesic control and significantly reduces phrenic nerve paralysis when compared to the gold standard ISB. Two studies found the SSAX block to cause significantly less phrenic nerve complications than the ISB block, while two others found there to be no difference. Further, three studies found the SSAX to provide inferior anesthesia and analgesia when compared to the ISB, while one article found the SSAX and ISB to be equivalent.

Recommendation for Practice: Evidence shows that administration of 10-15 mL of 0.25-0.5% ropivacaine or bupivacaine administered under ultrasound guidance as a superior trunk block prior to shoulder surgery provides sufficient analgesic control and significantly reduces phrenic nerve paralysis. Implementing an algorithm utilizing this anesthetic technique along with minimal-to-no opioid use, adequate neuromuscular blockade reversal, early ambulation, and pulmonary toilet techniques will lead to positive patient outcome measures, decreased hospital costs, and improved patient satisfaction.

An Argument for Implementing Preoperative Anesthesia Checklist for Patients with Religious and Dietary Restrictions

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Introduction: Cultural diversity presents most of the critical issues facing modern nations. The awareness of healthcare professionals of the constituents of biological products and effects on a cultural group has yet to be addressed in anesthesia practice. Certain religious groups have beliefs in the dietary use of porcine, bovine, eggs, and fish products that could limit treatment options during surgery.

Methods: PICO Question: "An argument to utilize a substation checklist in adult patients with dietary restrictions such as vegans, Muslims, Sikh, and Jewish Orthodox to increase patient satisfaction." The search utilized MedLine (ProQuest), Excerpta Medica Database (EMBASE), and Cumulative Index of Nursing and Allied Health Literature (CINAHL). A combination of search words and Boolean operators used including bovine, pig, heparin, low molecular weight heparin, gelatin, eggs, propofol, Diprivan, surgery, anesthesia, surgical procedures, and surgical operations. Then another combination of words was used including *religion, religiosity, religiousness, spirituality, bovine, pig, cow, Muslim, Islam, Jew, Islamic, Judaism, vegan, vegetarian, patient consent,* and *consent for treatment.*

Analysis of the Evidence: Literature regarding the use of porcine and bovine-derived medications and medical devices for patients who practice Judaism, Islam, and Hinduism is limited. Many decision-makers have limited knowledge of the differences in information needs, values, and preferences of individual patients from Muslim, Jewish, Sikh, or vegan faith. The American healthcare system has gaps in the delivery of medical care to groups of Muslims, Jewish, Sikh, and vegan faith with strict dietary restrictions. Ignoring religious sensitivities and neglecting consent in the usage of drugs and implants with animal or human-derived content could have very serious implications, including litigation.

Recommendation for Practice: Formulating checklists using evidence-based criteria and religious expert judgment, healthcare providers might be more comfortable knowing they are providing the best standard of patient care specific to patient's religious practice or cultural affiliation. The extent to which people follow their religious beliefs is a concern for the individual. The psychological, and legal ramifications for both the patient and the provider needs careful consideration. Institutions seeking Joint Commission accreditation must have expertise in administrative affairs, clinical practice, policy, research, risk management, patient advocacy, cultural competence, and language access.

Anesthesia Provider Postpartum Hemorrhage Education

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Introduction: Postpartum hemorrhage (PPH) is a leading cause of maternal death and morbidity worldwide. In the United States, PPH accounts for 30% intensive care admission rates and 15% mortality. Timely diagnosis and management are critical for preventing death. The Joint Commission requires obstetric units to provide role-specific education regarding the organization's hemorrhage protocol.

Methods: PICO: "In obstetric anesthesia providers with limited knowledge and experience regarding postpartum hemorrhage, how does providing a role specific educational intervention increase knowledge and preparedness for maternal hemorrhage?" Literature published between 2012 to 2017 from the National Library of Medicine (NLM), PubMed, MEDLINE, Cochrane, and CINAHL databases were utilized. Literature search identified supporting studies and multi professional organization guidelines recommending the implementation of role specific education on PPH management. The search produced 117 articles, of which 35 were further evaluated for relevance and applicability and 15 articles were determined to be the most applicable and reviewed further.

Analysis of the Evidence: Interventions to reduce PPH may allow for delivery of more cost-effective care, as well as overall improvements in maternal and population health. There is potential to substantially reduce pregnancy-related mortality by targeting risk factors prior to and during pregnancy, as well as ensuring all pregnant women have access to good quality antenatal care, skilled care during delivery, emergency obstetric care as well as post-natal care. Education on role specific tasks improves efficiency in PPH management. Members of the care team function optimally if they know the procedures to follow. Educational programs increase efficiency in a true hemorrhage emergency.

Recommendation for Practice: A role-specific education intervention based on UCMC PPH protocol was employed to increase obstetric anesthesia provider knowledge and preparedness for PPH management. Results: One tailed paired *t*-test was used to analyze average pre-test scores (M=58%) against average post-test scores (M=93%). A P value of <0.05 was set to be statistically significant. Test demonstrated there was a statistically significant improvement in post-test scores ($P = 0.0104192$). Results from the educational intervention suggests role specific education was beneficial and other disciplines within the obstetric unit can look into implementing a similar education.

Anesthetic Requirements With Chronic Cannabis Use Compared to Chronic Opioid Use

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Introduction: The purpose of this systematic review is to evaluate the effect of marijuana use on anesthetic requirements when compared to chronic opioid use. Due to recent changes in legislature regarding the use of cannabis products anesthesia providers are beginning to see a large number of adult patients who are currently using cannabis and research is needed to understand how to best care for them.

Methods: "In adult patients undergoing elective surgery under general anesthesia (P), how does the use of medical marijuana (I) when compared to chronic opioid use (C) effect anesthetic requirement intraoperatively(O)?" Databases searched included MedLine (ProQuest), Excerpta Medica Database (EMBASE), and Cumulative Index of Nursing and Allied Health Literature (CINAHL). In order to preserve the value of the systematic review, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist was used and the review was formatted based on this guide. Studies identified for analysis included randomized controlled studies, cohort studies, and experimental randomized controlled trials.

Analysis of the Evidence: The articles selected for this review displayed heterogeneity. There were limitations to the research conducted. Sample sizes in the included studies where limited. Future research should focus on multi-center randomized control trials that display homogeneity and have larger sample sizes. They should also include detailed information regarding cannabis dosage, route of administration, and duration of therapy. As policy regarding cannabis changes, researchers will have more opportunities to conduct additional studies that will help to better understand the specific needs of these patients.

Recommendation for Practice: Detailed preoperative evaluation of patients by anesthesia providers aimed at evaluating the use of cannabis may help anesthetists be better prepared to provide high-quality care to this patient population. A multimodal approach to pain management or the use of regional techniques may be beneficial in this patient population.

Anxiolysis in the Pediatric Population: Use of Preoperative Midazolam Versus Non-pharmacologic Distraction Based Techniques

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Introduction: The primary aim of this review is to assess the effectiveness of interventions that are non-pharmacologic and distraction-based used in the preoperative setting compared to midazolam in the pediatric population.

Methods: PICO Question: "In a Pediatric Population of Patients Receiving Anesthesia, What Is the Effect of Non-Pharmacological Interventions on the Reduction of Perioperative Anxiety Compared with Preoperative Midazolam?" A comprehensive search of the literature using the PRISMA guidelines was performed. Three different electronic databases were used to acquire a total of 136 studies. Nine studies were included after the application of inclusion and exclusion criteria. Eligible clinical trials included the use of non-pharmacologic, distraction-based interventions within the pediatric population and compared with the use of midazolam. The primary outcome was preoperative anxiety. The secondary outcomes included postoperative emergence delirium or agitation, length of stay, and parental satisfaction.

Analysis of the Evidence: The available evidence suggests that non-pharmacologic distraction based interventions compared with the traditional pharmacologic premedication are a sufficient alternative and show no significant differences in outcomes. A study comparing an audiovisual intervention to midazolam highlighted both groups to be cooperative with induction, however midazolam was superior. Findings of a combination of midazolam and a digital video disc player did not prove to be statistically significant. Two studies involving tablet based interactive distraction compared with oral midazolam resulted in increased effectiveness in reducing preoperative anxiety, emergence delirium, and length of stay.

Recommendation for Practice: Distraction based techniques have the capacity to reduce perioperative stress and anxiety amongst the child and parents, therefore a sufficient alternative to preoperative midazolam to eliminate deleterious side effects. In particular, out of all the distraction-based techniques, tablet based interactive distraction proved to be the most efficient tool in reducing perioperative anxiety, emergence delirium, and time-to-discharge thereby increasing parental satisfaction when compared to midazolam.

Battle of the Crystalloids in the OR: A Literature Review

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Introduction: The use of IV fluids for maintenance therapy in the operating room is universal. However, the variation in fluid selection is usually based on institution or provider preference rather than evidence-based guidelines or data. A focused review of the literature was conducted to determine which crystalloid solution is most appropriate for fluid maintenance during the perioperative period.

Methods: The PICOT question guiding the literature review is: "In adult patients, how does the use of normal saline (NS) compared to Plasmalyte (PL) and Lactated Ringers (LR) affect cost and patient outcomes during the perioperative period?" Evidence was gathered from PubMed, CINAHL Plus, and Cochrane Library. The search terms used were "surgery," "normal saline," "Plasmalyte," and "Lactated Ringers." A total of 50 peer-reviewed articles that met the inclusion criteria were reviewed. Of these, 15 articles published between 2008 and 2019 were deemed relevant and were critically appraised. The types of studies analyzed included double-blind randomized control studies, observational studies, a multiple-crossover study, retrospective cohort studies, and a cost-minimization analysis.

Analysis of the Evidence: Dey et al (2018), Hadimioglu et al (2008), Kim et al (2013), Pfortmueller et al (2018), and Song et al (2015) found that NS causes metabolic acidosis perioperatively. Dey et al, Kim et al, Raghunathan et al (2014), Shaw et al (2012), and Song et al showed PL has less postoperative complications and a better acid-base profile compared to NS. Hadimioglu et al, Noritomi et al (2011), Shin et al (2011), and Wang et al (2017) showed PL was superior to LR in acid base balance. LR is incompatible with blood and eight medications (Vallée et al, 2019). PL costs about $2/L, NS and LR cost about $1/L (Semler, Rice, 2016). Smith et al (2014) found PL is more cost-effective than NS.

Recommendation for Practice: Literature shows that PL is the most beneficial and cost-effective solution for perioperative fluid maintenance because its composition is the most similar to plasma. NS is associated with metabolic acidosis and an increase in bicarbonate usage. LR causes metabolic alkalosis, impaired diabetic glucose control, and is incompatible with blood products and drugs, such as propofol and ketamine therefore typically requiring a second IV with NS infusing. Although PL is roughly double in cost, it is more cost-effective because it requires less magnesium replacement than NS and does not have the same limitations as LR. Future studies are needed to further examine the cost-effectiveness of PL vs LR.

Best Practice for the Administration of Sodium Bicarbonate in Patients with Metabolic Acidosis

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Introduction: Sodium bicarbonate is routinely administered to acutely ill patients with metabolic acidosis. Administration of sodium bicarbonate can possess untoward side effects. The goal of this literature review is to determine best practices for administering sodium bicarbonate to patients with metabolic acidosis.

Methods: The online databases PubMed, MedGen, and PMC along with medical textbooks from the Schaeffer Library at Albany Medical College were used to acquire research articles and supporting material. The literature reviewed was within the past 10 years, while supporting articles and websites included older work. All research articles were peer-reviewed and published in national journals in the United States. The primary outcome measured in the literature review was mortality in patients with metabolic acidosis who received sodium bicarbonate therapy.

Analysis of the Evidence: Administration of sodium bicarbonate was not shown to significantly decrease mortality of patients with metabolic acidosis. However, several studies demonstrated a decrease in mortality rates when sodium bicarbonate was administered to patients with metabolic acidosis and acute kidney injuries (AKIN score 2 and 3). The administration of the sodium bicarbonate in patients with lactic acidosis was found to have a higher association with mortality.

Recommendation for Practice: Sodium bicarbonate administration in patients with metabolic acidosis results in different outcomes depending on patient comorbidities. When sodium bicarbonate is administered to patients with the comorbidity of AKI, mortality rates decrease. Further research is needed to confirm the correlation between AKI, sodium bicarbonate administration, and decreased mortality rates.

Can Music Therapy Reduce Perioperative Anxiety Under Spinal Anesthesia?

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Introduction: Anxiety is proven to increase the need for analgesics and anesthetics as the physiological response activates the sympathetic nervous system. Music therapy has shown to decrease adrenergic activity, producing reduced levels of consciousness and neuromuscular arousal. A literature review investigated the effectiveness of music therapy on perioperative anxiety in patients under spinal anesthesia.

Methods: PICO Question: "Can Music Therapy Reduce Perioperative Anxiety Under Spinal Anesthesia?" CINAHL, CLIO, Ovid, and MEDLINE databases were searched in English from 2013 to present with keywords: music therapy, spinal anesthesia, and anxiety. Eighty-five articles were found within cited criteria, 4 were excluded due to duplication, 69 were excluded after titles and abstracts were screened, and 5 were excluded after a full-text review. Seven articles were included in the final analysis relevant to music therapy and spinal anesthesia: 4 randomized controlled trials, 2 quasi-experimental designs, and 1 experimental research design. Type of music used varied with music used preoperatively in 2 studies, intraoperatively in 6 studies, and postoperatively in 7 studies in patients under spinal anesthesia.

Analysis of the Evidence: The appraised literature selected offered results that demonstrated a reduction in perioperative anxiety in patients under spinal anesthesia by music therapy. Six articles focused on the provision of music therapy during the intraoperative period in the adult population. Postoperative anxiety levels were reduced in 6 articles and intraoperative anxiety levels were reduced in four articles. The results were statistically significant, evidenced by the lower State-Trait Anxiety Inventory Scales (STAI), Visual Anxiety Scales (VAS), and questionnaires noted in each article. Patient selected music provided reduced physiological and stress responses, increased sedation, and higher patient satisfaction.

Recommendation for Practice: There are implications for further research, especially in the pediatric population in patients less than the age of 18 under spinal anesthesia. From the review of the literature, no studies focused on music therapy during the actual administration of spinal anesthesia. Adding a set of headphones or amplifying music through a speaker opens possibilities for authentic, patient-centered care. Based on the evidence, implementation of patient-selected music therapy is the most effective use of sound and may be utilized as an adjunct or alternative non-pharmacological approach to ease patient anxiety under spinal anesthesia.

Cardiac ERAS Needs Assessment and Educational Tool

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Introduction: Due to the growing information of cardiac Enhanced Recovery After Surgery (ERAS) interventions, an educational gap needs to be met. The purpose of this project is to perform a needs analysis by gathering baseline data from patients undergoing elective coronary artery bypass grafts in an effort to analyze current practice patterns for anesthesia providers; then educate anesthesia providers on current cardiac ERAS interventions.

Methods: The PICOT question utilized for this project was the following: "In (P) elective open-heart surgery patients at Kettering Medical Center, does (I) cardiac anesthesia provider education on medications and interventions as part of an ERAS protocol, (C) compared to no standardized ERAS intervention education (O) improve provider knowledge?" A literature search was then conducted, and results were limited to articles that addressed cardiac ERAS interventions. This produced 25 relevant articles, including 2 randomized controlled trials. A chart review was performed to obtain baseline data for elective CABG patients at a community hospital, this data was presented to cardiac anesthesia providers along with information on Cardiac ERAS interventions via an iTunes U course.

Analysis of the Evidence: ERAS focuses on a multidisciplinary effort, all operative stages, hydration, multimodal pain management, decreased preoperative fasting, and initiating early mobility (Engelman et al, 2018). Focusing specifically on multimodal analgesia has been proven to be an essential component in opioid reduction (Engelman et al, 2018). Literature also places an emphasis on providers advocating for Fast Track Extubation (FTE) (Bainbridge & Cheng, 2015). Implementing a cardiac ERAS protocol by first providing education to providers and demonstration evidence for the rationale to change practice improves adherence and sustainability (Fleming et al, 2016).

Recommendation for Practice: Multimodal Pain Management as part of a Cardiac ERAS protocol may be implemented at the community hospital. Anesthesia providers must be knowledgeable regarding literature and evidenced based interventions. The next phase will include further provider survey to establish specific interventions that can be implemented as part of a cardiac ERAS protocol at the facility.

Community Providers Disaster Preparedness

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Introduction: Nurse leaders are constantly on the front lines when there are disasters and there is a need for patient care. Healthcare graduate nursing students, specifically nurse anesthesia students, lack training in disaster preparedness. The aim of this literature review is to examine community providers disaster preparedness and explore the common themes for training and tools in disaster response.

Methods: The literature review was conducted through PubMed, CINAHL, U.S. National Library of Medicine-National Institutes of Health, and Google Scholar. The search contained the following key words and phrases: “disaster preparedness,” “disaster relief,” “training,” “program for healthcare workers,” “medical students,” and “nursing students.” The articles were categorized according to the evidence pyramid. The search yielded 507 articles and included randomized controlled trials, non-randomized controlled trials, semi-structured interviews, expert opinions, cohort/longitudinal studies, systematic reviews of evidence-based practice guidelines, and qualitative studies. Ultimately, 15 of those articles were included in the literature review.

Analysis of the Evidence: Evidence supports several methods for effective disaster preparedness training programs. Recurring themes include video-based education-such as virtual simulation, lectures, real-life scenarios, and online training particularly from international organizations (eg, American Red Cross, Center for Disease Control). Psychological first-aid training has shown beneficial effects in disaster preparedness by not only increasing self-efficacy with emotional self-awareness but also when caring for patients undergoing traumatic situations. Disaster preparedness training include both clinical and nonclinical components across a spectrum of emergencies.

Recommendation for Practice: Currently, a “gold standard” method does not exist to train community providers in disaster preparedness. Evidence reported healthcare providers who have undergone training preferred an online format in addition to a “hands-on” or simulation component. Both formats have been found effective. Further studies need to be conducted for best practice not only for community healthcare providers but also for graduate healthcare students, such as nurse anesthesia students.

Comparing Video Laryngoscopy and Direct Laryngoscopy for Improved Patient Outcomes

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Introduction: Instrumentation and establishment of a secure airway may be performed thousands of times throughout an anesthesia provider's career. Potential complications such as delayed time to intubation (TTI) or oropharyngeal trauma can lead to patient injury, increased hospital length of stay, and increased cost for hospital systems.

Methods: The PICO question was: "In adults requiring intubation (P), does the use of Video Laryngoscopy (I) compared to Direct Laryngoscopy (C) improve patient outcomes (O)?" The search for evidence using PubMed, CINAHL, and Embase yielded 423 potential sources with ten studies (6 meta-analyses, 4 randomized control trials) matching inclusion criteria. The sources consisted of human subjects greater than 18 years of age requiring endotracheal intubation (10,700 participants). Pre-hospital intubations, emergent intubations as performed during a cardiac arrest, or non-oral intubations were excluded. Each source consisted of a control group utilizing DL and an intervention group utilizing a form of video laryngoscopy.

Analysis of the Evidence: The evidence comparing video laryngoscopy to DL evaluated multiple patient outcomes including level of glottic view, first time intubation success rate, and esophageal intubation and airway trauma. Video laryngoscopy consistently demonstrated an improved glottic view, a decreased time to obtain the glottic view, and a decreased TTI when compared to DL. Video laryngoscopy was also associated with fewer esophageal intubations and a decreased risk for oropharyngeal injury. The improved patient outcomes with the use of video laryngoscopy will not only benefit the patients by improving safety and satisfaction but will also have a positive impact on the healthcare system by reducing complications.

Recommendation for Practice: The findings of this review support the use of video laryngoscopy over DL for anticipated difficult airway situations rather than to salvage a failed DL. Video laryngoscopy improves patient safety and satisfaction, decreases the risk of complications, and ultimately leads to a decreased cost to the healthcare system. Results were independent of experience level of provider. Findings from this evidence-based review also identified areas of improvement for future research, such as standardizing variables and appropriately randomizing and blinding participants from which more concrete conclusions can be drawn.

Corneal Abrasions: Improving Endoscopy Nurse Confidence

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Introduction: Corneal abrasions (CAs) are the leading ocular complication in the perioperative period. Patients experience pain, blurry vision, photophobia, vision loss, and permanent scarring. Education is lacking for endoscopy nurses regarding CAs in endoscopic patients. The purpose of this project is to improve satisfaction and outcomes by educating endoscopy nurses to improve their confidence regarding CAs.

Methods: PICOT question: "For the healthcare providers working in the endoscopy suite at University of Cincinnati Medical Center, will the education program on prevention, detection, and treatment of corneal abrasions compared to their current knowledge improve provider confidence in prevention, detection and treatment of corneal abrasions that occur in patients receiving moderate and deep sedation immediately after the education session?" An extensive review of the literature was performed using the databases PubMed, CINAHL, and EMBASE with keywords "anesthesia," "corneal abrasion," and "education." A total of 21 articles were reviewed. Types of articles included randomized control trials, qualitative studies, expert opinions, systematic reviews, and clinical practice guidelines.

Analysis of the Evidence: CAs are the leading ocular complication in the perioperative patient resulting in increased anxiety, delayed discharge, and low patient satisfaction. A knowledge gap currently exists with endoscopy nurses regarding prevention, recognition, and treatment. Evidence shows a multimodal educational program involving an in-person presentation, handout, and open discussion period can increase participant knowledge, satisfaction, and use of the educational material. Performing a multimodal educational program on CA prevention, recognition, and treatment could improve provider confidence regarding CAs leading to increased patient satisfaction and outcomes.

Recommendation for Practice: All participants who attended the educational session completed a post-education survey. A six-point Likert scale was used with a numerical value assigned to each of the six points. Mean scores were calculated for each question with a positive mean score showing participants felt the information was relevant or had a high confidence using the education material. An increase in provider confidence was shown post-education when compared to pre-education. These data indicated the use of a multimodal educational session improved endoscopy nurse confidence regarding prevention, recognition, and treatment of corneal abrasions.

Could Vitamin C Be the New ERAS Appointee? Perioperative Administration of Vitamin C Is Effective in Reducing Post-Operative Pain and Opioid Consumption

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Introduction: There exists a delicate balance between post-op pain control and recovery. Opioids are the most commonly used agents to control post-op pain despite their potential for adverse effects. Vitamin C, an anti-inflammatory and antioxidant agent that contributes to neuromodulation, potentially offers up an efficient anesthesia adjunct that reduces perioperative pain and opioid use without a price.

Methods: A literature search was conducted utilizing PubMed, Embase, and Google Scholar with keywords*: postoperative, perioperative, preoperative, analgesia, pain, postsurgical, vitamin C, ascorbic acid,* and *ascorbate*. A total of 39 articles published after 2009 were screened for their titles. The remaining articles were screened for relevance to the PICO question: "In Surgical Patients, Does Perioperative Vitamin C Supplementation Compared to Non-supplementation Cause a Reduction In Post-Operative Analgesia And Opioid Use?" A total of 7 articles (5 randomized control trials, 2 literature reviews) were further explored.

Analysis of the Evidence: Each controlled trial included in the review provided statistically significant results exhibiting a reduction in pain or opioid consumption in the adult post-operative patient after either preoperative, intra-operative, or postoperative administration of vitamin C. Specifically, vitamin C ranging from 0.5 - 3 g/day has been shown to reduce pain in a variety of clinical settings including reduced morphine consumption post-laparoscopic abdominal surgery, reduced pain at 2 and 6 weeks post-ankle or foot surgery, and comparative post-op pain reduction to NSAID after dental surgery. Overall, vitamin C's analgesic benefits have been proven effective in a variety of surgeries settings.

Recommendation for Practice: Vitamin C decreases post-operative opioid consumption and thus potentially diminishes the deleterious side effects of opioids. Adverse effects related to doses given in the perioperative period have not been observed. For the aforementioned reasons, vitamin C has potential to be a contender in the opioid-sparing movement of anesthesia and pain management. Vitamin C therefore should be explored for incorporation into ERAS and opioid-free anesthesia protocols. Widespread research and education on how vitamin C is able to execute its analgesic effects without drug interactions or harm to patients can be explored for maximal benefit to the post-surgical patient.

Decreasing Postoperative Opioid Consumption in the Postcesarean Patient

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Introduction: Multimodal analgesia is increasingly utilized across medical specialties and recommended by the American Association of Nurse Anesthetists and the Society for Obstetric Anesthesia and Perinatology in care of the parturient. This quality improvement (QI) project evaluated a systematic postcesarean multimodal order set developed by an interdisciplinary team at a community hospital.

Methods: The purpose of this QI project was to determine, in cesarean deliveries, how does a standardized multimodal order set compare to current cesarean analgesic management on postoperative analgesia during hospital admission? A systematic review was performed through PubMed, CINAHL, and ClinicalTrials.gov for peer-reviewed articles. A retrospective review of electronic medical records following cesarean delivery was initiated to allow for pain management comparison. The primary outcome examined postoperative opioid consumption during admission. Secondary outcomes include pain score, acetaminophen, and nonsteroidal anti-inflammatory consumption, and the number of opioid pills and morphine milligram equivalents prescribed upon discharge.

Analysis of the Evidence: A total of 139 records met the inclusion criteria for comparison. The mean opioid morphine milligram equivalents for the first 24 hours was decreased by 54% and by 44% for the first 48 hours postcesarean delivery. A reduction in mean pain score for all measured periods within the first 12 hours was observed, and the first 48 hours pain score reduced by 50%. Administration of acetaminophen and nonsteroidal anti-inflammatory increased by 153% and 12%, respectively. Discharge opioid prescription tablets and morphine milligram equivalents were reduced by 29%. Obstetrician opioid-acetaminophen combination prescription writing reduced to opioid only prescription by up to 92%.

Recommendation for Practice: A standardized, multimodal, postpartum order set as advocated by the American Association of Nurse Anesthetists and Society for Obstetric Anesthesia and Perinatology is recommended in reducing opioid consumption in the post-cesarean patient population. With an increase in acetaminophen and nonsteroidal anti-inflammatory use, a reduction in opioid consumption in the hospital was followed by improved pain scores and fewer discharge opioid-acetaminophen prescriptions in the new parturient. Integral to the successful execution of a standardized multimodal order set is the preliminary involvement of an interdisciplinary team grounded in the health systems quad aim principles.

Determination of the Best Weight-Based Dose of Perioperative Methadone to Minimize Postoperative Opioid Use in Adult Surgical Patients

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Introduction: Methadone agonizes the opioid receptor while also antagonizing the *N*-methyl-D-aspartate receptor. An advantage of methadone is not only its ability to provide analgesia, but also its ability to attenuate tolerance to opioids and hyperalgesia. At smaller doses methadone acts as a short-acting opioid, necessitating the need to determine a minimum effective dose.
Methods: A comprehensive literature search was conducted through the Florida International University library using CINAHL, MedLine, Embase, and the Cochrane Library electronic databases. The purpose of the search was to answer the clinical question: "In adult surgical patients (P), what is the most effective weight-based dose of intraoperative methadone (I), to decrease opioid use (O), postoperatively (T)?" A combination of keywords and Boolean operators was used including *methadone, opioid, morphine, dilaudid, fentanyl, preoperative, perioperative, intraoperative,* and *operative*. Twenty-six full-text articles were assessed for eligibility, and only those addressing the clinical question and meeting inclusion criteria were selected for review.
Analysis of the Evidence: Eight articles pertaining to the PICOT question were included in the final analysis: Chui and Gin (1992), Gottschalk et al (2011), Komen et al (2019), Machado et al (2018), Moro et al (2019), Murphy et al (2015), Murphy et al (2017), and Russell et al (2013). Two studies showed no difference in postoperative opioid use between groups receiving methadone 0.1 mg/kg and short-acting opioid controls. When compared to controls, seven studies showed those receiving methadone in the range of 0.15 mg/kg – 0.3 mg/kg had a significant decrease in the use of opioids from admission in the post anesthesia care unit, at 48- and 72-hours postoperatively, and up to 30 days post-procedure.
Recommendation for Practice: Nurse anesthetists are uniquely positioned to incorporate alternative medications during the intraoperative period to decrease patients' postoperative exposure to opioids. After a review of the literature it was determined that a perioperative dose of 0.1 mg/kg of methadone showed no advantage in decreasing postoperative opioid use compared to the administration short-acting opioids. The best perioperative dose of methadone to decrease postoperative opioid use in adult surgical patients ranges from 0.15 mg/kg to 0.3 mg/kg. Further research is needed to determine the ideal dose range for minimal, moderate, and maximally stimulating surgical procedures to further guide anesthetic technique.

Development and Evaluation of an Online, Evidence-Based Pediatric Clinical Preparedness Training Module for Student Registered Nurse Anesthetists

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Introduction: Pediatric anesthesia varies greatly from that of the adult. The purpose of this project was to introduce an online module specific to pediatric induction, emergence, and crisis scenarios. The primary aim was to improve confidence of student registered nurse anesthetists (SRNAs) prior to pediatric clinical rotations through use of this learning modality. The secondary aim was to assess SRNA satisfaction with the learning modality.

Literature Review: Fear of inadequacy and high levels of anxiety in students with insufficient clinical experience negatively affect learning outcomes. The ability to provide an educational outlet for deliberate practice and augmentation of technical and non-technical skills without fear of being penalized or causing harm reduces medical errors and improves patient safety.

Developmental Design or Methodology: An online interactive module was created with areas of emphasis related to pediatric anesthesia including: mask induction and emergence; airway obstruction; laryngospasm; and emergence delirium. Anonymous pre- and post-intervention surveys were administered using a 5-point Likert scale to rate confidence. SRNA confidence was evaluated by comparing pre/post data using the Fisher's exact test. A P value of <0.05 was considered statistically significant.

Proof of Concept/Results: N = 23. SRNAs revealed an educational gap with 70% stating they felt "not at all" or "only slightly" prepared for their pediatric rotation. No SRNAs ranked their pre-intervention confidence as "confident" or "very confident" in performing a pediatric mask induction or emergence. All areas of emphasis were found to have statistically significant increases in confidence with P values < 0.01. One hundred percent of SRNAs indicated they would use the online reference prior to starting their pediatric rotation.

Discussions and Conclusions: This project has the potential to serve as an exemplar for other clinical settings. Compared to simulation, interactive modules are cost effective, decrease faculty workload and can be reviewed by learners at any time. Didactic education alone does not enhance student confidence prior to engaging in skill-based clinical specialty areas such as pediatrics. Online interactive modules can be used to close the gap between didactic education and real-life clinical experiences.

Funding Sources: A monetary grant for this Blended Learning proposal was approved by the Mayo Clinic School of Health Sciences (MCSHS) Executive Committee. Funding endorsed collaboration with an outside vendor for development of an interactive module.

Difficult Airway Response Team: Managing Difficult Airways as Part of the Emergency Response System

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Introduction: Emergency response teams along with their corresponding algorithms for treating acute deteriorations have become ubiquitous in healthcare settings. The incidence of intubating events warrants the incorporation of processes that address difficult airways (DA). The purpose of DART is to provide a systematic process to prevent adverse events and facilitate management of difficult airways.

Methods: The PICOT question being studied: "In patients with difficult airways, outside of the perioperative area and in code response situations (P), will a difficult airway response team (DART) (I) compared to a code response team without a difficult airway management protocol (C) decrease adverse outcomes related to ineffective airway management. (O)?" Databases searched included: Proquest, Cumulative Index of Nursing and Allied Health Literature, Excerpta Medica dataBASE, and PubMed. Keywords used for searches included: *difficult airway, airway management, Difficult Airway Response Team, DART, emergency response team, airway emergency, anesthesia,* and *CRNA*. Selected studies were high-quality, quality improvement retrospective studies published in peer-reviewed journals between 2009 – 2020.

Analysis of the Evidence: Results included decreased morbidity and adverse events at all institutions, with a decrease in anoxic brain injuries, death, and sentinel events. It was also found that a systematic approach to mobilization of resources with role clarity resulted in expeditious prompt care of DA emergencies. Also noted was determining a standard of care for emergency surgical airways (ESA) using the bougie-assisted cricothyrotomy technique (BACT) for emergency surgical airways. Finally, education on and identification of DAs were essential components in escalating emergency airway events, which lead to development of education, operations, and other safety measures.

Recommendation for Practice: Mismanagement of difficult airways can result in life-threatening complications, or worse. Anoxic brain injuries and death related to untimely mobilization of vital resources during these events are often preventable situations, and given the pervasiveness of airway-related litigation, developing programs to address difficult airway responsiveness is a natural, and likely anticipated, addition to emergency response systems. The DART is a systematic multidisciplinary team-based approach to non-operating room airway emergency management that has resulted in positive and improved patient outcomes. Certified Registered Nurse Anesthetists are perfectly positioned to lead DART initiatives.

Do Marijuana Smokers Compared to Non-marijuana Smokers Require an Increased Dose of Sedation for Endoscopic Procedures

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Introduction: Cannabis use has undergone a drastic rise. Tetrahydrocannabiol, the main component of cannabis, interacts with mechanisms of pharmacologic action and may alter dose requirements for sedation. This review examines current literature to determine if frequent marijuana smokers undergoing endoscopic procedures compared to non-marijuana smokers require an increased amount of propofol for sedation.

Methods: A comprehensive search of the literature databases PubMed, Embase, and CINAHL were reviewed for scholarly publications from 2014 to present to answer the PICO question: "In endoscopy patients (P), do patients who regularly use marijuana (I) compared to non-marijuana using patients (C) require an increased amount of propofol for sedation (O) during an endoscopy procedure (T)?" Keywords used were cannabis, marijuana, endoscopy, endoscopic surgery, tetrahydrocannabiol, THC, and propofol. Exclusion criteria were nonhuman, cannabis use not related to procedural sedation and lack of relevance. Eight significant studies were included in the final analysis including 4 retrospective studies, 1 case report, and 3 literature reviews.

Analysis of the Evidence: The literature shows an increase in sedation medication requirements in marijuana users with 6 studies reporting this. A study by Twardowski et al, involving 250 cases randomly chosen from 1158 cases found that marijuana users had a 220.5% greater propofol requirement compared with nonusers. However, one retrospective chart review reported that cannabis users had a more difficult procedure, prolonged procedure time, utilized more outpatient benzodiazepines, but there was no difference found regarding sedation requirements between cannabis users and nonusers.

Recommendation for Practice: Future studies addressing the interaction between cannabis and sedation medications are required. Based on the evidence displayed by the studies, cannabis users have the potential to require greater amounts of sedation for endoscopic procedures. In turn, the increase in sedation medications can be accompanied by an increased incidence of adverse events, side effects, and increased need for reversal agents. Thus, it is important for the anesthesia provider to assess cannabis use prior to endoscopy procedures and prepare for possible increased sedation requirements.

Does the Use of an ERAS Protocol Compared to Traditional Anesthesia Care Lead to Improved Post-Operative Patient Outcomes in the Cardio-Thoracic Patient Population?

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Introduction: Enhanced Recovery After Surgery (ERAS) protocols have shown to improve post-operative patient outcomes in various surgeries by helping maintain preoperative organ function and reducing the surgical stress response. This review of the literature evaluates the post-operative outcomes of cardio-thoracic patients whose care was guided by the implementation of an ERAS protocol compared to patients receiving traditional anesthesia care.
Methods: Three research databases were searched: PubMed, Embase, and CINAHL. Keywords used in combination were: *ERAS, enhanced recovery after surgery, cardiac, cardio-thoracic surgery, post-operative outcomes, post-operative morbidity*, and *recovery*. Inclusion criteria were peer-reviewed research articles published from 2015 – present. Exclusion criteria included thoracic surgery, traditional anesthesia care, and any studies > 5 years old. Five studies were included in this review: 1 randomized controlled trial, 2 prospective studies, and 2 retrospective analyses. Data from these studies were abstracted and synthesized.
Analysis of the Evidence: Included studies report that the use of an ERAS protocol in cardio-thoracic surgery leads to earlier return to preoperative physiologic functioning when compared to traditional anesthesia care. Included studies also state that the use of an ERAS protocol leads to a decreased length of ICU stay, decreased length of hospital stay, and fewer postoperative complications. Additional beneficial outcomes included reduced opioid use and fewer GI complications during the recovery process in patients 18-70 years of age with varying ethnicities undergoing elective cardio-thoracic surgery.
Recommendation for Practice: Collectively, this review suggests that the use of an ERAS protocol in cardio-thoracic surgery may be valuable for producing improved patient outcomes if a multidisciplinary approach is taken throughout the perioperative process. Future research should investigate the impact of implementation of an ERAS protocol for cardio-thoracic surgical patients on hospital readmission rates and 30-day mortality rates. This knowledge would help to further refine care delivery in this patient population not only to improve patient outcomes, but also to save on costs of care.

Early Implementation of Fascia Iliaca Compartment Block for the Treatment of Hip Fracture Pain in the Prehospital and Emergency Department Setting

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Introduction: Hip fracture accounts for 300,000 hospitalizations annually, 40% are undertreated for pain, and 56% experience severe pain. This systematic review examined the efficacy of peripheral nerve blocks to make practice recommendations in the prehospital and emergency department settings for hip fracture analgesia.

Methods: This evidence-based practice project was guided by the PICO question: "In patients with acute hip fractures does the early implementation of peripheral nerve block techniques (prehospital, emergency department) compared to traditional systemic opioid pain management produce better analgesia and clinical outcomes?" A CINAHL, MEDLINE, and PubMed database search yielded 1,066 patients comprising 11 studies inclusive of 9 randomized controlled trials (RCT) and 2 pilot feasibility studies. Inclusion criteria were studies published in English from 2005 to present, fascia iliaca compartment block, femoral nerve block, 3-in-1 block, and systemic opioids. The evidence was evaluated utilizing the Johns Hopkins Appraisal Tool.

Analysis of the Evidence: Nine randomized controlled trials and two pilot studies of hip fracture patients compared the analgesia level attained after peripheral nerve blocks (PNB) to that of systemic opioids. Peripheral nerve blocks provided superior analgesia compared to opioids in 9 studies. Fascia iliaca compartment block (FICB) reduced median pain scores by 50%, and opioid use by 22% in one study. Seven studies noted that PNB reduced opioid requirements (rescue analgesia). In one study rescue analgesia requirements were 41% lower in the PNB cohort compared to the opioid cohort. Two studies concluded that FICB performed in the prehospital setting produced effective analgesia with no adverse effects.

Recommendation for Practice: There are 517 hip fractures for every 100,000 people annually, with patients over 65 accounting for 86% of cases. Comorbidities associated with advanced age coupled with adverse effects of opioids make severe hip fracture pain challenging to treat. Fascia iliaca compartment block (FICB) can be effectively performed in the prehospital setting to produce superior analgesia and spare the unwanted effects of opioids. The recommended technique for treating a hip fracture in the prehospital setting is the FICB using the "two-pop" method followed by 30 mL of 0.5% bupivacaine. Implementation of a prehospital FICB hip fracture algorithm can produce effective analgesia and reduce opioid requirements.

Educating Certified Registered Nurse Anesthetists on Parental Presence During the Induction of Anesthesia

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Introduction: Many conclusions exist on how to best allay preanesthetic anxiety in children. Parental presence during the induction of anesthesia (PPIA) is a non-pharmacological and family- centered option, but implementation is often met with resistance. An academic children's hospital was found to have inconsistencies with offering PPIA. An educational intervention is a potential solution to this issue.

Methods: A literature search was conducted to answer the question: "Does PPIA effectively decrease children's anxiety levels leading up to and during the induction of anesthesia compared to those who were not offered PPIA?" The search used PubMed and Scopus databases. Inclusion criteria were English language, human subjects, and published between 2001-2018. Nine articles met inclusion criteria and related to the PICOT: 5 randomized controlled trials, 3 systematic reviews, and one quality improvement project. An educational intervention was then implemented at an academic children's hospital. IRB quality improvement status was approved. CRNAs completed a pre-test survey about PPIA. The educational module focused on evidence-based practice and hospital PPIA policy. A post-test was conducted and analyzed.

Analysis of the Evidence: The literature reviewed noted that PPIA alone is not always as effective as other interventions; however, PPIA does offer benefits when combined with behavioral preparation programs and is a safe, family- centered, and non-pharmacological option. Presurvey data highlighted a knowledge gap related to EBP recommendations, the presence of a protocol, and inconsistencies among PPIA use. Following education, CRNAs indicated that they understood EBP recommendations and were more willing to consider PPIA. Qualitative feedback was positive, although a barrier was stated to be resistance due to provider preference. Further education to more providers is necessary to improve consistency with PPIA use.

Recommendation for Practice: Education regarding current literature is important in addressing the knowledge gap surrounding PPIA at an academic children's hospital in an effort to encourage its use in practice. PPIA is most effective with a multimodal approach, such as utilizing behavioral preparation programs. PPIA allows for comprehensive healthcare, as it is safe and family-centered. The educational intervention brought awareness to the lack of knowledge regarding the PPIA protocol. Communication with interprofessional collaboration is key to implementing the PPIA protocol and lessening the variation in care among anesthesia providers, leading to an improved perioperative period for both the child and family.

Educating Second Year Student Registered Nurse Anesthetists About Music Therapy During the Preoperative, Intraoperative, and Postoperative Time Period

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Introduction: Surgery provokes anxiety in 70.3% of patients; and moderate to severe pain in thirty percent (Jawaid et al, 2007). Poorly managed pain and anxiety is known to have a detrimental impact on patient outcomes. The purpose of this project was to educate graduate students about the benefits of music therapy, as well as offer implementation strategies to incorporate in the clinical environment.

Methods: "In second-year registered nurse anesthesia students, will a 50-minute educational lecture about music therapy, increase music therapy test scores when compared to the music therapy test scores taken prior to the informative lecture?" A search was performed using PubMed, CINHAL, and EBSCOhost for recent, full-text, peer-reviewed, original, scholarly articles. Search terms included anxiety, pain, music, genre, music therapy, preoperative, intraoperative, and postoperative, aided in the database search. Forty-three articles are included in the review of literature, six systematic reviews, twenty-four randomized controlled trials, two clinical practice guidelines, and five retrospective studies and six prospective.

Analysis of the Evidence: The literature supports the concept that music therapy can decrease pain and anxiety during the preoperative, intraoperative, and postoperative time period. When implementing music therapy for anxiety treatment, literature uses the State-Trait Anxiety Inventory (STAI) survey. A study comparing midazolam and music therapy to identify which therapy was superior in reducing preoperative anxiety measuring STAI scores showed STAI scores decreased more in the music therapy group than the midazolam group (Bringman et al, 2009). Music therapy is proven to be beneficial during induction and emergence, assisting in stabilizing vital signs (Graff, 2017).

Recommendation for Practice: With implementing music therapy, the genres to include are classical art, smooth jazz, country, binaural beats, and gospel, being sure to avoid heavy metal and pop (Ae-Na Choi et al, 2008). The tempo should range 60-80 BPM with a range of 1-30 hertz (Graff, 2017). Preoperatively, music should be played for a minimum of 15 minutes (Ae-Na Choi et al, 2008). When used intraoperatively, headphones should be placed on the patient and volume established before anesthesia is administered. Intraoperative music should be utilized throughout the entire procedure (Ayoub et al, 2005). Postoperatively, music should be played for no less than 30 minutes (Ebneshahidi & Mohseni, 2008).

Effect of Dexmedetomidine on Incidence of Postoperative Delirium in Older Cardiac Surgery Patients

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Introduction: Older patients undergoing on-pump cardiac surgery are particularly vulnerable to postoperative delirium, a serious postoperative complication associated with significant institutional and human costs. Perioperative sedation with dexmedetomidine has been touted as one possible way to reduce the incidence and mitigate the severity of postoperative delirium following on-pump procedures.

Methods: This review examines the effectiveness of dexmedetomidine versus other sedatives on the incidence of postoperative delirium in older cardiac surgery patients. Five electronic databases, including Pubmed, Scopus, Embase, the Cochrane CENTRAL Register of Controlled Trials, and ProQuest were searched using relevant keywords and synonyms. Ninety-six records were identified and evaluated for relevance and quality. After removal of duplicates and studies that did not meet inclusion criteria, data from six randomized, controlled trials were pooled for statistical meta-analysis. Effect sizes were expressed as either odds ratios (for dichotomous data) and weighted (or standardized) final post-intervention mean differences (for continuous data). A 95% confidence interval was calculated.

Analysis of the Evidence: After statistical analysis, the incidence of delirium was decreased by a magnitude of 1.42 (95% CI= 0.41-1.15; $P = 0.156$) when using dexmedetomidine. There was also a 1.46 day reduction in the duration of delirium (95% CI= -0.45, -2.46; $P = 0.004$), a 34.15 hour reduction in Intensive Care Unit (ICU) length of stay (LOS) (95% CI= 28.43, -96.74; $P = 0.29$), a 3.23 day reduction in hospital LOS (95% CI= -0.22, -6.24; $P = 0.03$), and a 21.21 hour reduction in time to extubation (95% CI= 0.08, -42.5; $P = 0.05$).

Recommendation for Practice: After review of the meta analysis, although there was a decrease in the incidence of delirium with dexmedetomidine, it was not statistically relevant ($P = 0.156$). The use of dexmedetomidine is still warranted and recommended due to the reduction in the duration of delirium ($P = 0.004$), length of hospital LOS ($P = 0.03$), and time to extubation ($P = 0.05$). Based on these findings, the authors recommend the use of dexmedetomidine as a perioperative sedative in older cardiac surgery patients.

Efficacy of Intravenous Versus Oral Acetaminophen

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Introduction: Surgery is often accompanied by acute pain. Opioids are commonly used to treat pain but are associated with side effects such as nausea/vomiting, respiratory depression, and ileus. APAP has been shown to decrease opioid use and associated side effects. An exhaustive literature review was conducted to determine efficacy differences between intravenous (IV) and oral (PO) APAP.

Methods: The literature search was conducted to answer the following research question: "In adult patients undergoing general anesthesia, does the use of IV acetaminophen compared to PO acetaminophen decrease total opioid consumption and associated side effects, postoperative pain scores, and length of stay?" MedlineOvid, EMBASE, and PubMed were used to find relevant literature. Medical Subject Headings and keywords used included: "acetaminophen," OR "Tylenol," OR "paracetamol," OR "APAP," AND "intravenous drug administration," OR "IV," AND "oral drug administration," OR "by mouth," OR "pill," OR "PO." Thirteen articles were determined to be relevant to the search, including six randomized control trials and seven retrospective analyses.

Analysis of the Evidence: Evaluated outcomes included total opioid consumption, opioid-associated side effects including nausea/vomiting, respiratory depression, and constipation, postoperative pain scores, and length of stay. Five studies were affiliated with Mallinckrodt Pharmaceuticals, the manufacturer of IV APAP. In the research not funded by Mallinckrodt, there were no differences in the aforementioned outcomes when comparing IV and PO APAP formulations, with one exception. In patients undergoing coronary artery bypass, there was a statistically significant decrease in opioid consumption in patients who received IV APAP (P = .016). In this study there was no difference in rates of nausea/vomiting or pain scores.

Recommendation for Practice: In the independently funded research studies, the PO APAP formulation was non-inferior to the IV APAP formulation. Due to the decreased cost to the patient and hospital, the ideal first method of administration is the PO formulation when possible. If APAP is not contraindicated, and the patient is able to consume medications by mouth, 1,000 mg PO APAP should be administered 30 to 45 minutes prior to induction. Every six hours, the patient should be re-evaluated and APAP re-dosed according to their ability to consume medications. In the future, larger randomized control trials with uniform outcome selection and standardized measurement methods should be conducted.

Efficacy of Ultrasonography for Identifying Tracheal versus Bronchial Intubation in Comparison to Traditional Methods

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Introduction: Current methods of endotracheal tube placement verification may fail to detect endobronchial intubation. Undetected endotracheal tube malposition may increase patients' comorbidities and healthcare related complications. Ultrasound of the lung can be an advantageous tool in the detection of tracheal tube placement and recognition of malposition.
Methods: The literature presented in this review was a result of a comprehensive electronic search of the PubMed and CINAHL databases through the Albany Medical College's Schaffer Library. The search was done between May and July of 2019. Results were included if they were published within the past 10 years, were written in English, used human subjects and evaluated endobronchial versus endotracheal intubation with use of ultrasound techniques. Four studies were reviewed.
Analysis of the Evidence: All four studies show ultrasonography to have a higher accuracy compared to some traditional methods in detecting endotracheal or endobronchial tube placement. Chest radiography was the only method that had a higher specificity and sensitivity to detecting tube misplacement. However, the studies showed that ultrasound was faster than radiography in the time used to detect malposition. These findings were true for both adult and pediatric populations. A pediatric study also showed that tube depth should be calculated based on height and not gender
Recommendation for Practice: Portable ultrasonography is more reliable than some traditional methods for its accuracy and time sensitivity in determining endotracheal tube placement. Although not as accurate as chest radiography, portable ultrasound has a time advantage over chest radiography in verifying tube placement.

Enhanced Recovery After Surgery (ERAS) Mobile Application

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Introduction: The existence of many variables of Enhanced Recovery After Surgery (ERAS) protocols can be overwhelming and cumbersome for the in-room Certified Registered Nurse Anesthetist. Strict adherence can therefore be challenging and potentially lead to adverse patient outcomes. The purpose of the project is to determine if a single mobile application platform could improve adherence of ERAS protocols by CRNAs.

Literature Review: Proportions of patients with symptoms delaying discharge and 30 day morbidity significantly reduced with higher levels of ERAS adherence. The greater the adherence to ERAS protocol, the shorter the hospital length of stay, and decrease in significant morbidities. Smartphones and mobile applications are increasingly being used in clinical settings.

Theoretical Framework: The concept of a single platform mobile application is based on a literature review that shows strict adherence to ERAS protocols results in improvement of patient care during the perioperative phase.

Methodology: Using the Johns Hopkins Nursing Evidence Based Practice Model, the ERAS mobile application platform is a level V project that is based on experimental and non-research evidence used for quality improvement at Vanderbilt University Medical Center (VUMC).

Data Collection and Methods: An online survey to assess the current practices and preferences of VUMC CRNAs in obtaining ERAS protocol information was created through REDCap. VUMC's ERAS committee currently collects statistical data on ERAS adherence rates in the form of reports that are broken down by surgical service. Staff will utilize this report to determine which service line is in greatest need of ERAS adherence improvement. Additionally, staffing practices at VUMC provides for consistency of anesthesia providers within surgical services. The authors will also be able to identify a pilot group of CRNAs to propose to the ERAS committee for testing the mobile application.

Results and Data Analysis: A total of 44 CRNAs responded to REDCap survey with nearly 40% stating usage of ERAS on 25% to 50% of cases. Eighty-four percent of the CRNAs state using an in-room computer to access protocols, while only 25% use smartphone. Eighty-nine percent of respondents perceive the cumbersome nature of current access to protocols a barrier to adherence. Sixty-seven percent of CRNAs positively agreed that if an interactive mobile application existed, it would be preferred over current platforms.

Discussion and Conclusions: There is a high prevalence of use of mobile computing devices and smartphones among healthcare providers in general, both in personal use and clinical practice. Strict adherence to ERAS protocol improves patient outcomes and decreases morbidity and length of stay. Perioperative ERAS has become popular along surgical service lines and the streamlined mobile application optimizes for patient care.

Evaluating the Implementation of Madigan Army Medical Center's Opioid Sparing Anesthetic Pathway

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Introduction: Currently there is no evidence identifying the successful implementation of the opioid sparing pathway at Madigan Army Medical Center (MAMC). Our study aims to identify the utilization of both opioids and non-opioid analgesics before and after OSAP implementation and identify barriers to implementation based on a survey of anesthesia providers.

Methods: Assessing MAMC's anesthesia providers (population) use of the MAMC opioid-sparing anesthetic pathway (intervention) compared to an opioid-centric anesthesia (comparison) effect on total opioid utilization, measured in oral morphine equivalents, and utilization of drugs in the opioid-sparing pathway (Outcome). The PICO question was developed from the initial evidence-based question: does the use of the MAMC opioid-sparing pathway by Madigan Anesthesia providers decrease perioperative opioid consumption? We did an umbrella review of PubMed, CINAHL, Joanna Briggs Institute, Cochrane Systematic Reviews, and TRIP Medical database, looking for systematic reviews and meta-analyses.

Analysis of the Evidence: Our initial analysis of the evidence was based on reperforming the umbrella review previously completed for the successful implementation of the OSAP. The details of this review have been previously published by Mark et al in JBI, revealing 9 analgesic agents that ultimately make up the OSAP. The results of our analysis did not produce any additional articles that met the inclusion criteria in the umbrella review process. Therefore, it was determined that there continues to be adequate evidence to support the continued implementation of this OSAP, and to identify and remove any barriers that inhibit the success of its implementation.

Recommendation for Practice: The initial analysis of opioid administration by anesthesia providers within MAMC identified no significant changes in the overall amount of opioids administered based off morphine equivalents. There was a general trend of increased administration of hydromorphone. Survey results suggested an increase in the use of non-opioid analgesics. Staff appear to be in a "moving" stage in respect to their acceptance of non-opioid analgesics. However, staff appear to be in a "unfreezing" in regards to their opioid usage. Barriers identified include a fear of further reduction in opioid usage, difficult access to OSAP information, and difficulty with access to OSAP medications intraoperatively.

Expansion of Nurse Anesthesia Education and Reduction in the Global Burden of Disease

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Introduction: The purpose of this literature review was to evaluate how expansion of nurse anesthesia education in low- and middle-income countries utilizing the model educational curriculum and standards of practice provided by the International Federation of Nurse Anesthetists (IFNA) can decrease the global burden of disease related to lack of surgical care.
Literature Review: The search for relevant evidence included searching PubMed, CINAHL, and Cochrane Databases from the years 1980-2019. Search terms included "nurse anesthesia", "education", and "global." In addition, practice guidelines and educational guidelines from the IFNA were evaluated during this literature review.
Theoretical Framework: The evidence was appraised by utilizing the methods outlined by Melnyk and Fineout-Overholt, and the CASP critical appraisal tool for qualitative studies helped guide the appraisal of the literature.
Methodology: Studies included describe the issue of lack of access to surgical care or lack of access to safe anesthesia care in regards to the global burden of disease and studies regarding nurse anesthesia education.
Data Collection and Methods: All of the sources were qualitative studies with one study having mainly qualitative design with some quantitative analysis. Every source evaluated in this literature review is classified as Level V evidence by the John's Hopkins Level of Evidence Guide with one article described as high quality, three articles described as good quality, two articles described as low quality, and one article described as poor quality.
Results and Data Analysis: After careful review of the relevant literature, three barriers emerged as common reasons for lack of safe anesthesia care in low and middle income countries. These barriers can be categorized as lack of trained anesthesia personale, problems with healthcare facilities, and educational challenges.
Discussion and Conclusions: Problems with educating anesthesia providers can be broken down into subcategories related to a lack of standardized educational curriculum, no defined practice standards, and a lack of a central credentialing body. A proposed solution to the majority of these barriers to safe anesthesia care would be to utilize the resources developed by IFNA.

Evaluation of Colorectal ERAS Protocol Compliance

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Introduction: A large community hospital designed and implemented a colorectal Enhanced Recovery After Surgery (ERAS) protocol. The next step in this quality improvement project is to evaluate provider protocol adherence. Paper protocol checklists and respective health medical records (EHR) were audited for compliance to ERAS protocol.

Methods: The question of this evaluative quality improvement project is "Can audits of a standardized paper checklist compared to audits of respective perioperative EHR documentation over a 6-month period identify gaps in perioperative staff compliance for colorectal ERAS protocol?" To collect evidence for outcomes of using colorectal ERAS protocol, a systematic review of the literature was conducted. MeSH term "colorectal surgery" and relevant key words/phrases were searched within PubMed and EMBASE, using inclusion criteria within the past 5 years. Twenty articles were selected and evaluated using the Johns Hopkins Nursing Evidence-based Practice Rating Scale. Eighteen articles were graded level III or higher, with 2 level IV articles being guidelines for the colorectal ERAS protocol and analysis of success.

Analysis of the Evidence: Care standardization using evidence-based practice with ERAS protocols reduces length of stay and complications and decreases readmissions and overall costs of care. Due to success of ERAS protocols, the international ERAS society published population-specific guidelines. Implementing ERAS protocols can be challenging, and evaluating consistency and compliance are pivotal for protocol's evolution as part of perioperative culture. Evidence supports relationship between more protocol steps adhered to and better patient outcomes. An evidence-based practice (EBP) standardized audit tool can investigate checklist consistency, compliance, and sustainability of colorectal ERAS protocol at a large community medical center.

Recommendation for Practice: The project used retrospective observational analysis. Standardized colorectal ERAS paper checklist followed each applicable patient through the perioperative process. Ten checklists were randomly selected per month for 6-months yielding 60 paper and respective HER checklists. Paper checklist compliance was 63% and EHR compliance was 72%. The EHR compliance, serving as true compliance, decreased over the 6-month period. Audit analysis identified weakly adhered steps within the protocol. These results illuminate the opportunity for protocol adherence improvements in all phases of care, which can further positively impact outcomes as well as other ERAS protocols within the facility and network.

Evaluation of Multimodal Pain Plan in Patients Following Cesarean Delivery

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Introduction: Cesarean section can lead to opioid addiction from uncontrolled pain. Classic cesarean pain treatment involves neuraxial local anesthetic, opioids, and acetaminophen. To optimize pain management, the American Association of Nurse Anesthetists and Society for Obstetric Anesthesia and Perinatology recommend scheduled oral non-steroidal anti-inflammatory agents and acetaminophen postoperatively.

Methods: "In post-cesarean patients (P) with and without opioid use disorder (OUD), what is the effect of the implementation of an evidence-based multimodal pain management plan (I) on analgesia and opioid administration rates (O) compared with prior non-standardized analgesic management and opioid administration rates (C) within the timeframe of delivery to discharge (T)?" A literature review was conducted in PubMed, after applying MeSH keywords "cesarean section," "multimodal analgesia," and limit within last 5-year publication. After review, 9 articles were selected. Six articles were experimental study/randomized controlled trials or meta-analysis. Two articles were quasi-experimental. One article was non-experimental study. Eight articles were systematic reviews or clinical practice guidelines.

Analysis of the Evidence: For this quality improvement project, articles used Johns Hopkins Nursing Evidence-Based Practice rating scale to find the level of evidence. There were 6 level I articles, 2 level II articles, 1 level III article, and 8 level IV articles. Using the Iowa model, reliability, validity, and applicability were assessed via each article for the chosen topic of research. The University of Cincinnati Health and Sciences library allowed for full text articles to be viewed based on the chosen article abstracts. The articles were analyzed by subject information, analysis, results, and conclusions. This literature review supported a multimodal approach utilizing non-opioids into practice guidelines.

Recommendation for Practice: Evaluation suggests that classic pain management when compared to multimodal pain management is not as successful in decreasing pain. Administration of preoperative and scheduled acetaminophen with scheduled ibuprofen decreased pain scores, total morphine milligram equivalent (MME) opioid consumption, and discharged prescription opioids measured by MME. There are gaps in literature that need to be examined to optimize analgesia. Future recommendations include: increasing the use of TAP blocks, using gabapentinoids, increasing OUD population data, improving provider adherence, examining follow up discharge opioid usage versus the prescribed amount, and measuring patient satisfaction.

Green Anesthesia at the Green U

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Introduction: A primary contributor of increasing green-house gases (GHG) and climate change is solid waste and anesthetic gases. Hospitals in the United States are responsible for 10% of GHG emissions and more than 5.9 million tons of waste with operating rooms producing 20% of that waste.

Methods: Independent electronic databases were used to perform a literature review including PubMed, CINAHL, Medline and Google Scholar. Key words searched included "operating room," "gas," "green," "recycle," "waste," "anesthesia," "plastic," and "hospital." Inclusion criteria included scholarly, peer-reviewed journals, written in English and published from 2010-2020.

Analysis of the Evidence: Anesthesia providers generate as much as 25% of solid waste with up to 60% being recyclable. Evidence from different case studies demonstrate recycling rates ranged from 14.3% to 25% waste as recyclable. An estimated 5% of delivered anesthetic gas is metabolized by the patient, with remaining gases vented into the atmosphere by the scavenging system. Desflurane remains in the air for 10 years and has global warming potential 20 times that of sevoflurane. Utilizing low fresh gas flows (FGF) conserves anesthetics and prevents excess amounts of gases from entering the atmosphere.

Recommendation for Practice: Current recommendations include implementation of a recycling program to separate non-contaminated plastics and paper from hazardous waste to reduce GHG emissions. Development of a recycling education program prevents knowledge barriers and improves recycling rates, resulting in a financial cost benefit. Anesthetic gas recommendations to reduce GHG emissions include; using sevoflurane, avoiding the use of desflurane and nitrous oxide and incorporating regional anesthesia. Utilize low FGF using calcium hydroxide absorbent. For induction, turn off FGF during intubation with vaporizer on, so anesthetic gas remains in circuit. During emergence, keep FGF low until vaporizer completely turned off.

Implementation of an Oxytocin Dosing Protocol in the Third Stage of Labor

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Introduction: It is common practice to administer oxytocin during the third stage of labor as a rapid infusion which can lead to adverse events in parturients. The primary goal of this project was to identify standardized protocols for oxytocin administration in vaginal and cesarean deliveries. A secondary goal was to identify potential differences in quantitative blood loss (QBL) pre and post implementation.

Methods: A comprehensive electronic search of the PubMed, CINAHL, and Cochrane library databases was performed. Inclusion criteria were English language and published between 2009 and 2019. Various oxytocin dosing protocols were examined and graded using established criteria. Two protocols were identified to include vaginal and cesarean deliveries. The Association of Women's Health, Obstetric and Neonatal Nurses protocol was adapted for use in vaginal deliveries and the "Rule of Threes" protocol was adapted for cesarean deliveries. The two protocols were selected for implementation with a small group to ensure there were no unintended risks to the parturients.

Analysis of the Evidence: Four obstetricians agreed to trial the protocols. All departments were educated regarding the dosing protocols prior to implementation. There were 50 parturients (25 pre and 25 post-implementation) in the vaginal delivery group. The mean QBL in the pre-implementation group was 118 ± 37 ml versus 146 ± 30 ml in the post-implementation group. This was not a statistically significant difference (t -1.19, 48 df, p 0.24). There were a total of 36 parturients (18 pre and 18 post-implementation) in the cesarean group. The mean QBL in the pre-implementation group was 442 ± 161 ml versus 418 ± 121 ml in the post implementation group. This was also not statistically significant (t 0.26, 34 df, *P* 0.8).

Recommendation for Practice: There was no difference in the mean QBL for the dosing protocols demonstrating there is no increase in blood loss when using smaller and slower doses of oxytocin. It is hoped this dosing change will result in a decrease in overall adverse events and increase safety for parturients. Possible future analysis should include the impact the dosing regimen change has on overall adverse events in this institution. To increase safety of administration, the protocols can be included in the electronic medical record, pre-programmed in the infusion pump drug library, and standardization of oxytocin syringes and infusion bags prepared by the pharmacy.

Implementation of Transversus Abdominis Plane Block in Bariatric Surgical Patients to Improve Postoperative Surgical Outcomes

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Introduction: Obese patients are plagued by a myriad of comorbidities including obstructive sleep apnea and right-sided heart failure, placing them at great risk for postoperative complications. Transversus abdominis plane block (TAP) has emerged as a beneficial opioid-sparing option in bariatric surgery however sonoanatomy becomes a challenge when BMI is greater than 40.

Methods: This evidence-based project answered the clinical question: In patients undergoing bariatric surgery, does the use of an ultrasound-guided perioperative transversus abdominis plane (USG-TAP) block compared to laparoscopic TAP (lap-TAP) improve postoperative surgical outcomes? The literature search included 3 databases: EMBASE, MEDLINE, and CINAHL, yielding a collective total of 178 citations. Inclusion criteria were studies published in English from 2010 to present, male and female ages 18-65 years, BMI > 30, ASA 2-3, lap-TAP, and USG-TAP. The Johns Hopkins Appraisal Tool was utilized, 28 articles reviewed, and 10 study designs selected inclusive of 4 Randomized Control Trials (RCTs), 3 retrospective studies, and 3 qualitative studies.

Analysis of the Evidence: This systematic review, comprised 1,788 patients, examined the impact of the USG-TAP vs lap-TAP block on postoperative surgical outcomes. All studies found that USG-TAP and lap-TAP blocks reduced opioid requirements, and facilitated early ambulation, resumption of bowel activity, readiness for discharge, and greater patient satisfaction. However, 3 studies reported the lap-TAP as superior when BMI was greater than 40 because sonoanatomy was non-linear, and structures appeared hypoechoic on US due to excess adipose tissue. Two lap-TAP studies acknowledged hematoma and liver puncture as complications albeit rare.

Recommendation for Practice: Bariatric surgery is among the most common performed in the United States, with over 200,000 surgeries performed yearly. The implementation of a Transversus Abdominis Plane block perioperatively is an effective analgesic modality independent of approach. USG-TAP blocks should be performed with a curved array transducer when patients present with BMI 30-40. However, the lap-TAP is non-inferior to its US-guided counterpart, and should be considered the ideal technique in morbidly obese patients with BMI > 40 as it provides optimal visualization. Both TAP block approaches in bariatric surgical patients provide a multimodal approach to pain management and increasing patient's quality of care.

Implementing Strategies and Protocols to Reduce Infection Risks of COVID-19 Among Anesthesia Providers

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Introduction: Healthcare workers have been working on the front lines to save lives for the past several months in response to COVID-19 pandemic. Anesthesia providers in particular are playing a crucial role in managing critically ill patients who require airway management during this global pandemic. The safety of anesthesia providers must be ensured in order to provide care to the increasing number of patients.

Literature Review: The authors conducted a literature review on PPE and strategies to reduce infection among patients who have infectious disease. Database includng PubMed, Embase, CINAHL, Cochrane, and Scopus were used to conduct search.

Theoretical Framework: 1. Correct use of PPE such as doffing and donning is the first step to ensure their safety. 2. Implementing protocol decreases error made.

Methodology: Observational study with integrative literature review

Data Collection and Methods: Case studies, cross-sectional studies, retrospective studies, simulations were retrieved when met the search criteria.

Results and Data Analysis: 1. PPE observational staff who can monitor staff on donning and doffing was found to be helpful in minimizing errors to avoid contamination. 2. Donning takes approximately 2-3 minutes whereas doffing takes around 1 minute. However, contamination steps occurs mostly in doffing procedures. 3. Implementing protocols and strategies can effectively reduce the risk of infection among OR staff.

Discussion and Conclusions: 1. PPE observational staff who can monitor staff on donning and doffing was found to be helpful in minimizing errors to avoid contamination. 2. Donning takes approximately 2-3 minutes whereas doffing takes around 1 minute. However, contamination steps occurs mostly in doffing procedures. 3. Implementing protocols and strategies can effectively reduce the risk of infection among OR staff.

Improving Anesthesia Providers' Knowledge of Generational Diversity and Influences

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Introduction: The five generations working in healthcare today each have different values, communication styles, and priorities. Breakdowns in communication due to generational differences can negatively impact patient safety.

Methods: Will an education module (I) improve the understanding of generational diversity/influences and communication (O) in anesthesia providers in the multi-specialty operating room suites at Mayo Clinic (P)? A literature search was performed using keywords such as "generational diversity," "intergenerational," "generation," "workplace," "healthcare," "communication," "patient safety," "learning," "education," "values," "conflict," etc. A search was conducted separately in PubMed, EBSCO MegaFILE, CINAHL, and PsychInfo databases. After restrictions were applied, the searches yielded a total of 129 potential articles. The abstracts and full text of these articles were reviewed for relevance related to this PICOT question, which narrowed the number to 51 articles and then down to 30 articles.

Analysis of the Evidence: There are differences in characteristics of each generation, which often creates conflict in the workplace. These include differences in values, beliefs, communication and feedback preferences, technology use, work-life balance, and work expectations. There are learning preference differences between each generation. However, the one common preference between all the generations is they all feel most engaged when learning content is relevant to their work, and they can relate it to real-life experiences. Lastly, studies have concluded that knowledge and awareness of generational differences can lead to improved communication and decreased conflict, which results in increased patient safety.

Recommendation for Practice: An education module was developed, and disseminated via in-person or online education. The impact on provider knowledge of generational differences, and the resultant impact on communication were measured through pre- and post-education surveys. Pre- and post-education data were analyzed using paired *t*-test, two-sample *t*-test, Wilcoxon signed rank test, and two-sided tests were performed with P values < 0.05 considered statistically significant. A statistically significant increase in knowledge was observed for both education modes ($P < 0.001$). It was discovered that in-person education has a greater impact on improving knowledge and perceptions of generational diversity.

Improving Anesthesia Technician Education

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Introduction: Many institutions require no formal education, experience, or certification to be an anesthesia technician. Most anesthesia technicians are trained on-the-job. On-the-job training may be a better economic option up front, but in the long-run, it does a disservice to the anesthesia technicians and the anesthesia providers.

Methods: PICOT question: For anesthesia technicians at the University of Cincinnati Medical Center (UCMC), how does formalized anesthesia machine education, compared to the current system of no formalized training, improve technician's anesthesia machine knowledge? A literature search was performed using CINAHL, Pubmed, Embase, and Scopus using a combination of the following terms: anesthesia/anaesthesia technician/technologist, anesthesia/ anaesthesia support staff, and education/training. Fifteen articles were selected according to the previously mentioned criteria. The articles can be divided into several themes: interdisciplinary workflow and team work, anesthesia technician training and standardization, job satisfaction, and the anesthesia technician's role and skills.

Analysis of the Evidence: IRB exemption for non-human research was obtained prior to implementation. Two education sessions were delivered to anesthesia technicians to encompass all shifts. A presentation on basic anesthesia machine knowledge was given, with a pre-test just prior, and a post-test immediately after. The pre and post-tests were to measure the knowledge gained from the presentation. The results were analyzed using a paired *t*-test. Two items saw a significant increase in knowledge. The survey consisted of six questions regarding basic anesthesia machine knowledge. Questions concerning patient suction and pipeline gas supply connection did see an increase in correct responses.

Recommendation for Practice: The implementation of a standardized training regimen for anesthesia technicians can prove beneficial. Annual competencies should be administered to ensure practical skills and knowledge are maintained. Incentives for certification should also be available to encourage technicians to actively seek growth and advancement. The literature suggests that trained technicians are more efficient, make less errors, experience less burnout, and may decrease operating room delay. Anesthesia technicians have the potential to improve patient outcomes, especially outside of the operating room where equipment and resources can be transient and scarce.

In Perioperative Patients Receiving Peripheral Nerve Block, Does Administration of Perineural Dexamethasone Versus Intravenous Dexamethasone Better Extend the Duration of Analgesia?

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Introduction: Perineural dexamethasone increases block duration, however, anesthetists question its off-label use, unclear mechanism of action, and safety concerns especially with mounting evidence that intravenous dexamethasone reduces post-operative pain and opioid use. This literature review is focused on studies that compare the route of administration on duration of block analgesia.

Methods: Four databases were searched utilizing the MeSH: "nerve block" AND "dexamethasone" AND "perineural" AND ("systemic" OR "intravenous"). A PRISMA flow diagram was formed to depict the process of identifying the 14 articles that met the selection criteria: 1) population-perioperative patients receiving peripheral nerve block; 2) intervention-perineural dexamethasone adjuvant; 3) comparison-intravenous dexamethasone; 4) outcome-duration of analgesia. A synthesis matrix was utilized to identify themes and four common subgroups: first sign of sensation, first sign of post-op pain, first analgesic request, and return of complete sensation. Data, in the form of mean hours and standard deviation, were extracted and compared across categories.

Analysis of the Evidence: All studies with a control group determined that dexamethasone, regardless of route, prolonged duration of analgesia. Five of the fourteen studies determined that the perineural route provided statistically significant prolongation in duration of analgesia. Upon subgroup comparison, the mean difference in outcomes were 2.53, 2.63, -0.37, and 3.18 hours, respectively, favoring the perineural route. Analysis was limited by variations in outcome assessment, local anesthetic choice, block type, use of epinephrine, and dexamethasone dose across studies.

Recommendation for Practice: Dexamethasone prolongs the duration of analgesia of peripheral nerve blockade independent of route of administration and any difference, statistically significant or otherwise, may be of limited clinical significance in light of aforementioned concerns. Therefore, until additional research is completed to determine equivalence or superiority, mechanism of action, and safety profile, intravenous dexamethasone should be considered for routine use in patients receiving peripheral nerve block to extend duration of analgesia.

Incorporating Pre-procedural Hand-held Ultrasound (HUD) to Improve the Efficacy of Neuraxial Anesthesia

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Introduction: Neuraxial anesthesia is a valuable multimodal approach to pain management. Traditional techniques using landmark palpation to guide insertion into the epidural space or spinal space are inaccurate and inefficient. The aim of this quality improvement project is to introduce pre-procedural hand-held ultrasound device (HUD) use by means of education to improve the efficacy of neuraxial anesthesia.

Methods: Two databases, CINAHL and PubMed, were searched using components of a PICOT question: In anesthesia providers how does introducing pre-procedural hand-held ultrasound use through education, affect staff confidence and knowledge using ultrasound for neuraxial anesthesia following one education session. Keywords included ultrasonography, nerve block, epidural, obesity, and pregnancy. Articles published between 2002 and 2017 and in the English language were included. A total of 42 articles were reviewed for inclusion. Altogether, 15 articles were revealed to meet inclusion criteria and underwent full review.

Analysis of the Evidence: Education was developed based on the selected literature for neuraxial anesthesia techniques: reviewing anatomy and physiology; discussing inaccuracies of landmark palpation; examining evidence supporting hand-held ultrasound device; introducing and using of hand-held ultrasound device.

Recommendation for Practice: A 45-minute education session was developed on neuraxial anesthesia techniques. Immediately before and after the education session a pretest/posttest survey assessed knowledge, self-confidence and perception of ultrasound device use. In-person attendance by fifteen certified registered nurse anesthetists and two anesthesiologists. A seven item 5-point Likert scale pretest and posttest survey were completed by all participants. Education score averages showed pretest of 3.2, mostly “neutral” and posttest of 4.5, agree to strongly agree. A two tailed paired *t*-test analysis ($P < .05$ for significance) demonstrated statistically significant improvement in posttest scoring ($P = 0.00957143$).

Intraoperative Esmolol and Reduced Opioid Requirements

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Introduction: Opioids remain the mainstay therapy for pain management. Overuse of opioids may lead to increased side effects and delay discharge. The aim of this literature review is to evaluate the evidence supporting perioperative administration of esmolol for reduction of intraoperative and postoperative opioid consumption and postoperative pain.
Methods: Current literature was identified using Google Scholar, MEDLINE/Pubmed, EBSCOhost, and CINAHL databases. The following key phrases were used: "esmolol," "intraoperative," "anesthesia," "pain," "opioid-sparing," "postoperative," and "analgesia." Only primary research, full text articles that were published in the last seven years were included.
Analysis of the Evidence: In adult patients classified as ASA I-II, current literature demonstrates that intraoperative administration of esmolol is a valid method to improve multiple patient outcomes. Patients who receive intraoperative esmolol infusions have reduced intraoperative remifentanil and fentanyl requirements, reduced pain scores, and reduced opioid requirements in the post-anesthesia care unit. The exact mechanisms of analgesic and anesthetic-sparing actions of esmolol have yet to be discovered.
Recommendation for Practice: Despite the heterogeneity in methodology, all of the studies in this literature review demonstrate that intraoperative esmolol is associated with decreased intraoperative and postoperative opioid requirements and reduced postoperative pain scores. Additional data need to be obtained on esmolol dosing, because esmolol infusion rates varied significantly between all studies. Future studies are needed to identify the role of esmolol as an analgesic adjunct in specific population groups, such as morbid obesity, chronic pain, obstructive sleep apnea, and bariatric surgery.

Intraoperative Hemoglobin Management in Jehovah's Witness Patients Undergoing Orthopedic Procedures

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Introduction: Orthopedic surgeries result in blood loss, leading to a need for volume resuscitation. Due to their religious beliefs, Jehovah's Witness (JW) patients are deterred from receiving allogeneic blood. ANH and cell salvage are known techniques to decrease the need for allogeneic blood. Further exploration is needed to compare ANH and cell salvage to create recommendations on its use in orthopedic surgery for JW patients.

Methods: Investigators used CINAHL, MedLine ProQuest, and the EMBASE databases to answer the PICO question: In Jehovah's Witness patients undergoing orthopedic surgeries (P), does the use of acute normovolemic hemodilution intraoperatively (I) compared to cell salvaging (C) improve hemoglobin levels, mortality, and morbidity postoperatively(O)? A total of seven Level 1 and Level 2 evidence-based studies were included in this systematic review as well as the recommendations. Inclusion criteria: Jehovah's witness, allogenic blood refusal, adults, orthopedic surgeries, intraoperative cell saver, or ANH.

Analysis of the Evidence: There were a total of 7 combined studies which had 946 participants. Four studies found intraoperative cell salvage beneficial in maintaining postoperative Hgb levels. Two studies found intraoperative ANH effective in optimizing the patient, resulting in increased postoperative Hgb levels. One study found that the routine use of cell salvage was not beneficial. That preoperative Hgb levels and BMI should be indicators to influence the use of cell salvage. One study found the indicator of ANH was a preoperative Hgb of at least 10 g/dl. One study found that a preoperative hgb level greater than 13 g/dl was an indicator for ANH and less than 13g/dl for cell salvage.

Recommendation for Practice: The evidence shows that including intraoperative autologous transfusion in the multimodal plan of JW patients, optimizes hemoglobin levels. Within these techniques, ANS and cell salvage are often used, leading to increased postoperative hemoglobin levels and ultimately decreasing morbidity and mortality. Implementation of ANH as the initial intraoperative autologous technique will reduce variations in practice management, decrease healthcare costs, and increase the quality of care provided to JW patients. Preoperative hgb levels and expected blood loss are indicators for ANH or cell salvage.

Intrathecal Catheter Insertion versus Epidural Re-site for Prevention of Post-Dural Puncture Headache

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Introduction: Epidural analgesia is popularly desired for women in labor and pain relief after some surgical procedures. Dural punctures complicate the procedure and the experience for the patient. Post-dural puncture headache (PDPH) can be debilitating and can last up to 2 weeks. The purpose of this review was to explore initiatives to change local policy to align with best practices for PDPH prevention.

Methods: The PICO question guided the literature search, inclusion, and exclusion criteria: "In parturients with an accidental dural puncture (P), does intrathecal catheter insertion for 24 hours (I), compared to re-siting the epidural (C), reduce the risk of post-dural puncture headache (O)?" The literature presented in this evidence-based review was acquired through a comprehensive database search of PubMed, Embase, and the Cochrane library. PubMed's "similar articles" link was applied, and the "ancestry approach" was used to find similar sources. After duplicate articles were removed, 281 possible sources were screened. Four evidence sources met the criteria for the final evaluation.

Analysis of the Evidence: The 4 sources chosen for the final data analysis were peer-reviewed sources from outside the United States. The studies included 2 systematic reviews and 2 observational studies. The findings indicated a lack of consensus on whether intrathecal catheters (ITC) reduced PDPH, as compared to the re-siting of an epidural. One observational study determined a PDPH incidence of 11.76%; however, the other three sources did not support a significant reduction. Intrathecal catheter placement did not significantly reduce the incidence of PDPH after accidental dural puncture. There were no adequately powered data to determine the safety of ITC placement.

Recommendation for Practice: The nurse anesthesia community strives to offer the best quality care to patients while upholding a responsible awareness of the financial impact of complications. Based on the literature, there is no consensus on the benefit of an intrathecal catheter (ITC) in PDPH. Of note, the number of neuraxial attempts and subsequent accidental dural punctures was less common with the insertion of ITC after accidental dural puncture. Still, the best evidence recommendation does not support ITC use for the purpose of PDPH prevention.

Ketamine: Innovative Treatment for Severe Depression

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Introduction: Major depression is a common debilitating disease, and many are resistant to standard treatment. Ketamine is a safe, effective therapy for treatment-resistant depression, but people are often not aware of this treatment. This project aims to use an innovative process, social media, to increase awareness of the safety and effectiveness of CRNA-administered ketamine infusion therapy.

Literature Review: A literature review was conducted in PubMed, CINAHL, PsycINFO, and GoogleScholar for articles in English and all dates inclusive. Search terms included "depression," "treatment-resistant depression," "major depression," "major depressive disorder," "suicide," "ketamine," and "ketamine infusion." A total of 736 articles resulted, and 28 were included in the evidence-base that informed next phases of the project.

Developmental Design or Methodology: This proof of concept project used an educational video, based upon current evidence, using FIVERR and iMovie technology uploaded to YouTube and Facebook. The proposed audience was the lay public, with the intent that the video would be routed to people with depression via forwarding by friends, or by depressive individuals searching for depression treatment options.

Proof of Concept/Results: View analysis was obtained through YouTube and Facebook analytics. Within 3 weeks, the video was viewed 108 times, shared 8 times, and commenters revealed appreciating content to help depressed individuals. These results indicate the content is being viewed, and shared by viewers with others. The comments reveal the viewers intend to use the information to educate depressed individuals about ketamine infusion treatment.

Discussions and Conclusions: Online social media platforms offer an innovative and effective method of dissemination of evidence-based information. Low-dose ketamine infusions are a newer, safe, effective option for treatment of depression. Education of this option is needed among the patient population and social media platforms can be utilized to reach the population. A more focused effort of dissemination through social media is required to reach more of the depression-diagnosed patient population.

Medication-Assisted Treatment (MAT): The New Role of the Certified Registered Nurse Anesthetist

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Introduction: The SUPPORT for Patients and Communities Act authorizes CRNAs to prescribe medication-assisted treatment (MAT) for opioid use disorder (OUD) according to prescriptive authority under state law. Limited experience and published literature on CRNA's knowledge of OUD, MATs or the new scope of practice (SOP), results in a knowledge gap. Providing education in nurse anesthetist programs may close this gap and increase CRNA engagement in this new role.

Methods: A literature search was completed to determine if a knowledge gap exists. Databases used included PubMed, PsycINFO, and EBSCOhost. No published literature was found on the topic. To close the knowledge gap, an innovative video presentation was created using light-board technology. The content of the presentation included OUD, MATs and policies related to CRNA's new SOP. The content was compiled using literature from 3 professional associations, 7 government agencies, 1 academic textbook and 12 scholarly articles. Interviews from a CRNA and an individual in recovery from OUD were integrated into the presentation. The video presentation was implemented to 19 CRNAs and 34 SRNAs at a large academic health center who completed a pre and post-surveys before and after the presentation.

Analysis of the Evidence: Data were collected using a pre and postsurvey consisting of 7 content-based questions. Efficacy of the presentation on increasing knowledge was measured by comparing the percent of correct responses on the pre and postsurvey. On the presurvey 20% were aware of 3 medications used to treat OUD, increasing to 98% on postsurvey. Fifteen percent knew the most dangerous phase of treatment, increasing to 84% on postsurvey. Twenty-four percent were aware of training required to prescribe MATs, increasing to 94% on postsurvey. Postsurvey data revealed an increase in knowledge for all 7 questions, therefore the presentation will be implemented into the nurse anesthetist program curriculum to close the knowledge gap.

Recommendation for Practice: CRNAs have been called to play a role in combatting the opioid crisis in the United States. With this broadened scope of practice, it is imperative to close the knowledge gap that exists. Implementing an innovative video presentation on OUD, MATs, and the CRNAs scope of practice in nurse anesthetist programs can increase engagement, competency, and the confidence of the nurse anesthetist in treating this underserved patient population. The capacity of the CRNA profession to increase the number of adequately trained providers to treat OUD using MAT can function to address the opioid crisis and highlight the CRNA's ability to adapt to new roles within healthcare as needs arise.

Micro Breaks for CRNAs: Bringing Wellness Into the OR Suite

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Introduction: A mixed methods research methodology can be a good combination of assessing CRNA burnout because the issue is unclear. Using survey and thematic analysis, focus group content was reviewed to identify stand out themes to provide insight into where CRNA burnout initiated, provide an intervention, and then assess if the intervention was effective in reducing burnout and increasing wellness in CRNAs.

Literature Review: The nature of the CRNA role can lead to physical and emotional stress. A proven method of reducing stresses in the operating room (OR) is the implementation of micro breaks. Research demonstrates the positive effects of micro breaks among non-anesthesia OR personnel; however, information on the impact of micro breaks on CRNAs is lacking.

Theoretical Framework: Researching reasons why burnout occurs in the CRNA population can help reduce burnout, increase wellness. By learning what activities can provide those outcomes for CRNAs.

Methodology: A form of grounded theory research methodology was used for focus groups. Conversations were recorded, transcribed, and coded into similar categories. Once categories were saturated, they were analyzed and themes emerged.

Data Collection & Methods: CRNAs from a large academic medical center participated in a mixed-methods quality improvement project. In the pre-intervention focus group. They discussed: roles in the OR, stressors, and self-care practices. All completed the Well Being Index for Health Care Employees (Well Being) survey, which identifies burnout. CRNAs were educated about the concept of micro breaks and given pamphlets that included the exercises and space to record micro breaks for the 6-week intervention. Following the intervention, the focus group reconvened or completed one-on-one interviews and participants again completed the survey.

Results and Data Analysis: Pre-intervention focus group themes were a desire for wellness, and difficulty finding time and support for wellness. The Well-Being Survey results indicated mild burnout (2.2± 2.1). Post-intervention survey results indicated reduced burnout (1.4±2.8) P = 0.234). Themes in the post-intervention focus group included awareness of movements, identifying surgical case types ideal for micro breaks, and expanding micro breaks to include all OR staff.

Discussion and Conclusions: The dedication of CRNAs to patient care often comes at the expense of thinking about their own wellness while engaging in clinical practice. Micro breaks can be an effective tool to help reduce musculoskeletal pain and to increase overall wellness in the CRNA population.

Multidisciplinary Airway Crisis Simulation

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Introduction: Early recognition of patients with difficult airways is important in minimizing morbidity and mortality. The clinical value of bedside screening tests for predicting difficult intubation remains limited. Providers need to be equipped with the knowledge and ability to manage an airway crisis with a high level of proficiency. Simulation-based training allows for education and skill acquisition.

Methods: In an interprofessional team of senior nurse anesthesia students and oral and maxillofacial surgery residents, does emergency airway education compared to no education, decrease the time until an airway is secured during a 2-hour simulation? MeSH terms were established, and a search was conducted through the PubMed database. Peer-reviewed, evidence-based practice articles, limited to 1993 to 2018, were selected. The search window included the original ASA difficult airway practice guidelines that were introduced in 1993. The quality of each article and its relevance was considered. Articles were assessed for relevance, quality, statistical significance, limitations, reproducibility, and generalizability. Articles were graded using the Johns Hopkins Nurse Evidence Based Practice Model.

Analysis of the Evidence: A high-fidelity, in situ simulation improved familiarity and recall of the ASA-DAA. The data support the use of airway crisis education training to improve airway securement times during a difficult airway situation. Multidisciplinary participation allows participants to practice non-technical skills which include situational awareness, decision-making, communication, teamwork, and leadership.

Recommendation for Practice: A simple *t*-test was run to analyze the data. It can be concluded from a *P* value of 0.0006 that there is statistically significant evidence that the airway securement times for those who were pre-education is less than the times for those who were not provided pre-education (therefore supporting both pre-education and simulation practice for airway training skills). Additionally, it was noted that fewer deviations from the American Society of Anesthesiologists Difficult Airway Algorithm (ASA-DAA) were committed by the group that was pre-educated, average of four and average of zero respectively.

Music in the Perioperative Setting: Education for Senior Registered Nurse Student Anesthetists

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Introduction: The incorporation of music in anesthesia clinical practice is limited. The purpose of this quality improvement (QI) project is to promote the use of music in anesthesia. A class of senior Registered Nurse Student Anesthetists (RNSAs) attended an educational presentation to bolster their knowledge about the efficacy of music in the perioperative setting and application to their future practice.

Methods: PICOT: For senior RNSAs, will a 50-minute educational session, improve RNSA confidence and knowledge levels regarding the use of music in the perioperative setting, when compared to levels prior to education? The search for evidence was completed by accessing the databases PubMed and CINHAL. To meet inclusion criteria, the studies had to be published between the years 2015 to 2020, and available in the English language. A total of 9 articles were included in the literature review, utilizing the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model to grade the identified studies. Based on the JHNEBP, 7 articles were considered level I (experimental) and 2 articles were considered level III (non-experimental).

Analysis of the Evidence: According to the literature, music has the potential to be an effective adjunct in anesthesia by reducing anxiety and improving patient outcomes. In addition to the education session, a pre and post evaluation was administered. These contained 5 statements that were to be answered using a 4-point Likert scale, a point value was assigned to each agreeance option. The pre-evaluation average score for knowledge about physiologic effects of music was 2.23 (disagree) and increased to 3.81 (agree) on the post-evaluation. The pre-evaluation average score for confidence in ability to utilize music in future practice was 1.85 (strongly disagree) and increased to 3.46 (agree) on the post-evaluation.

Recommendation for Practice: Music is a safe, non-invasive, and cost-effective technique that can be an adjunct to the anesthetic plan. It can be used to offset the deleterious effects associated with pre-operative anxiety. The educational session was an effective method to increase RNSA knowledge and confidence with utilizing music in the perioperative setting. The potential benefits of music in anesthesia should be incorporated into future RNSA curriculum. This will encourage future anesthesia providers to integrate music into their multimodal anesthetic plan.

Needs Assessment: Presence of Maternal Morbidity and Mortality Disparities

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Introduction: Racial and ethnic minority women face substantially higher rates of severe maternal morbidity and mortality compared to non-Hispanic White women. Specifically, African American women are 2 to 4 times more likely to die from pregnancy-related causes and research suggests that 60% of pregnancy-related deaths are preventable.

Methods: National statistics warrant a needs assessment at an urban medical center to investigate the presence of maternal health disparities at the local level. A review of the literature was conducted by searching PubMed, CINHAL, and Scopus. The key words "healthcare disparities," "obstetrics," "maternal mortality," "severe maternal morbidity," and "African American" were used as subject headings and free text terms throughout the search. The article search was limited to articles published in English, involving human subjects, and published between 2014 and 2019. A total of 47 articles were identified and 11 were selected for final analysis including 1 quasi-experimental study, 7 qualitative studies, 1 retrospective study, and 2 expert opinion pieces.

Analysis of the Evidence: The literature suggests that significant racial disparities in maternal mortality and morbidity exist and need to be identified. To identify maternal morbidity and mortality rates locally, a retrospective chart review of patients who delivered a child at an urban medical center in 2017 was performed. A total of 162 charts were selected using systematic random sampling averaging 13.5 charts per month. Maternal variables assessed from the electronic health records were age, race, insurance, cesarean delivery, preeclampsia, hemorrhage, death, and ZIP code. The data were analyzed using SSPS to conduct one-sided Fisher's Exact test and Relative risk ratio with 95% confidence intervals.

Recommendation for Practice: The Relative risk was calculated for the variables; findings reflect an increased risk for maternal complications for minority women. Specifically, risk was higher for African American women when compared to non-Hispanic White women for cesarean delivery (94.5% higher risk), preeclampsia (29.5% higher risk), and hemorrhage (21.3% higher risk). Hispanic women and women of other minority racial groups also showed increased risk for maternal complications compared to non-Hispanic White women. This pilot study brings awareness to maternal health disparities at the local level and facilitates initiation of next steps to eliminate maternal health disparities and improve patient outcomes.

Obstetric Enhanced Recovery After Surgery Protocols

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Introduction: Nearly 1.3 million cesarean deliveries are performed annually, comprising one third of births. Recovery ranges from 3 to 6 days, consequently increasing length of stay and cost. Improving obstetric post-operative recovery is critical towards enhancing maternal care. The purpose of the literature review is to synthesize best evidence and current processes involved in developing obstetric Enhanced Recovery After Surgery (OB ERAS) protocols.

Methods: A comprehensive literature review was conducted of peer-reviewed journals written in English and published between the years of 2013 and 2020. The literature was obtained through MEDLINE, PubMed, Google Scholar, and EMBASE databases. Search terms included were "obstetric", "enhanced recovery after surgery", "enhanced recovery" and "cesarean". Articles were appraised using John's Hopkins evidence appraisal tool. Inclusion criteria included scholarly articles that contain current processes specific to obstetric Enhanced Recovery After Surgery.

Analysis of the Evidence: The literature search yielded a total of 605 articles, 41 of which met inclusion criteria. Twenty-two of the 29 articles reported key interventions included in enhanced recovery protocols with positive outcomes. Key themes included early mobilization (n=22), early postoperative oral intake (n=22), early catheter removal (n=21) and multimodal pain management (n=20). The majority of evidence were Level I evidence (n=10) and a review research design (n=11). Eight articles implemented Enhanced Recovery After Cesarean (ERAC) protocols.

Recommendation for Practice: Early catheter removal, ambulation, and antibiotic prophylaxis each led to a reduction in LOS after cesarean by 12 to 36 hours, with up to 25% of patients leaving the hospital the day after cesarean delivery. Implementation of OB ERAS interventions decreased total postoperative direct costs by 8.4% or $642.85 per patient, readmission rates from 8.3% to 3.3%, and complication rates by nearly 50%. Ninety percent of obstetric patients reported adequate pain control from multimodal analgesia on day 1 and 7. Multimodal and neuraxial analgesia increased the percentage of women recovering without the use of any narcotic from 25% to 56% and decreased opioid use/side effects by 50%.

Operating Noise Pollution Education and Practice Improvement

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Introduction: Evidence supports that noise levels in the OR frequently exceed limits set by federal regulatory agencies. Excessive OR noise levels have been found to place CRNA personal wellness at risk, negatively impacting provider performance, practice, and patient outcomes. Noise reduction education can be an effective method in reducing noise levels and increasing awareness in the OR.

Methods: PICOT – "Do CRNAs exposed to an education module conveying the hazards of noise pollution in operative settings and practice implications, compared to CRNAs that have not received OR noise pollution education, display increased awareness recognizing hazards associated with noise pollution?" A literature review was performed using Embase and PubMed databases. Key search terms included "noise," "noise pollution," "operating room," "anesthesia," "occupational safety," "education," "nurse anesthetist," and "anesthesiologist." Inclusion criteria were peer-reviewed articles published after 2008 and in the English language. The search yielded a total of 177 articles. After limiting criteria, removal of duplicates, and satisfying inclusion criteria, 22 articles underwent full text review.

Analysis of the Evidence: An OR noise pollution education and practice improvement project was implemented at a large academic medical center. A 30-minute education module describing OR noise pollution, associated hazards, and reduction strategies was provided to 31 CRNAs. Ten item pretest and posttest surveys were completed by participants. Pre survey data showed that more than 50% of the sample had not received previous OR noise pollution education. Average pretest questionnaire scores were 47.2%. Average posttest questionnaire scores were 80.6%. One tailed paired *t*-test analysis ($P < .05$ for significance) demonstrated there was a statistically significant improvement in post-test scores ($P = 0.0166734$).

Recommendation for Practice: OR noise pollution education should be standardized for CRNAs and OR personnel. Application of the sterile cockpit concept should be utilized by CRNAs for all anesthetics. During Time Out, providers should consider adding "can we have quiet during induction and emergence?" Long-term studies should commence to determine the impact of OR noise pollution on CRNA providers' wellness, and on practice performance and patient outcomes.

Peer-to-Peer Mentoring and Positive Outcomes for Healthcare Students: A Review of Literature

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Introduction: Transitioning from an expert clinician to novice learner in nurse anesthesia is infrequently easy. Evidence supports peer-to-peer mentoring as beneficial in many fields; however, there is limited studies targeting peer-to-peer mentoring in nurse anesthesia programs (NAP). The purpose is to evaluate the literature on peer-to-peer mentoring in graduate level education.

Methods: An integrative literature review examined best practice from evidence-based peer-to-peer mentorship models to study the benefits of implementing a program. The literature review was obtained using CINAHL PLUS, Google Scholar, and PubMed to search for best practice use of peer-to-peer mentoring. The search contained the following phrases or keywords: "peer to peer," "mentoring," "near-peer," and "students teaching students." Although a total of 1,108 publications were identified, only 18 peer reviewed articles were kept after appraisal.

Analysis of the Evidence: Synthesis of the evidence reported that peer-to-peer learning has positive outcomes for the mentor and the mentee. Majority of surveys indicated that peer-to-peer mentoring decreased anxiety, confusion, and helped improve leadership skills and practical skills.

Recommendation for Practice: Implementing peer-to-peer mentoring has shown great success in the articles that were reviewed. One study showed that 58.8% of students reported peer mentoring increased self-efficacy (Bass, 2017). Another, stated that over 80% of mentors and mentees felt the program helped (Hogan & Barratt-see, 2016). However, there are some negatives to peer-to-peer mentoring: such as frustration with mismatching of learning styles between mentor and mentee. A positive is that it enhances learning skills/intellectual gains for both the mentor and mentee.

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Perioperative Anxiety Assessment for Student Nurse Anesthetists

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Introduction: Perioperative anxiety effects up to 60% of patients undergoing surgery. While multiple studies have reported that perioperative anxiety is correlated with elevated postoperative pain scores and increased opioid requirements, it remains a facet of the surgical experience that is often under appreciated. Bolstering graduate education about perioperative anxiety will help optimize patient outcomes.

Methods: The PICOT question guiding this project states: In the student nurse anesthesia population, does education on perioperative anxiety, compared to no education, affect student knowledge and perception on perioperative anxiety, after one 50-minute lecture? The literature was electronically searched using PubMed. The key words searched included "perioperative anxiety," "anxiety assessment tools," and "anxiety management strategies." After inclusion and exclusion criteria were applied, 22 articles were chosen based on their rigor, strength, and outcomes, and were synthesized into an educational presentation.

Analysis of the Evidence: The sample consisted of 23 second year students from the University of Cincinnati's nurse anesthesia program. Surveys assessing student perception and knowledge regarding perioperative anxiety were administered prior to and immediately following an educational session on perioperative anxiety that was 50-minutes in length and delivered live via WebEx. Qualitative, quantitative, and demographic data were gathered via Survey Monkey and subsequently organized and analyzed. A simple *t*-test was performed for all quantitative data, with all other data sorted and integrated in a discussion section.

Recommendation for Practice: Overall, pre- and post-test score averages increased from 70 to 90%. Of the 10 quantitative questions, the variance between pre- and post-test scores for 6 of the questions had P values < 0.05, indicating a statistically significant improvement in graduate student knowledge pertaining to perioperative anxiety. The results of this project suggest that a 50-minute educational session on perioperative anxiety improves student knowledge, confidence, and also increases awareness about the maladaptive behavioral changes caused by perioperative anxiety. With an increased knowledge base, students are more likely to effectively manage perioperative anxiety, which will yield optimal patient outcomes.

Pilot Pre-operative Handoff Standardization in a Pediatric Postanesthesia Care Unit

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Introduction: Ineffective handoff among healthcare providers is recognized as a critical patient safety issue. Breakdown in communication during patient handoff results in adverse events, patient and employee dissatisfaction, and increases healthcare costs. A handoff quality improvement project between the anesthesia care team and PACU nurses was done to assess handoff in the pre-operative phase of care.

Methods: Between the anesthesia care team and PACU nurses, is the implementation of a handoff tool to help standardize the pre-operative handoff process compared to not using such a tool beneficial in improving, the communication of specific information, parent and patient participation in handoff and the occurrence of face-to-face handoff? Databases searched per medical librarian: EBM Reviews - Cochrane Central Register of Controlled Trials June 2019; EBM Reviews - Cochrane Database of Systematic Reviews 2005 to July 3, 2019; Embase 1974 to 2019 July 05; Ovid MEDLINE and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 1946 to July 05, 2019.

Analysis of the Evidence: A review of the available literature was performed by the presenter.

Recommendation for Practice: Implementation resulted in a statistically significant increase in communication of pertinent patient allergies during patient handoff (P =0.0428). Increase in parent and patient participation during the handoff process was statistically significant ($P < 0.0001$). Overall the frequency of face-to-face patient handoff was not statistically significant between pre- and post-implementation ($P = 0.0849$). Handoff duration time was not assessed for this project.

PONV Treatment Analysis

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Introduction: Postoperative nausea and vomiting (PONV) occurrence rates remain high ranging from 30% to 80% depending on risk factors. The purpose of this quality improvement initiative was to conduct an assessment of an anesthesia department's PONV occurrence rate and prophylactic treatment practice in relation to the preoperative PONV risk assessment.

Methods: The PICOT states, "In adult patients receiving surgery, is the incidence of postoperative nausea and vomiting (PONV) decreased within the PACU postoperative period when prophylactic antiemetics are properly administered according to patient risk factors, compared to conventional prophylactic antiemetic administration?" The literature was electronically searched using PubMed, CINAHL, and MEDLINE. Articles were sought that were associated with PONV guidelines, protocols, risk assessment, and prevention. Fifteen randomized controlled trials, quasi-experimental studies, systematic reviews, clinical practice guidelines, and literature reviews were included for analysis. The Johns Hopkins Evidence-Based Practice Rating Scale was used to determine the strength of the literature.

Analysis of the Evidence: Four clinical gaps were revealed in the literature. First, the lack of importance placed on PONV by providers. While anesthesia providers still negatively perceive PONV, progress in reduction will continue to be a slow. Second, the lack of standardization of PONV protocols. Standardization is imperative to consistent, reproduceable results. Third, the lack of provider cooperation with the implementation of guidelines/protocols. Provider perception and overly restrictive protocols can negatively impact provider compliance. Lastly, there is a lack of alternative therapies in PONV treatment strategies. Alternative therapies are essential to the multimodal treatment approach.

Recommendation for Practice: Comparison analysis of data collected from April and October 2019 revealed increased use of a new PONV preoperative screening tool implemented in May 2019. Contrary to presumed thought, PONV occurrence rates changed very little, 23.84% to 22.15%, from April to October 2019. This could be associated with the improper use of the PONV risk assessment tool as evidenced by the low prediction of post-op opioid administration, and that treatment regimens are not fully based upon patient risk factors. Recommendations pertain to the need for education on the proper use of the PONV risk assessment tool and the reinforcement of risk-based treatment modalities.

Postoperative Nausea and Vomiting with Low-Dose Propofol Infusions in Patients Undergoing Gynecological Surgeries with Volatile Anesthetics at Providence Sacred Heart Medical Center and Providence Holy Family Hospital

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Introduction: Postoperative nausea and vomiting (PONV) is a common complication following general anesthesia with volatile anesthetics in female patients undergoing gynecological surgery. Propofol is known to have antiemetic properties. In this study, the authors aim to describe the incidence rates of intraoperative low dose propofol infusions and baseline characteristics associated with its use.

Theoretical Framework: The theoretical framework guiding this study is Donabedian's "Structure, Process, Outcome" model which provides a strategy for evaluating the quality of care and identifies areas for improvement.

Literature Review: Females undergoing gynecological surgery are known to have the highest rates of PONV. Propofol has antiemetic properties and current research literature supports the utilization of low-dose propofol infusions in treating PONV in high-risk patients.

Research Design: This is a retrospective observational evidenced-based practice project deemed exempt by the IRB for human subjects research.

Methods: This study was conducted at two Providence hospitals in Washington State. Adult patients (≥18 to 90 years of age) undergoing gynecological surgery from January 2014 to December 2019 that were hospitalized for at least 24 hours and no more than 14 days were included. Patients receiving a low-dose propofol infusion of ≤25 μg/kg/min were identified.

Data Collection: Anonymized health data were extracted from the electronic medical record to a secure database. The project included patients receiving general anesthesia with volatile anesthetics and excluded patients with TIVAs (propofol infusion >25 μg/kg/min).

Results and Data Analysis: This multi-year evidenced-based practice project examined 499 cases and found that intraoperative low-dose propofol infusions were used 45 times accounting for 9% of the total sample. Bivariate analysis revealed that age, BMI, case duration, ASA status, smoking status, and post-op opioids did not influence whether a patient received an intraoperative low-dose infusion. The bivariate analysis did show a statistical significance with a history of PONV ($P = 0.04$). Similar findings were demonstrated in a multivariable model.

Discussions and Conclusions: PONV remains a complication and females patients undergoing gynecological surgery are at the highest risk. Low-dose propofol infusions were vastly underutilized accounting for only 9% of total cases despite patients having multiple risk factors for PONV. Results identify areas for care improvement and CRNA education.

Pre-deployment Disaster Preparedness

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Introduction: Natural disasters occur worldwide and vary greatly based on location and magnitude of destruction. CRNAs play a key role in disaster response by volunteering professional skills during times of crisis. To ensure a successful deployment, CRNAs must prepare physically, psychologically, and spiritually. This review aims to highlight key pre-deployment guidelines and recommendations for CRNAs.

Literature Review: The aim for this literature review was to gather current evidence-based checklists, guidelines, and protocols given to CRNAs prior to deployment into disaster hit locations. Data were analyzed and critiqued in order to identify the best practices used to increase and improve disaster preparedness for CRNAs traveling abroad.

Theoretical Framework: Multi-factorial success is required to achieve disaster preparedness. Pre-deployment simulation/clinical exposure, psychological training, and cultural competencies improves overall success of trips.

Methodology: Many articles used ethnography research methodology to observe healthcare workers ability to efficiently function during mock simulation. A narrative approach was also used to identify key themes.

Data Collection and Methods: A systematic review was conducted of recent articles between 2009 and 2020. Databases used included, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, ScienceDirect, and Google Scholar. Quality of selected studies was assessed using Johns Hopkin's Nursing Evidence-based Practice Guidelines. Common themes were identified and evaluated. The studies were conducted in 10 countries: China, United States, Australia, Saudi Arabia, Philippines, Japan, West Africa, Indonesia, Turkey, and South Korea, and included descriptive studies, systemic reviews, and qualitative surveys, with sample size varying between 4 and 1,443.

Results and Data Analysis: Eighteen articles met the inclusion criteria. The articles reported an average of low-to-moderate levels of disaster preparedness. Clinical and psychological preparedness increased when healthcare providers engaged in simulation. Additionally, international travel recommendations and key pre-deployment guidelines propose that a pre-deployment checklist would improve overall disaster preparedness for healthcare providers.

Discussion and Conclusions: CRNA providers must prepare physically, psychologically, and spiritually. Through the standardization of a pre-deployment checklist and engagement in advanced learning education, healthcare providers will have improved levels of disaster preparedness. This literature review has identified key concepts for a successful trip, including psychological well being, skills, and cultural competencies.

Premedication to Treat Pediatric Anxiety: A Comparison of Intranasal Dexmedetomidine to Oral Midazolam

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Introduction: Pediatric patients most commonly receive oral midazolam to ease anxiety despite having adverse side effects. Newer medications have been shown to provide anxiolytic effects with fewer negative side effects. The purpose of this literature review is to compare the effectiveness of intranasal dexmedetomidine to oral midazolam as premedication to treat preoperative anxiety in pediatric patients.

Methods: The presented literature was obtained by comprehensive search using the PubMed database accessed between June 11 and 13, 2019. Inclusion criteria limited the literature to peer reviewed journals within 10 years, randomized control studies on human pediatric subjects, and a comparison of intranasal dexmedetomidine versus oral midazolam as a premedication for anxiety in children.

Analysis of the Evidence: Kumar et al found sedation and behavior scores were improved in the dexmedetomidine group, as compared to midazolam; Segovia et al found anxiety scores to be lower; and Ghai et al found better sedation scores and lower Groningen Distress Rating Scale (GDRS) scores. All three studies found intranasal dexmedetomidine to be superior to oral midazolam in treating preoperative anxiety in pediatric patients prior to undergoing procedures requiring sedation.

Recommendation for Practice: Premedication in the pediatric population helps facilitate separation from parents, ease the induction process, prevent psychological stress, and allows for smooth intravenous (IV) cannulation. Midazolam has been known to cause adverse side effects, warranting researchers to seek alternative options. Intranasal dexmedetomidine demonstrates greater efficacy with fewer side effects, but future research is needed to provide further supporting evidence of its superiority.

Preoperative Education for Patients in Opioid Use Disorder Recovery

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Introduction: Research shows that patients with opioid use disorder (OUD) have decreased pain tolerance, hyperalgesia, higher depression and anxiety rates, chronic pain conditions, experience stigma, and are at increased risk of recidivism. This project aims to empower these patients to develop a collaborative perioperative pain management plan with their providers and recovery support team.

Methods: PICOT Question: "For patients preparing for surgery who are in recovery for OUD, does an e-book addressing the importance of open communication with a patient's healthcare team regarding nonmedical opioid use and analgesia plans increase a patient's likelihood of discussion and developing a postoperative pain management plan that involves their recovery support team as measured by a pre and post e-book survey?" A literature review of PubMed was conducted and included articles published in the last 5 years and pertaining to education or surgical challenges of patients with OUD. Based on findings, an e-book was created and delivered virtually during online recovery meetings with anonymous pre and post surveys consisting of multiple choice and open-ended questions.

Analysis of the Evidence: Patients are often hesitant to disclose an OUD history, limiting the clinician's ability to meet the needs of this patient population. However, this project's virtual e-book provides access to tools that can prevent recidivism. Not all participants completed both the pre (n=13) and post surveys (n=9), but feedback was positive. The e-book reportedly offered a "template" for discussion and a "comprehensive and informative" resource with multimodal analgesia options cited as particularly valuable. Patients spoke of the fear of "awakening a monster" of addiction through surgery but stated that the e-book gave them "a concrete plan for approaching the healthcare team about their addiction."

Recommendation for Practice: The findings of this project demonstrate the impact and future potential of virtual preoperative education for the recovery community. Patients reported decreased fear in talking with providers and felt the e-book helped them establish realistic expectations and guidelines. While surgery can be a vulnerable time, collaboration with one's healthcare and recovery support teams can create an environment that fosters shared decision making, the development of an agreed upon pain management plan, and provides additional support to prevent recidivism. The true value of this project is that through education, patients can be empowered as an active part of their healthcare and continued recovery.

Prevention and Treatment of Neuraxial Anesthesia Induced Shivering in Parturients: Comparing Intrathecal Dexmedetomidine, Meperidine, and Magnesium Sulfate

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Introduction: Perioperative shivering is a common complication during cesarean section. Adjuvants used to minimize shivering are administered intravenously, but studies on neuraxial administration have shown to produce similar results with minimal side effects. This review investigates the literature on the use of intrathecal dexmedetomidine, meperidine, and magnesium on the reduction of perioperative shivering.

Methods: A systematic literature search was performed following the Preferred Reported Items for Systematic Review and Meta-analysis, or PRISMA, guidelines. Using specific inclusion and exclusion criteria, 14 peer-reviewed articles published from 2011 to 2019 were selected using three electronic databases: EMBASE, PubMed and the Cochrane Library. The research articles chosen for data extraction and analysis assessed neuraxial adjuvants and their effects on perioperative shivering during cesarean sections. Perioperative shivering was identified as the primary outcome. Secondary outcomes included pruritis, nausea, hypotension, and bradycardia.

Analysis of the Evidence: Both intrathecal dexmedetomidine and intrathecal meperidine significantly decreased shivering during cesarean section in a dose dependent manner. Intrathecal dexmedetomidine showed no significant difference in adverse reactions such as pruritis, nausea, vomiting, and hypotension. Several studies, however, indicated an increase in pruritis, nausea, and vomiting when using intrathecal meperidine, particularly with increased doses. Intrathecal magnesium sulfate also demonstrated a significant decrease in shivering but one study concluded the effects did not last.

Recommendation for Practice: The evidence suggests intrathecal dexmedetomidine and intrathecal meperidine are effective adjuvants to reduce perioperative shivering during cesarean section. Few studies directly compare the effect of different drugs and therefore an accurate comparison is not possible. Furthermore, there is minimal research to determine optimal dosing that minimizes side effects and maximizes shivering prevention. While all three adjuvants are effective and safe, more direct-comparison studies and dose-response research is needed before practice recommendations can be made.

Prone Emergency Extubation Response

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Introduction: Inadvertent loss of airway (LOA) in the intra-operative setting requires prompt recognition and immediate intervention by the CRNA. Once LOA is determined, coordinated efforts among by the intra-operative team are important for optimizing patient outcomes. Currently, no coordinated guideline or protocol exists for managing a prone patient with inadvertent LOA intra-operatively.

Methods: Based on review of literature and best practices a Prone Emergency Extubation Response (PEER) protocol was drafted. This protocol outlined the steps of recognition of LOA, notification process of a PEER, and role delineation and expectation of the intra-operative team during the crisis. After modifications of the protocol, staff in-services were held, info graphs were distributed, and a multidisciplinary in-situ simulated PEER was held. Lastly, feedback was used to refine the PEER protocol.

Analysis of the Evidence: Feedback from multidisciplinary in-services provided valuable input into the development of the PEER protocol. During the simulation, the authors learned that logistical and practical perspectives were important during a PEER. Logistical perspectives included role delineation and role expectations, and practical perspectives included standardized ETT taping, securing of standardized bite blocks, and consistent use of nasopharyngeal temperature probes. The post-simulation debrief identified adjustable barriers within the setting. Further refinement of the PEER protocol was accomplished through incorporating feedback from the multi-disciplinary in-situ simulation.

Recommendation for Practice: Preliminary evidence suggests that the PEER protocol is a useful tool for a coordinated intra-operative team response to LOA, reducing time and effort in safely securing the airway. Multidisciplinary involvement in the creation of guidelines is critical to maintain professional practice standards. In addition, repeated routine simulations and reinforcement of the PEER are important to ensure that cross campus employees are knowledgeable and can function effectively in this crisis. Further research should investigate the PEER's usefulness in proning of COVID patients, cardiac arrests, or hemodynamic instability in the prone position.

Proper Hazardous Waste Segregation and Disposal in the Operating Room

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Introduction: ORs are one of the greatest producers of medical waste in a health system. Educating OR staff could have a dramatic effect on improving proper waste segregation and decreasing biohazardous waste incineration. University of Cincinnati Medical Center (UCMC) has an environmentally friendly alternative to incineration; the Ozonator. It uses ozone, water, and electricity to treat biohazardous waste, producing zero emissions.

Methods: PICOT: "Can a hospital reduce its environmental impact and financial cost related to waste treatment and disposal by incorporating an Ozonator into its waste management practices, in combination with proper sharps segregation and disposal, by 50% within one year?" A thorough investigation of available literature was completed, using PubMed, CINAHL, and Scopus databases; 9 quasi-experimental or qualitative studies, 6 systemic reviews, and 4 case studies or literature reviews were included. This project has been deemed a "Non-Human Subjects" activity by the IRB. Educational presentations were given to anesthesia providers and to OR registered nurses and technicians. Presentations outlined proper waste segregation in the OR, the Ozonator, and suggestions for staffmember involvement.

Analysis of the Evidence: Two themes emerged when assessing the data; medical waste segregation is not universally understood, and traditional waste disposal practices are hazardous, expensive, and toxic to the environment. Many barriers were encountered, including difficulty scheduling the educational sessions for both groups, as well as securing the environmental service (EVS) director's attendance at the sessions to further explain details and future goals with the Ozonator. While national and state standards of sharps and red barrel waste were clear, the hospital specific policies were not. Some leadership were unaware of what the inclusion of an Ozonator would do to the waste segregation and disposal in the OR.

Recommendation for Practice: Future plans include updating hospital waste disposal policies to reflect current OSHA and Stericycle guidelines and including the Ozonator's capabilities and requirements. Future cessation of all waste segregation is planned to utilize the Ozonator for the treatment of all waste. This timeline will be based on the EVS director's approval. Future measurement of the environmental impact after at least one year of a fully operational Ozonator to allow for accurate assessment will be necessary. Long term goals include providing available financial support for other institutions to obtain an Ozonator. True environmental changes will be noted with the addition of numerous Ozonator units.

Rates of Ondansetron Administration Prior to Spinal Anesthesia: Evaluating the Practice of Prophylactic Attenuation of Spinal-Induced Hypotension and Bradycardia

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Introduction: The research evidence has identified prophylactic ondansetron to be associated with reducing spinal-induced hypotension (SIH) and bradycardia. The aim of this project is to examine the proportion of prophylactic ondansetron and rate of rescue treatment interventions.
Theoretical Framework: The Donabedian model of Structure-Process-Outcome was used to guide this project. This model provides framework for assessing healthcare services and quality of care.
Literature Review: Four meta-analysis and two randomized controlled trials were included for review. The pooled analysis demonstrates when combining all surgical services, ondansetron administered prior to spinal anesthesia reduced the incidence of SIH and bradycardia.
Research Design: This retrospective, multicenter, observational project was deemed exempt by the IRB for human subject research. This project reported the practice of ondansetron prophylaxis for SIH and bradycardia and the rate of rescue treatment in obstetric and orthopedic surgery patients at two large facilities.
Methods: This project was conducted at two Providence medical centers in Spokane, Washington. Adult patients undergoing obstetric and orthopedic surgery whom received spinal anesthesia over a 2-year period were included in this project. Ondansetron administered prior to spinal block were considered SIH and bradycardia prophylaxis.
Data Collection: Anonymized data were extracted from the electronic medical record and stored in a secure HIPAA-compliant database. Final data analysis included 3,157 obstetric and orthopedic spinal anesthesia cases over the calendar years of 2018 to 2019.
Results and Data Analysis: The descriptive time series demonstrated a gap in practice between facilities and service lines. The rate of ondansetron prophylaxis at Providence Sacred Heart Medical Center (PSHMC) for obstetric surgery has increased, with the highest quarterly administration rate reaching 73%. Obstetric surgery at PHFH had quarterly administration rates of 12% to 62%. Quarterly administration rates among orthopedic surgery at PSHMC and PHFH were 8% to 21%. Findings revealed rates of rescue treatment for hypotension were higher in orthopedic surgery receiving prophylactic ondansetron.
Discussions and Conclusions: This project demonstrates a gap in practice for prophylactic ondansetron to attenuate SIH and bradycardia. Limitations to this project includes the inability to differentiate the use of ondansetron prophylaxis for SIH or PONV, and confounding factors that may influence the rate of rescue treatment. This project suggests evidence-based practice improvements for the use of ondansetron prior to spinal anesthesia.

Safe Opioid Prescribing Strategies Education

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Introduction: The purpose of this program is to address the present and urgent need for opioid use disorder and mental health resources in relation to proper pain management for rural communities. Selected Advanced Practice Nurse Practitioner students specializing in adult, family anesthesiology are trained to address and safe opioid prescribe. This also examines attitudes and beliefs of opioid use disorder (OUD).

Methods: P: Advanced Practice Nurse Students; I : Safe Opioid Prescribing Prescribing Strategies Education; C: Their pre knowledge and post knowledge O: Improved outcomes. The literature search strategy was performed on three large databases: Cumulative Index to Nursing, Allied Health Literature (CINAHL), Ovid and PubMed (Medline) the search started from 1995 to present. 1995 was selected for the historical stand point of pain being introduced as the "fifth vital sign" (Campbell, 1996). The Boolean search terms sequence was as follows: "Opioid Use Disorder AND Medication Assisted Treatment OR Home Induction OR Buprenorphine OR Self Adherence." The search terms were searched in all fields including titles and abstracts.

Analysis of the Evidence: Training provided an innovative approach to learning using hybrid teaching and multidisciplinary interaction. Online training consisted of pre and post assessment and 9 modules featuring assessments after each module completion before continuing to the next module. Additionally, in person focus groups were completed at the middle and end of training highlighting student feedback, experience, integration of knowledge gained and application during clinical rotation and discussion of current research of OUD.

Recommendation for Practice: Graduate students who completed the online training on pain management and opioid misuse learned to define and classify pain and factors affecting patient response to pain (gender, age, ethnicity, religion, culture and genetics). Evaluation measures include pre and post evaluation assessments with a total of 3,828 data points. Introduction to the pain assessment and management has provided basic principles of pain management in the emergency care setting such as introduction, recognition, and assessment.

Funding Sources: This project is supported by the Health Resources and Service Administration (HRSA) of the US Department of Health and Human Services (HHS) as part of an award totaling $ 1.39 Mil. Grant # T94HP30893.

Serratus Anterior Plane Block vs Thoracic Epidural to Attenuate Post-thoracotomy Pain Syndrome

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Introduction: Inadequate pain management can lead to postoperative thoracotomy pain syndrome (PTPS). In thoracic surgery, placing a thoracic epidural is the golden standard yet this method is prone to errors and complications. Serratus anterior plane block demonstrates less risk of hematoma and inadvertent dural puncture and provides effective analgesia thereby minimizing PTPS.

Methods: The purpose of the review was to answer the following question: "In patients above 18 years undergoing thoracic surgery does serratus anterior plane block versus thoracic epidural analgesia minimize the occurrence of postoperative thoracotomy pain syndrome?" EMBASE, PubMed, and CINAHL databases were utilized. Nine randomized control trials (RCTs), one longitudinal cross-sectional study, and one retrospective study yielded a sample of 1,061 patients. Inclusion criteria comprised evidence published in English from 2010 to present, male and female above 18 years of age, undergoing thoracic surgery, video-assisted approach, and open thoracotomy. This critical analysis was evaluated using the Johns Hopkins Appraisal Tool.

Analysis of the Evidence: Nine RCTs and 1 longitudinal cross-sectional study found that utilization of serratus anterior plane block minimized postoperative pain and attenuated post-thoracotomy pain syndrome and recommended serratus anterior plane block as the preferred technique when thoracic epidural analgesia was contraindicated. All studies showed SAPB provided non-inferior analgesia. One retrospective study found that the use of serratus anterior plane block and thoracic epidural block administration had similar outcomes for post-thoracotomy analgesia.

Recommendation for Practice: Post thoracotomy pain persisting for 2 months is characteristic of PTPS and transpires in as much as 80% of patients following thoracotomy. To ensure adequate pain management postoperatively, the serratus anterior plane block should be considered and favored in cases with PTPS risk factor presentation, including surgical time > 2.5 hours, 60+ age, preexisting pain, and female gender. Evidence supports SAPB for thoracic surgical patients utilizing 20-30 ml of 0.375% ropivacaine placed in the preoperative period. Continuous infusions may also be used. Analgesic efficacy should be monitored for 8 weeks after surgery.

Staff Education on Evidence-Based Techniques and Guidelines for Obstetric Anesthesia

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Introduction: A knowledge gap exists among anesthesia staff at an urban facility concerning best practices for obstetric analgesia. Without sufficient knowledge of the recommended analgesia regimens pain management in the obstetric population may be inadequate leading to poor patient outcomes. Educating anesthesia providers on recommended evidence-based guidelines and techniques may be a solution to this issue.

Methods: PICO: "Will obstetric anesthesia providers, who participate in an educational session on evidence-based techniques and multimodal analgesia guidelines, increase their knowledge surrounding labor and delivery pain management at Norton Women's and Children's (NWC) Hospital?" A review of literature was performed detailing interventions on evidence-based practices for obstetric patients. The search was conducted on PubMed, CINHAL, and Cochrane Library databases. Key terms used included "cesarean section," "multimodal analgesia," "nonopioid analgesia," "regional analgesia," and "evidence-based guidelines." Results yielded 162 abstracts; 18 articles retained for analysis. After evaluation of the literature data were collected and an evidence-based presentation was created for obstetric anesthesia staff at NWC.

Analysis of the Evidence: Inadequate postoperative analgesia is a common cause of poor patient outcomes (Chou et al, 2016). Individualizing the care delivered to the patient utilizing evidence-based techniques and guidelines for pain management enhances beneficial effects in the parturient, including; reduced postoperative opioid consumption, less preoperative anxiety, fewer requests for opioid medications, and reduced length of stay (Booth et al, 2016). Findings in the research provide evidence supporting the efficacy of the dural puncture epidural (DPE) technique, intermittent epidural bolus infusion (IEBI) and multimodal pain regimens for labor and delivery analgesia in the obstetric patient population.

Recommendation for Practice: Anesthesia providers must be knowledgeable of current literature and evidence-based interventions. The DPE technique, IEBI, and multimodal analgesia are recommended for use in standard obstetric anesthesia practice to effectively manage pain in labor and delivery. Following the educational session, participating anesthesia staff agreed that the standardization of the evidence-based interventions into obstetric anesthesia practice at NWC would be beneficial for the obstetric patient population. Evaluation of practice change through follow-up assessments should be conducted after a minimum of 6 months from the educational session to accurately evaluate the impact on clinical practice at NWC.

Standardization of Student Registered Nurse Anesthetists' Competencies in Anesthesia Machine Check Off by Utilization of an Objective Structured Clinical Examination TooL

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Introduction: Since 1990, 35% of gas delivery equipment claims involved an empty vaporizer, incorrect mounting, malfunction, leaks, overdoses of volatile anesthetics, and others. Cases of overdoses and pollution of anesthetic gases have adverse effects on staff and have been linked to improper machine checks. Standardizing education and a universal tool can help prevent these errors and improve patient safety.

Methods: PICOT question: "For the use of simulation, does the use of an objective structured clinical examination tool aid in the proper instruction of SRNAs prior to first clinical rotation?" Literature reviews were conducted using databases such as PubMed, CINAHL, Medline, and Google Scholar. Previous studies, in which simulation-based education and objective structured clinical examination (OSCE) tools were used for education and examination, were included in the review. Other inclusion criteria for articles included peer reviewed journals and scholarly articles that were written between the years of 2010 to 2020. Keywords searched included "anesthesia machine," "checklist," "hazards," "injury," "OSCE," and "simulation."

Analysis of the Evidence: Current literature shows the use of OSCE tools in a variety of different specialties. Studies included in the review show that OSCEs are beneficial for education and examination in Advanced Practice Registered Nurse (APRN) programs, to assess emergency medicine resident competency in resuscitation scenarios, to acquire competency in basic clinical skills and training of medical students, for assessment of trainees in anesthesia, to assess clinical skill performance and competency of nursing students, and for maintenance of credentialing and certification.

Recommendation for Practice: Currently, there is no standardized tool being used in the education of anesthesia machine check offs. FDA recommendations have been established and the development of a standardized tool used in all anesthesia education settings can help in regulating practice for anesthesia machine check offs. Studies have shown OSCE's reliability in education and testing competency. Current recommendations include their use in advanced practice nursing programs, resuscitation scenarios, skill training for medical and anesthesia students, and undergraduate nursing programs. Standardized practice for checking the anesthesia machine can lead to less equipment malfunctions and increased patient safety.

Strategies to Improve Postoperative Handoff Between Certified Registered Nurse Anesthetists and Registered Nurses

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Introduction: A *handoff* is the interprofessional transfer of essential information and responsibility from one healthcare provider to another. Transferring a patient from the operating room to the postanesthesia care unit presents a high potential for communication errors and adverse outcomes. The errors that compromise quality and safety are decreased through education and the standardization of handoff communication.

Literature Review: Lack of structure of postoperative handoff increases mortality and medical costs. An evidence-based approach to healthcare improvement decreases the number of communication errors and increases structure of handoff. SBAR is cited most frequently in the literature as a handoff mnemonic and has shown to improve the structure of postoperative handoff.

Theoretical Framework: The Donabedian Conceptual Model, which incorporates three dimensions into healthcare quality, outlined the structure, process, and outcomes of improving handoff through an educational initiative.

Methodology: This project was evaluated by the Medical University of South Carolina (MUSC) IRB/Quality Improvement Tool. The project was determined to be QI and was therefore not subject to IRB review. Pairing grounded theory research with evidence provided clinically applicable results.

Data Collection and Methods: This quality improvement project implemented an educational presentation to CRNAs and PACU nurses to determine if a structured, evidence-based presentation would result in favorable perceptions of the current handoff process. A needs assessment pre-survey was sent electronically to CRNAs and PACU nurses to assess the frequency that 16 recommended essential elements of postoperative handoff were included in postoperative handoff. Education was provided to CRNAs and PACU RNs regarding survey data and evidence-based guidelines. A post-implementation survey was subsequently sent to collect data on the handoff process following implementation.

Results and Data Analysis: Needs assessment and post-implementation survey data were analyzed to determine whether clinically significant changes resulted from implementation. After provision of education and data analysis, 12 elements were noted to increase in the frequency of inclusion in postoperative handoff. Other conclusions from analysis of comparative data revealed that providing education decreased frequency CRNAs and PACU RNs reported distractions during handoff.

Discussion and Conclusions: Provision of handoff education to CRNAs decreased omission of essential components of handoff and increased situational awareness of postoperative communication. It is recommended that PACU RNs receive handoff education in order to decrease discrepancies and increase structure. Similar projects can be replicated in this facility and others to improve the handoff process and improve patient care.

Sugammadex Effects on Hormonal Contraception: Postoperative Teaching

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Introduction: The use of sugammadex decreases the efficacy of progesterone and consequently increases the risk for an unintended pregnancy. The decision to use sugammadex is not determined until the time of surgery and has led to an inconsistency in sugammadex discharge teaching for women of childbearing age. This issue has led to the need for uniform discharge teaching in women receiving sugammadex.

Methods: Standardized discharge teaching may include the use of verbal and written instructions. Current literature assesses patient understanding and recall of written discharge instructions, supporting the use of written instructions to improve both patient recall and patient understanding. This quality improvement (QI) project utilized a pre-test post-test implementation design with patients and PACU nurses who perform discharge teaching. Implementation included modifications to the institution's written discharge teaching instructions, as well as education to PACU nurses. Data were collected from patients via postoperative phone calls. Data from the PACU nurses were collected via surveys both pre and post implementation.

Analysis of the Evidence: Postoperative patient phonecalls identified a small increase in patient recall of discharge instructions from 5 out 14 (35.7%) pre-implementation to 7 out of 17 post-implementation (41.2%). Nursing staff surveys indicated an increase in the frequency of discharge teaching (34.8% vs 64.2%, $P = 0.024$) and that new discharge instructions contained clear comprehensive information (29.4% vs 75.5%, $P = 0.001$).

Recommendation for Practice: Simplification of sugammadex discharge instructions was achieved using evidenced-based recommendations for electronic discharge instructions and nursing education. This QI project led to more consistent and comprehensive discharge instructions for women who receive sugammadex intraoperatively. As a result of switching to uniform discharge instructions, more patients received discharge teaching from PACU nurses and the percent of patients who recalled this information increased.

The Effect of 100% Inspired Oxygen During Emergence on Post-Operative Pulmonary Impairment

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Introduction: 100% inspired oxygen at emergence from anesthesia remains the standard of care. Nevertheless, literature provides evidence that too much oxygen can produce harm. The purpose of this literature review is to determine if high inspired oxygen during emergence from general anesthesia results in statistically significant increased post-operative lung impairments.

Methods: A search of both PubMed and CINAHL was performed through the Schaffer Library at Albany Medical College between June 2 , 2019 and June 23 , 2019. All studies were randomized controlled trials that evaluated post-operative pulmonary impairment. Participants included any patients undergoing general anesthesia. Outcome measures included atelectasis, partial pressure of oxygen in arterial blood (PaO_2), saturation of hemoglobin with oxygen (SpO_2), and alveolar-arterial oxygen pressure gradient ($AaDO_2$). The study must have been published within the last 10 years, written in English, and utilized human subjects. Studies were excluded if they lacked peer review or clearly defined anesthetic controls and methods. A total of three studies were chosen and will be discussed in this literature review.

Analysis of the Evidence: The three studies included in this literature review compared emergence on high FIO_2 with emergence on low FIO_2 and effects on post-operative pulmonary impairments. Two of the three studies found no differences in primary outcomes while the third study yielded significant differences. Clearly a consensus on this issue in favor of lower oxygen at emergence has not yet been established. Additional prospective RCT's will need to use a larger sample sizes, a stringent inclusion and exclusion criteria, and a fitting anesthetic technique.

Recommendation for Practice: It is the anesthesia provider's clinical decision to weigh the benefits versus potential risks of 100% oxygen. Clearly a consensus on this issue in favor of lower oxygen at emergence has not yet been established for all patients.

The Efficacy of Liposomal Bupivacaine in Controlling Postsurgical Pain, Decreasing Opioid Consumption and Length of Hospital Stay in Lower Extremity Arthroplasty Patients

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Introduction: Adequate pain control is essential for positive clinical outcomes after lower extremity TJA. Standard regimens focused on narcotics can lead to negative side effects, and typical regional techniques may hinder mobility post-op. This review examined if adding liposomal bupivacaine to standard pain regimens decreased post-op opioid consumption and improved clinical outcomes after lower extremity TJA

Methods: The literature review was conducted by searching PubMed, CINAHL, and Cochrane databases. Keywords used were "liposomal bupivacaine," "lower extremity arthroplasty," "opioid consumption," and "length of stay." Articles were excluded if they focused on upper extremity arthroplasty, demographic and cultural factors, administration techniques of infiltration, and if they compared the use of liposomal bupivacaine to peripheral nerve blocks. Articles included focused on comparing clinical outcomes such as post-operative opioid consumption, hospital length of stay, and discharge status for patients undergoing lower extremity arthroplasty with and without liposomal bupivacaine administration.

Analysis of the Evidence: Eight articles were included in the final literature review. Six of the articles described studies that had results showing favorable clinical outcomes associated with liposomal bupivacaine. The results demonstrated that lower extremity joint arthroplasty performed with the addition of liposomal bupivacaine was associated with less post-op opioid consumption, shorter length of hospital stay, and increased likelihood of home discharge. The other two articles had results that did not show statistically significant benefits of using liposomal bupivacaine, suggesting limited advantage for this patient population.

Recommendation for Practice: ERAS pathways, employed by CRNAs, emphasize opioid-sparing, multi-modal analgesia techniques to improve patient outcomes and recovery after surgery. Many studies show that long-acting, continuous-release liposomal bupivacaine is a promising adjunct to current analgesia regimens for lower extremity joint arthroplasty procedures and is associated with decreased post-op opioid consumption and more favorable clinical outcomes. CRNAs should be empowered to advocate for the use of this non-opioid local anesthetic. However, further research is needed to conclusively establish the advantage of its use in this surgical population.

The Impact of Peer Mentorship in the Clinical Setting for First-Year Student Registered Nurse Anesthetists

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Introduction: Student registered nurse anesthetists (SRNAs) consistently report higher stress levels than other graduate-level programs. High levels of perceived stress for SRNAs can lead to negative consequences, such as interference with academic and clinical performance. Peer mentorship offers psychosocial benefits. It promotes positive coping strategies to reduce perceived stress and ease of transition into the clinical setting for first-year SRNAs.

Methods: The purpose of this evidence-based project is to address the clinical question: "For the first-year SRNAs, will a peer-to-peer mentorship with a senior SRNA student compared to no peer mentorship guidance improve the clinical experience by reducing perceived stressors during the first clinical experience?" The literature search included evidence from CINAHL, MedLine, ERIC, Google Scholar, and Academic OneFile, yielding 698 articles after duplications removed. Upon the application of the inclusion and exclusion criteria, 31 studies were analyzed, and eight selected. This systematic review included five qualitative and three quantitative studies, including one randomized control trial. Studies were critically evaluated using the John Hopkins Appraisal Tool.

Analysis of the Evidence: The results of this systematic review consistently provided supportive data for implementing a peer mentorship program for graduate-level students. The review identified four main themes: improvement in skill performance, confidence, mitigation of stressors, and a sense of community support. Eight studies reported psychosocial benefits from graduate-level peer mentorship programs. Six studies found that peer mentorship mitigated stressors with graduate students and reduced anxiety. Student mentors and mentees reported satisfaction with the peer mentorship program.

Recommendation for Practice: Evidence suggests that a peer mentorship program is suited to mitigate stress for first-year SRNAs. Early implementation is essential to acclimatize the students to the peer mentorship program and provide support early for transitioning to the rigors of the anesthesia program. Establishing a trusting relationship with a peer mentor creates a safe, non-retaliatory environment where the freedom to express thoughts, views, and feelings is encouraged, thus reducing stress. A cost-effective approach consists of using volunteers in the Nurse Anesthesia Program to form a peer mentorship program committee and have a mandatory workshop during the first-year students' orientation.

The Use of Nitrous Oxide in Decreasing Pain and Anxiety in Laboring Patients

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Introduction: Pain experienced by laboring women creates stress and anxiety and can lead to dysfunctional labor. Parturients may choose to avoid an epidural for labor pain to avoid side effects. It was unclear if inhaled N_20 would decrease pain and anxiety during labor. This work describes the evidence on the safety and effectiveness of N_20 used during labor and a change in practice based on this evidence.

Methods: The literature databases, Cochrane, PubMed, CINAHL, and Science Direct were searched using keywords from the following PICOT question: "Do laboring patients (P) who are administered intermittent nitrous oxide (N_20) (I) compared to similar patients who do not receive N_20 (C) have less anxiety and pain (O) during the active phases of labor and delivery (T)?" Four randomized controlled trials and one qualitative analysis were critically appraised. Following IRB review and approval, a change in practice was developed and implemented at St. Vincent's Medical Center Riverside in Jacksonville, Florida.

Analysis of the Evidence: The results of these published studies found a statistically significant reduction in labor pain during the active phase of labor in patients that received Entonox. Categories and emergent themes were identified and coded. Of the women who provided clarifying comments, 90% reported high satisfaction with N_20 and 36% rated analgesic effectiveness high. Apgar scores were not statistically significantly different from women who did not receive N_20. Laboring women who used N_20 for pain experienced less pain and increased maternal satisfaction. From the evidence, reported side effects of dry mouth, drowsiness, lightheadedness, weakness, blurred vision, nausea, and vomiting were experienced.

Recommendation for Practice: At St. Vincent's Medical Center in Jacksonville, FL the option for use of Nitronox (N_20) for the management of labor pain and anxiety was implemented. Education was provided to all stakeholders discussing the evidence, the practice change, and the anticipated improvement in patient outcomes. This option for pain control was nurse driven and independent of anesthesia. The informatics team provided an unidentified method to monitor trends in usage. Twenty patients received Nitronox over a 6-month period of time compared to no patient use prior to implementation. More than 50% of patients that used Nitronox reported decreased pain. Fewer patients reported a feeling of "lightheadedness."

The Utilization of Buprenorphine vs Methadone Treatment of Opioid Use Disorder in Pregnant Women: Impact On Neonatal Opioid Withdrawal Syndrome and Duration of Treatment

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Introduction: Opioid dependence in pregnancy poses risk to obstetrical morbidity and mortality. Withdrawal from opioids is not the first line treatment because of risks of acute maternal withdrawal and relapse. Medication assisted treatment with methadone or buprenorphine suppresses withdrawal, minimizes incidence of neonatal opioid withdrawal syndrome, and is the preferred treatment for opioid use disorder (OUD).

Methods: The purpose of this project was to answer the clinical question: "In pregnant women with OUD, does buprenorphine compared to methadone reduce the incidence of neonatal opioid withdrawal syndrome (NOWS) and duration of treatment?" EMBASE, Medline, and CINHAL were utilized yielding 382 articles. Inclusion criteria were studies published in English from 2005 to present, pregnant women, medication assisted therapy with methadone and buprenorphine, and NOWS. Utilization of the Johns Hopkins Appraisal Tool resulted in selecting 8 studies inclusive of 2 randomized control trials, 5 retrospective cohort studies, and 1 prospective study.

Analysis of the Evidence: All studies measuring NOWS treatment times reported a shorter duration in the buprenorphine group. Fischer et al found that neonates born to mothers treated with buprenorphine had an average treatment time of 4.8 days compared to 5.3 in the methadone group. Similarly, Jones et al found that neonates exposed to buprenorphine spent 58% less time in the hospital receiving medication for NOWS than those exposed to methadone (P <0.003125). Buprenorphine reduced incidence of NOWS in all studies except one that reported no significant difference between methadone and buprenorphine groups in the percentage of neonates requiring treatment for NOWS after delivery (P =0.26).

Recommendation for Practice: The United States consumes 80% of the world's supply of opioids and less than 20% of pregnant and non-pregnant women with substance use disorder receive treatment. Buprenorphine should be considered as a primary medication assisted treatment option for OUD in pregnancy. Unlike methadone, buprenorphine requires no clinic visits, making it easy to prescribe and readily available. The empirical evidence showed use of buprenorphine to manage OUD compared to methadone may reduce the rate of NOWS and improve neonatal outcomes. Neonates born to mothers managed with buprenorphine required less treatment time and experience NOWS less often than neonates born to mother managed with methadone.

The Utilization of Intraoperative Dexmedetomidine to Reduce the Incidence and Prevalence of Emergence Delirium or Agitation in ASA 1 or 2 Adult Surgical Patients Undergoing General Anesthesia Diagnosed with Post-Traumatic Stress Disorder

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Introduction: Emergence delirium is noted as an increasing adverse effect of anesthesia among adult surgical patients who have been diagnosed with PTSD. Dexmedetomidine is a highly selective alpha-2 agonist that has shown to reduce incidence/severity of emergence delirium in pediatrics. Further investigation is warranted to determine efficacy in reducing emergence delirium amongst adults with PTSD.

Methods: This systematic review aimed to evaluate the strongest scientific evidence within RCTs to determine the efficacy of intraoperative dexmedetomidine in attenuating the incidence/prevalence of emergence delirium in adults with PTSD and to guide practice recommendations for anesthesia professionals on use as the anesthetic adjuvant of choice for PTSD. Investigators utilized CINAHL, Medline (ProQuest), Medline (Ovid), Ovid Emcare, PubMed, and EMBASE databases to answer the PICO question: "In adult surgical patients diagnosed with posttraumatic stress disorder or PTSD receiving general anesthesia, does the intraoperative administration of dexmedetomidine, compared to other modalities or placebo, reduce the incidence and prevalence of agitation or delirium upon emergence from anesthesia?"

Analysis of the Evidence: To date there are no published RCTs exploring the efficacy of dexmedetomidine as an anesthesia adjunct to attenuate emergence delirium in adult surgical patients diagnosed with PTSD. Research indicates a diagnosis of PTSD independently predicts the frequency of emergence delirium in adult surgical patients. Thus, the studies included in the systematic review encompass an adult surgical population typically deemed at risk for emergence delirium. A combined sample size of 699 adult patients who received general anesthesia were included across nine RCTs. All RCTs concluded that intraoperative dexmedetomidine is effective in reducing emergence delirium in adults receiving general anesthesia.

Recommendation for Practice: Evidence indicates that intraoperative dexmedetomidine is a highly effective adjuvant to attenuate emergence delirium in adult surgical patients receiving general anesthesia. Additionally, correlative data further suggest intraoperative dexmedetomidine as the most effective choice for use in reducing emergence delirium in adults with PTSD. Studies included applied both bolus dosing and continuous infusion with noted success. Based on manufacturers guidelines, RCTs, and the pharmacokinetics of dexmedetomidine, bolus dosing at 1 μg/kg over 10 minutes prior to the cessation of surgery is optimal for use in the reduction of emergence delirium in adults surgical patients diagnosed with PTSD.

The Utilization of Nebulized or Gargled Magnesium to Prevent Postoperative Sore Throat: A Systematic Review

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Introduction: Airway manipulation during direct laryngoscopy and intubation carries an inherent risk of trauma to the vocal cords and surrounding tissue. Postoperative sore throat (POST) prolongs patient length of stay in PACU and increases cost of care. POST leads to undesirable outcomes affecting patient satisfaction. Despite high rates of POST, there is no standard of practice or recommendation in relation to preventing it.

Methods: (P) In adult patients over 18 years of age, undergoing general anesthesia requiring endotracheal intubation, (I) does the application of either nebulized or gargled magnesium (C) compared to standard practice, (O) reduce complaints of postoperative sore throat? A variety of database searches were conducted; PubMed, Excerpta Medical Database (EMBASE), Cumulative Index of Nursing and Allied Health Literature (CINAHL), and MedLine (ProQuest). Combination of search words and application of Boolean operators were executed within each search. Titles and abstracts were examined in correlation to the primary PICO question.A full-text screening process resulted in 10 relevant RCT articles based on meticulous inclusion criteria and exclusion criteria.

Analysis of the Evidence: The systematic review aimed to assess the current RCT regarding the efficacy of magnesium nebulization, gargle, and lozenge prior to intubation with a single lumen tube and to introduce recommendations for anesthesia professionals to utilize to decrease occurrence of POST. Three RCTs showed magnesium gargles 15 minutes prior to intubation significantly reduced POST. Three studies found magnesium nebulization administered over 15 minutes decreased POST. One RCT found magnesium lozenges 30 minutes before intubation decreases incidence of POST. The prophylactic use of magnesium prior to induction of general anesthesia with endotracheal intubation all reduce the occurrence of POST.

Recommendation for Practice: The empirical evidence showed that administration of 225 mg magnesium nebulization, 20 mg/kg magnesium gargle, or 610 mg magnesium lozenges (30 minutes prior) prophylactically 15 minutes prior to inducing general anesthesia with endotracheal intubation in ASA I and II adults is recommended to prevent POST. The results of this systematic review demonstrate the recommendation of magnesium nebulization, gargle, or lozenge administration prior to endotracheal intubation has commending effects on adults in the postoperative period.

The Utilization of Subanesthetic Intravenous Ketamine in Adult Patients with Major Depressive Disorder to Alleviate Depressive Symptomatology

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Introduction: Major depressive disorder (MDD) is a medical illness effecting nearly 300 million people. Despite diverse treatment options available for MDD, 10% to 30% of people do not improve or demonstrate only a partial response to conventional antidepressant treatment. Contemporary research suggests that sub-anesthetic intravenous ketamine is efficacious in rapidly alleviating the symptoms of depression.

Methods: The investigators used CINAHL, MedLine, and EMBASE databases to answer the PICO question "In adult patients with a history of depression (P), does the administration of sub-anesthetic doses of intravenous Ketamine infusions (I) compared to conventional treatment (C) alleviate depressive symptoms (O)?" Studies included for analysis were randomized control trials (RCTs) utilizing only intravenous sub-anesthetic ketamine for the alleviation of depressive symptoms in adult patients published within the past 10 years.

Analysis of the Evidence: A total of 11 RCTs included a total of 545 participants. Current evidence suggests that a single sub-anesthetic intravenous ketamine infusion administered at .5 mg/kg over 40 minutes attenuates depressive symptoms in patients with MDD. Additionally, the same one-time dose was efficacious in decreasing suicidal ideation in MDD patients. Ketamine's antidepressant effects can ultimately be preserved by administering ketamine twice or thrice weekly at a rate of .5 mg/kg over 40 minutes for up to 2 weeks however further research is necessary to identify ketamine's efficacy beyond this time frame

Recommendation for Practice: Sub-anesthetic intravenous ketamine infusions are effective in alleviating the symptoms of depression and have a role in clinical practice as an adjunct to conventional antidepressant treatment modalities. A single ketamine infusion (.5 mg/kg over 40 minutes) decreases suicidal ideation as evidence by a significant decrease in Beck Suicidal Ideation (BSI) scores or Montgomery Asberg Depression Rating Scale- Suicidal Ideation Section (MADRS-SI) scores from baseline. Additionally, ketamine is efficacious in mitigating the symptoms of depression in as little as 2 hours with its greatest effect at 24 hours post infusion. Ketamines antidepressant effects were maintained with repeat infusions.

Use of Caudal Dexmedetomidine as an Adjunct to Local Anesthetic in Pediatric Patients: Worth the Shot?

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Introduction: Caudal blockade is a safe pediatric anesthetic technique with a short duration of 4-8 hours. Studies have shown that adding dexmedetomidine to caudal epidural block may prolong analgesia and decrease rescue analgesics. The purpose of this literature review was to assess the efficacy and safety of caudal dexmedetomidine on analgesia in children undergoing abdominal and perineal surgeries.

Methods: The PICO question was: "In Pediatric Patients Undergoing Abdominal and Perineal Surgeries, Does the Addition of Dexmedetomidine to Caudal Block Have a Greater Effect on Analgesia Compared to Local Anesthetic-only Caudal Block?" A literature search was performed using PubMed, CINAHL, and Cochrane Library databases. Keywords included: "dexmedetomidine," "caudal," and "pediatric." Studies were excluded for publication dates > 5 years, not in English, non-human subjects, adjuncts other than dexmedetomidine, inappropriate surgical populations, and dependent variables other than analgesia and sedation. Seven studies (6 RCTs and 1 meta-analysis) met the inclusion criteria for combined n= 1,282 patients.

Analysis of the Evidence: Three themes emerged: effects of caudal administration (Dcau), Caudal (Dcau) vs. IV (Div) route, and dose-dependent effects of Dcau. Dcau + local anesthetic significantly prolonged duration of analgesia, lowered pain scores up to 6 hours, and decreased the need for rescue analgesic, with no differences in side effects in all studies. There were no significant differences in analgesic effects and rescue analgesia between Dcau + Div. The use of Dcau was associated with lower sevoflurane requirements. In one study, several Div patients developed bradycardia and hypotension. One study showed longer time to awakening with doses 2 μg/kg vs 1 μg/kg Dcau.

Recommendation for Practice: The administration of either caudal or IV dexmedetomidine at doses 1 μg/kg augments the analgesic effects and prolongs the time of caudal blockade without residual motor blockade or hemodynamic effects. This adjunct has the added benefit of reducing anesthetic requirements and emergence delirium in the pediatric population. The anesthesia provider should consider the use of either caudal or IV dexmedetomidine as an adjunct to a caudal anesthetic. Further research on differences between profiles of caudal vs IV administration and larger scale RTCs are recommended.

Use of Quantitative vs. Qualitative Monitoring of Neuromuscular Blockade and its Effects on Post-Operative Respiratory Complications

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Introduction: Residual neuromuscular blockade can result in otherwise avoidable post-operative respiratory complications for patients receiving non-depolarizing neuromuscular blockade (NDMB). The prevalence of rNMB in the PACU setting continues to be as high as it was decades prior despite technologies and medications available to reverse blockade and monitor for full muscle recovery.

Methods: PICOT: "In adult patients undergoing general anesthesia receiving NDMB (P), does the intraoperative use of quantitative neuromuscular monitoring (I) compared to intraoperative qualitative neuromuscular monitoring (C) reduce the instance of respiratory complications (O) in the post-operative period (T)?" A comprehensive online literature search was completed using various medical databases. The most recent and relevant research regarding use of quantitative v qualitative monitoring and respiratory complications were then critically appraised for validity and reliability.The synonyms used to search PubMed, Medline (OVID), CINAHL, and ProQuest Nursing & Allied Health were: "neuromuscular blockade," "residual neuromuscular blockade," "monitoring," "general anesthesia," and "respiratory complications."

Analysis of the Evidence: Use of quantitative v qualitative monitoring intraoperatively results in higher TOFr (>0.9) in the PACU period following extubation. TOFr (<0.9) correlate with decreased PFTs following extubation. rNMB results in multisystem complications: poor patient outcomes, prolonged hospitalization, and higher healthcare costs. A majority of critical respiratory events occur within 15 minutes upon arrival to PACU following extubation and involve a TOFr <0.9. The ASA does not include monitoring of NMB as one of the standard monitors while the AANA recognizes the need for monitoring depth and recovery of blockade. Clinical assessment tools and qualitative devices cannot distinguish acceptable NMB recovery.

Recommendation for Practice: Phase 1:critically appraising EBP research articles relating to rNMB; Phase 2:force field analysis completed with surveys to identify driving/restraining forces for providers accepting/resisting the use of quantitative monitoring in practice; Phase3: assessment of resources available; Phase4: a normative re-educative strategy, to focus on providing EBP information that support the need for a change to occur; Phase5: hands on education sessions, training sessions, online education provided during multiple, arranged meeting times; Phase6:continued education phase as there is a correlation between training and stabilizing change; Phase7: terminate helping process as change becomes standard.

Use of Sphenopalatine Ganglion Blocks for Postdural Puncture Headaches

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Introduction: A postdural puncture headache (PDPH) is an orthostatic headache that develops within 5 days of a dural puncture. There is a 1.5% incidence of accidental dural puncture with epidural placement and 52.1% of these patients end up with PDPH. The gold standard epidural blood patch has a slow onset, is expensive and has several complications. This calls for a faster and more affordable treatment modality.

Methods: PICOT: "In the obstetric patient experiencing a postdural puncture headache, does the use of a sphenopalatine ganglion block, as compared to the administration of an epidural blood patch, caffeine or oral analgesics, provide a faster attainment of lower pain scores?" A search was initiated on the Texas Medical Center Library website, accessing databases such as PubMed, Clinical Key, Scopus, and EMBASE. Key and Medical Heading Subject Terms such as "post-lumbar puncture headache," "postdural puncture headache," and "sphenopalatine ganglion block" were used for the search. The snowballing technique was used to find more articles, and Boolean operators "OR" and "AND" were used to narrow and widen the search respectively. This yielded 4 prospective studies and 3 retrospective case control studies.

Analysis of the Evidence: All 7 articles were given a Grade B rating: moderate net benefit. Primary outcomes measured were pain and vital signs. Better relief was noted with the sphenopalatine ganglion block (SPGB) immediately and up to 1 hour post procedure in all 7 studies ($P < 0.05$). Complete relief was noted with SPGB ($P < 0.05$) in 3 studies. There was a need for second application at 18 hours in 1 study. No differences noted at 24 hrs, 48 hrs, and 1 week post treatment in 2 studies. There were less return visits to the ER with SPGB ($P < 0.005$) in one study. No adverse effects were noted with SPGB in any of the studies, while the epidural blood patch was associated with vaso-vagal reactions, hearing loss, Horner syndrome, etc.

Recommendation for Practice: The sphenopalatine ganglion block is useful in the treatment of PDPH due to its minimal side effect profile, non-invasive nature, and rapid onset. For these reasons, the author would recommend its use in parturient women of Physical status Classification 1 and 2 who have had a dural puncture, are experiencing a PDPH, and have no contraindications for the administration of a SPGB. It is especially useful in patients who are unwilling to undergo the more invasive epidural blood patch. The trans-nasal technique with 2-4 mL of 2% or 5% lidocaine in each nare can be used by the clinician with the patient in supine position, as well as taught to the patient for application at home if headache re-occurs.

Utilization of Ultrasound Technology for Effective Identification of the Cricothyroid Membrane in Obese Patients

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Introduction: Utilization of ultrasound technology for effective identification of anatomical structures is a growing aspect of anesthetic practice. Current literature suggests that an increasing number of providers are finding that such modalities improve accuracy of locating the cricothyroid membrane (CTM) in patients with large neck circumferences versus traditional identification via palpation.

Methods: Both PubMed and Cochrane Library were used to search for articles published from 2012-2020. Within the search, keywords were: "ultrasound," "airway," "cricothyroid membrane," and "obesity." Exclusion criteria included other unrelated airway anatomy identification, non-human studies, commentaries, and computerized tomography studies. Nine studies were included in the final analysis, including prospective observational and randomized controlled studies, among others. Studies investigated accuracy of palpation alone compared to accuracy of ultrasound guided technology to identify the cricothyroid membrane.

Analysis of the Evidence: Current literature demonstrates increased accuracy in identifying the cricothyroid membrane when using ultrasound technology. Several studies included in this analysis showed that an increased neck circumference may create challenging instances for providers using only palpation for locating the CTM. One prospective observational study determined that the cricothyroid membrane was more difficult to identify in females than in males regardless of body habitus; however, only palpation was utilized before comparing with ultrasound. Also, one randomized controlled study found transverse approaches with ultrasound to be significantly faster than the longitudinal approach.

Recommendation for Practice: Evidence has established that utilization of ultrasound technology for identification of the cricothyroid membrane is more efficient than palpation alone. Provider training in the use of ultrasound technology is important for replicating similar results. While results suggest more rapid detection of CTM with ultrasound, further studies are needed to determine if there are better outcomes for patients in emergent airway situations when the cricothyroid membrane is identified via ultrasound.

When After Eight Shows You Ate: Gastric Ultrasound vs NPO Time to Assess for a Full Stomach and Decrease the Risk for Pulmonary Aspiration

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Introduction: Pulmonary aspiration of gastric contents increases the morbidity and mortality of patients having surgery. National mean costs for aspiration totaled $13,500 w/ average hospital stay of 7 days. Fasting guidelines are used to assess aspiration risk but does not guarantee an empty stomach. Gastric ultrasounds allow providers to assess the quality and quantity of contents within the stomach.

Methods: PICO question: "In adult patients having surgery, does gastric ultrasound versus NPO time better assess stomach fullness and risk for pulmonary aspiration?" A search was performed using CINAHL, Embase, and Pub Med with keywords: adult, gastric, ultrasound, aspiration, pulmonary, risk within a timeline from 2014 to 2019. Eighty-one articles were identified through database searching and four from additional sources. Twenty-three articles were excluded due to duplication, 39 articles were then excluded after title/abstract was screened, and 13 articles were excluded after a conducted full text review. The remaining 10 articles are within 5 years of publication and provide relevant information regarding gastric ultrasound use, reliability, and accuracy for measuring gastric contents.

Analysis of the Evidence: Some patients still present as a full stomach despite following fasting guidelines. Fasting more than 6 to 10 hours does not guarantee an empty stomach. Gastric ultrasounds have the ability to determine quality and quantity of gastric content and has proven to be as reliable as gastric scintigraphy; the gold standard for assessing gastric content and volume. These tools provide objective data to assist in guiding anesthetic management and reduce aspiration risks.

Recommendation for Practice: Ultrasounds are a fast, reliable, noninvasive, readily available tool, that enhances safety and individualizes a patient's aspiration risk. This includes prevention of unnecessary expenditure related to aspiration complications. Enhancements in technology has further provided healthcare workers access to an ultrasound small enough to fit in their pockets and provide quality data from the comfort of their phones. Utilizing this tool to perform a brief assessment will further enhance our practice and increase the safety of the patients we serve.

General Posters
Case Report

Airway Management in Patient with Acute Stridor: A Case Study

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Introduction: The recognition of the spatial relationship and the impact on the visualization of vocal cords by both clinical exam and imagining studies are crucial for airway management. Certain medical conditions could be underlying acute symptoms that would become apparent with this knowledge. The following highlights acute stridor with respiratory distress requiring urgent surgical intervention.

Literature Review: The difficult airway has been a source of great debate since the early 90 s. There are strong opinions on airway management. Despite continued research in the area, there is a dearth of convincing evidence indicating a decrease in "can't intubate/ventilate scenarios." Current practice has been influenced by the video laryngoscope's appearance in the early 2000s. There is a lack of its inclusion in all professional difficult airway algorithms—only the Difficult Airway Society has included it.

Description of the Case: A 69-year-old morbidly obese male was diagnosed with COPD and CHF having an elevation of CO_2. Patient was admitted to the hospital for new onset acute stridor. Prior surgical history was remarkable for right vocal cord cyst 7 months prior. Respiratory distress ensued that was not responsive to medical treatment. Imaging demonstrated airway narrowing at the vocal-cord level from a mass of the left supraglottic region. The patient was taken to the operating room while being preoxygenated via nasal cannula enroute. Induction ensued. Videolaryngoscope with a LoPro4 was inserted midline in the oral cavity. A constricted glottic opening was found. The mass was pushing the glottic opening right. A 6.0 laser endotracheal tube was inserted and resistance was met. The ETT was gently pushed through.

Discussion and Conclusions: A preoperative airway assessment and management plan is a critical component of successful securement of the airway. It is imperative that the practitioner know the structures of the airway, which can be partially visible and/or distorted by anatomic structures with underlying disease conditions. Comorbidities could make the patient less tolerant to hypoxia during airway management. Given the case study, further investigation and research should be used to assess the inclusion of the videolaryngoscope in all difficult airway algorithms. Only the Difficult Airway Society has included the videolaryngoscope in their algorithm.

Airway Management of the Noonan Syndrome Patient

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Introduction: Many medical professionals outside of the anesthesia community consider the word "anesthesia" to be synonymous with "intubation." Anesthesia providers are viewed as airway experts that remain collected in the face of adversity. It is paramount to be aware of genetic diseases with airway implications so that providers are prepared with all necessary airway modalities before proceeding.

Literature Review: Noonan syndrome is a genetic disorder with autosomal dominant inheritance. The incidence of Noonan syndrome is 1 every 1,000 to 2,000 births without gender predominance. The characteristics of this disorder include short stature, micrognathia, webbed neck, hypertelorism, congenital heart defects, and other comorbidities. Noonan syndrome's aforementioned characteristics make it a condition of anesthesia and airway consideration.

Description of the Case: A total laparoscopic hysterectomy with bilateral salpingo-oophorectomy was performed on a 40-year-old female. The patient presented with a history of Noonan syndrome, hypertension (HTN), heavy menstrual bleeding, intellectual disability, and iron-deficiency anemia. Due to the nature of the patient's genetic condition, a potentially difficult airway was anticipated. Difficulties were encountered during intubation; however, the airway was secured, and the case proceeded as scheduled. Emergence was smooth, with no complications. The patient did not experience any adverse events or postoperative nausea and vomiting (PONV) in the post-anesthesia care unit (PACU).

Discussion and Conclusions: Patients with Noonan syndrome have the potential to possess difficult airways for ventilation and intubation. The importance of a thorough airway assessment is necessary. Due to craniofacial anomalies, limited mouth opening, webbed neck with cervical spine anomalies, and other characteristics, it may be beneficial to consider awake fiberoptic bronchoscopy before inducing the patient. Patients may also have unseen abnormalities present in the nasopharynx/oropharynx. If the provider decides to advance with direct laryngoscopy, it is suggested to have the difficult airway cart bedside. Regardless of which method of airway management is chosen, it is crucial to be familiar with the various anatomic and physiologic anomalies associated with Noonan syndrome prior to administering any medication.

Case Report: Non-Obstetric Surgery in the Pregnant Patient with Pheochromocytoma

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Introduction: Pheochromocytoma is a neuroendocrine tumor located within the adrenal medulla in 90% of the cases. This rare event during pregnancy (0.2/10,000) has a mortality rate of 50% for the mother and the fetus if left untreated. The aim of this case report is to illustrate the importance of early diagnosis and optimal perioperative management of symptomatic pheochromocytoma during pregnancy.

Literature Review: Based on recent review, there is no definitive consensus on the optimal treatment for pheochromocytoma during pregnancy. Early diagnosis and management reduced mortality for mother and fetus to <5% and < 15% respectively. It can be managed medically or surgically with the definite treatment of surgical removal during the second trimester. It is preferred that medical treatment should be started 10-14 days prior to surgery with alpha- and beta- antagonists and delivery by cesarean section.

Description of the Case: A 39-year-old 10 week pregnant patient with a past medical history of pheochromocytoma presenting for left open adrenalectomy. Computed tomography scan showed a 6.2 × 5.1 × 6.4 cm left adrenal mass. She was preoperatively managed with doxazosin with ongoing symptoms of palpitations, headaches, and diaphoresis. The obstetrician recommended surgery before the 14th week of pregnancy to avoid fetal development complications. The procedure was done under general anesthesia, she was managed with sevoflurane, remifentanil, and dexmedetomidine infusion. Hemodynamic stability was assured with nicardipine, phentolamine, beta antagonists, norepinephrine, phenylephrine, and calcium gluconate. Patient was extubated and transferred to a surgical intensive care unit for post-operative close monitoring.

Discussion and Conclusions: Pheochromocytoma is a serious condition, especially when presented during pregnancy. The definitive treatment for pheochromocytoma is resection of the tumor. The second trimester is the preferred time for surgery, but the final decision is based on patient presentation, and the avoidance of complications for both the fetus and mother. Pheochromocytoma presents a challenge for anesthesia providers due to the intraoperative hemodynamic instability. The main goal of anesthetic management of the obstetric patient is to avoid drugs and events that can lead to sympathetic stimulation. When caring for the obstetric population diagnosed with pheochromocytoma, a multidisciplinary team approach is important for treatment and decision making to ensure the best patient and fetal outcomes.

Dexmedetomidine Versus Propofol for Cardiopulmonary Bypass

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Introduction: Propofol (PROP) and dexmedetomidine (DEX) are both used to supplement anesthesia during on-pump cardiac surgery and have an excellent safety profile. PROP has been used as a part of balanced anesthetic in order to reduce complications such as neurologic insults. DEX has emerged as newer agent that may be superior in providing better hemodynamic stability and reducing neurological complications.

Literature Review: PROP and DEX have not been shown to significantly decrease cerebral tissue oxygenation ($rScO_2$) and are deemed to be neuroprotective. DEX has shown superiority in reducing delirium in postoperative CV surgery patients in a recent systematic review. PROP and DEX do not impact atrial fibrillation incidence, but DEX has been shown to reduce ventricular tachycardia incidence. DEX also causes less hemodynamic fluctuation and overall intraoperative opioid requirements.

Description of the Case: A 68-year-old male is undergoing an elective CABG x 3, on-pump. Preop vital signs and labs were BP 140/87 mmHg, HR 85, O_2 sat 100%, RR 12, temp 36.8°C, 3 vessel disease with EF 65%. An uneventful general anesthesia induction ensued. DEX infusion at 0.3 µg/kg/min and sevoflurane 1.3% were started for maintenance. DEX infusion was titrated during the procedure ranging from 0.1-0.7 µg/kg/hour based on heart rate and blood pressure. Patient maintained $rScO_2$ >50%. Case total for fentanyl was 1,000 µg and sufentanil was 250 µg. After procedure ended, patient was transferred to ICU while ETT in place with DEX infusion at 0.3 µg/kg/hour. and norepinephrine drip at 0.03 µg/kg/min. patient was able to wake up, followed commands, and successfully extubated 2 hours post op. Patient was discharged on POD5 without complications

Discussion and Conclusions: DEX infusion was used for maintenance along with sevoflurane and opioids throughout the procedure. The infusion continued in ICU for post op sedation while patient remained intubated. Patient maintained $rScO_2$ > 50%, did not suffer from arrhythmia, and hemodynamic values were stable. He was extubated within 2 hours after arrival to the ICU. No post-operative delirium was reported. Overall, the patient's outcome in this case report mirrored the literature review of DEX usage in cardiac surgery. DEX infusion during cardiac surgery may be superior to propofol infusion for maintenance of anesthesia. DEX may be offer better prevention of ventricular dysrhythmias, hemodynamic stability, reducing length of mechanical ventilation and ICU stay, and prevention of postoperative delirium.

Erector Spinae Plane Block Use for Postoperative Analgesia in Laparoscopic Cholecystectomy Surgery

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Introduction: Annually, over half a million laparoscopic cholecystectomies (LC) are performed. With more LC being preformed in ambulatory care centers, appropriate postoperative pain control is paramount to patient safety, timely discharge, and satisfaction. In recent literature, the use of the erector spinae plane block (ESPB) has been used to provide analgesia in the early postoperative time frame.

Literature Review: The proliferation of ultrasound has increased regional anesthesia safety and unlocked the full potential of truncal fascial plane blocks. The ESPB is a recently described block with a high safety profile. The ESPB provides somatic and visceral analgesia and alleviates the varied sources of pain after LC. The ESPB has been shown to provide adequate postoperative analgesia by lowering postoperative analgesic requirements and pain numerical rating scores in multiple studies.

Description of the Case: In a Texas surgery center, a 22-year-old female patient presented for a LC. The patient was premedicated in the preoperative area with 10 mg of ketamine and 2 mg of midazolam and positioned for right sided ESPB. A linear ultrasound probe was used to locate the transverse process of T8. A 21Ga. A 10 mm needle was inserted in a caudal direction at a 30° angle until encountering the transverse process. After identification of the fascial plane, 20 mL of 0.5% ropivacaine and 10 mL of 2% lidocaine were injected. After local anesthetic injection, the patient was taken to the OR. After surgery, in the PACU, the patient declined the need for additional analgesics. After displaying stable vitals, the patient was able to ambulate and was discharged home without additional analgesic requirements.

Discussion and Conclusions: Due to the number of outpatient LC, postoperative pain control for LC is becoming vital. The need for expedient but safe discharge emphasizes the need for safe analgesia. The ESPB has been shown to provide postoperative analgesia and decrease opioid usage preventing their deleterious side effects. However, with no current recommendations on optimal vertebral level placement or local anesthetic selection there is a need for future research. Despite current research deficits, there is evidence to suggest patients at high risk for narcotic side effects should be considered for placement of an ESPB before undergoing LC surgery. With the push toward opioid-free anesthesia and the surge of regional anesthesia, the ESPB will continue to evolve and be a valuable tool for anesthesia providers.

High Frequency Jet Ventilation in the Prone Position to Facilitate Cryoablation of a Peri-diaphragmatic Pulmonary Neoplasm: A Case Report

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Introduction: The ablation of peripheral pulmonary neoplasms is particularly challenging as they are subject to diaphragmatic respiratory motion. The complexity is further increased if the lesion is near a delicate intrathoracic structure, such as the pericardium and/or diaphragm. High-frequency jet ventilation (HFJV) has been exclusively used with patients in the supine position.

Literature Review: The only known application of prone high frequency ventilation in the literature is from high frequency oscillatory ventilation for patients with acute lung injury and acute respiratory distress syndrome. Prone positioning of an anesthetized patient on a flat surface can impact pulmonary mechanics, resulting in a significant reduction in respiratory compliance. Paolo et al conducted a study on the effects of respiratory mechanics and gas exchange in appropriately positioned prone patients.

Description of the Case: A 74-year-old female presented with a lung mass. Computed tomography images demonstrated a 2.9 cm solid nodule in the left lower lobe, abutting the diaphragm, and adjacent to the pericardium. HFJV was the best option to provide a quiescent field and facilitate precise probe placement. Prone position was necessary to facilitate the procedural approach.The patient underwent general endotracheal anesthesia utilizing standard monitors. Induction was performed, she was intubated, and a total intravenous anesthetic was initiated.The parameters utilized for HFJV were set for a frequency of 100 breaths per minute and gas jet driving pressure of 15 pounds per square inch. Thereafter, the patient was transitioned to positive pressure ventilation and extubated. The recovery was uneventful.

Discussion and Conclusions: Ablative therapies, specifically, cryoablation offer distinct advantages of precise targeting and real-time visualization of the ablative zone. HFJV is an effective technique that can be used for the percutaneous treatment of peripheral pulmonary neoplasms, as well as lesions abutting critical intrathoracic structures such as the diaphragm, pericardium, and major vessels. Its ability to create a quiescent field greatly assists the interventional radiologist in safely and successfully performing the procedure. Though HFJV is a widely used technique, using it in the prone position is novel in the nonoperating room anesthesia environment. Furthermore, HFJV in the prone position is safe and feasible with the proper positioning.

Intraoperative Management of Hereditary Angioedema Type III

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Introduction: Hereditary angioedema (HAE) type III is a mutation of coagulation factor XII causing overproduction of bradykinin via the kallikrein-kinin pathway. Bradykinin is a vasoactive peptide that causes vascular leakage and swelling of the skin, gastrointestinal tract and upper airway. Treatment includes bradykinin receptor blockers, C1-esterase inhibitors, kallikrein inhibitors and fresh frozen plasma.

Literature Review: Allergists first discovered and formally diagnosed HAE type III in 2000. Previously, HAE was thought to be caused by mutations in the SERPING1 gene. This modification leads to decreased amounts of functional C1-esterase inhibitor and an increased generation of bradykinin. A genetic mutation causes HAE type III and increases activation of FXII. Activated factor XII drives the kallikrein-kinin pathway and generates bradykinin.

Description of the Case: A 61-year-old female with HAE type III underwent surgical removal of a granuloma from her true vocal cord. General anesthesia was induced with intravenous fentanyl and propofol. The anesthesia provider titrated propofol and remifentanil infusions to an adequate depth of anesthesia while allowing the patient to maintain spontaneous respirations throughout the duration of the procedure. The patient did well intraoperatively, but at the end of the procedure she appeared to have some edema around the vocal cords and the glottic opening appeared narrow. The anesthesia provider administered a dose of dexamethasone and the patient was left intubated. Post-operatively, the operating room staff transferred the patient to the intensive care unit for further management.

Discussion and Conclusions: Patients presenting with HAE type III are at increased risk of developing perioperative upper airway obstructions. Clinicians must be prepared to manage the airway conservatively and should have access to appropriate medications to prevent and treat acute angioedema attacks. Early detection and treatment of angioedema attacks can prevent hypoxic events and emergent airway interventions.

Opioid-Free Anesthesia for Shoulder Arthroscopy

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Introduction: Shoulder arthroscopy is known to cause significant postoperative pain. Regional anesthesia has increased, but opioids still play a significant role in pain management commonly resulting in adverse side effects. A multimodal approach to pain therapy targets multiple elements of the pain processing pathway to avoid or drastically decrease opioid consumption and their adverse side effects.

Literature Review: The pain processing pathway is an afferent three-neuron ascending system, with descending modulation from the cortex, thalamus, and brainstem. The four elements of pain processing include: transduction, transmission, modulation, and perception. Various mediators are involved at each element of the pain processing pathway. Therefore, analgesia can be obtained by interfering with specific neuromediators without the use of opioids.

Description of the Case: A right-shoulder arthroscopy with rotator cuff repair was performed on a 54-year-old female at an ambulatory surgery center. Standard beach chair position was utilized for access to the right shoulder. Standard intraoperative monitoring was used. A preoperative interscalene nerve block and multimodal medications were administered prior to surgery. A general endotracheal anesthetic (GETA) was performed using opioid free anesthesia techniques and sevoflurane. Intraoperatively, the necessity for treatment of hypotension made it apparent the multimodal therapies were likely effective. The patient had a stable postoperative course and required no additional medications for pain control. She maintained a verbal pain score of 0 out of 10 until the time of discharge.

Discussion and Conclusions: Effective perioperative pain management is a critical component to recovery for shoulder arthroscopic surgeries. Adequate pain control can optimize postoperative rehabilitation, increase patient satisfaction, and improve functional recovery. Opioid-free anesthesia (OFA) techniques using multimodal analgesia pathways featuring interscalene brachial plexus blocks have demonstrated efficacy in perioperative pain control with a low risk for opioid rescue in properly selected patients, while decreasing adverse side effects associated with perioperative opioid administration. It is also important to remember that OFA does not strictly imply the use of no opioids, but rather the use of opioids as a last line of treatment and not the first.

Perioperative Dexmedetomidine for Analgesia during Burn Excision and Grafting

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Introduction: Patient was a 26-year-old female with 2nd and 3rd degree burns over 95% of her body 1 month prior. She had previously undergone multiple excision and grafting (EG) procedures and was scheduled for extensive EG including bilateral buttocks and bilateral lower extremities. Dexmedetomidine infusion was utilized as a multi-modal approach for pain management.

Literature Review: Dexmedetomidine is an alpha-2 adrenergic agonist which inhibits the presynaptic release of norepinephrine resulting in sympatholysis, analgesia and sedation. Its perioperative use correlates with increased sedation, decreased anesthesia requirements and attenuated surgical stress response. It also enhances analgesia provided by narcotics producing lower total narcotic doses, lower postoperative pain scores, as well as improved patient perception of recovery.

Description of the Case: Patient was premedicated with midazolam 2 mg intravenously (IV), preoxygenated and induced with sevoflurane via tracheostomy, then relaxed with rocuronium. Dexmedetomidine infusion was started immediately after induction at 0.3 µg/kg/hr and along with sevoflurane, remained part of the anesthetic maintenance. Patient also received ketamine 10 mg IV approximately every hour, fentanyl 50 µg IV twice prior to surgical stimulation, and dilaudid 0.5 mg IV once. Total operating room time was approximately 5 hours. Dexmedetomidine was discontinued approximately 2 minutes prior to end of surgery. Patient was reversed with sugammadex and returned to burn intensive care unit with vital signs within baseline and spontaneous respirations via tracheostomy.

Discussion and Conclusions: To quantify the value of inclusion of dexmedetomidine, the anesthetic specific to this case report was compared to the patient's other anesthetics and immediate postoperative period for similar, though less extensive, procedures. To prevent data skew from physiologic changes, these were limited to the two procedures immediately before and the two procedures immediately after said case report. Chart review revealed no other anesthesia provider utilized dexmedetomidine. Consistent with the evidence, on the day dexmedetomidine was used, intraoperative narcotic doses were lower, postoperative pain and Richmond Agitation Sedation Scores were lower, and it was the only day the patient did not require any postoperative PRN pain medication.

Scalp Block for Skull Pin Insertion

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Introduction: Application of skull pins for head stabilization during neurosurgeries of the head and neck may cause an undesirable hemodynamic response despite adequate anesthetic depth on pin insertion. The administration of a scalp block has been shown to effectively reduce the hemodynamic effects of skull pin insertion.

Literature Review: During the last few decades, methods to attenuate the hemodynamic response to skull pin insertion have included opioids, local infiltration, beta blockade, and deeper anesthetic techniques. Review of recent evidence supports that scalp blocks are superior to these methods in not only blunting the hemodynamic response, but providing better analgesia, as well as decreasing the incidence of post-operative nausea and vomiting.

Description of the Case: A 54-year-old male was brought to the operative room for a C3 to C6 laminectomy. After induction of anesthesia, a bilateral scalp block was performed. Five minutes after the scalp block was performed, a skull clamp was applied to the patients head and the patient was rotated from the supine to prone position. A brief increase in heart rate and mean arterial blood pressure were noted with skull clamp application and prone positioning, but hemodynamics returned to baseline within 90 seconds. The patient did not require intraoperative opioids other than 100 µg of intravenous fentanyl used for induction. The patient did not experience an extended period of hemodynamic stimulation requiring the use of beta-blockers or additional narcotics throughout the case.

Discussion and Conclusions: The hemodynamic response produced by application of skull clamps can be detrimental in patients undergoing neurosurgery. An increase in intracranial pressure can increase morbidity in patients with impaired cerebral autoregulation. The application of a scalp block has been compared to historically common methods used to prevent the sympathetic response to skull clamp application. Scalp blocks provide superior attenuation of the hemodynamic response, as well as providing better analgesia, a decrease in post-operative nausea and vomiting, which may all improve overall patient outcomes and reduce morbidity in the neurosurgical population.

Tranexamic Acid for the Prevention of Postpartum Hemorrhage

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Introduction: The purpose of this case study is to evaluate the impact of CRNA-administered tranexamic acid (TXA) post-cesarean section to prevent postpartum hemorrhage. Postpartum hemorrhage is one of the leading causes of maternal mortality in the United States, causing 25% of parturient mortality worldwide. Recent evidence shows that 1 g of TXA 1 - 3 hours postpartum can impact postpartum hemorrhage.

Literature Review: TXA is an antifibrinolytic that has historically been used to reduce hemorrhage in trauma. Two landmark studies, the Senthiles study (n = 4079) and the World Maternal Antifibrinolytic Study (WOMAN) (n = 20,060 women in 21 countries), reported statistically significant decreases in postpartum hemorrhage versus placebo in those receiving 1 g of TXA 1 - 3 hours postpartum. No adverse effects of TXA administration were noted in maternal studies.

Description of the Case: A Gravida 4, Para 3 parturient, 38 weeks, 4 days 4-cm dilation, effacement 100%, history of postpartum hemorrhage (PPH) and placenta previa presented for emergent c section due to failure to progress. Anesthetic plan: monitored anesthesia care (MAC), place continuous spinal-epidural, 0.75% bupivacaine 1.6 mL, yielding T4 sensory level. Post-delivery and cord-clamping 20 units oxytocin administered in 1L lactated ringers. Uterus assessed for size and tone, fundus massaged to express clots, minimal clotting noted. Uterus initially boggy, after 5 minutes of vigorous massage uterus began to regain tone. One gram TXA given prophylactically immediately postoperatively due to patient history. Patient evaluated for additional hemorrhage, overall blood loss 1150 mL, no additional hemorrhage noted.

Discussion and Conclusions: Obstetric patients can have a myriad of health problems that lead to increased PPH. Prophylactic, early TXA administration can reduce maternal mortality due to hemorrhage. Every 15-minute delay in TXA administration has been shown to cause a 10% reduction of benefit against bleeding-related deaths, with no TXA benefit > 3 hours post-delivery. This patient benefited from early recognition of PPH risk and received TXA prophylaxis as supported by current evidence. Therefore, management of parturients with PPH risk factors should include TXA prophylaxis with 1 g intravenously within 3 hours of delivery.

Tranexamic Acid for Total Shoulder Arthroplasty

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Introduction: Total shoulder arthroplasty (TSA) is a common orthopedic procedure. Because anatomic location precludes the use of a tourniquet, managing blood loss is a challenge. Due to the risks associated with historical methods, anti-fibrinolytic agents have seen increased use in this capacity. The purpose of this case report is to examine the efficacy of tranexamic acid in reducing blood loss during TSA.

Literature Review: Historically, permissive hypotension, allogenic transfusion, and hemodilution have been used to manage blood loss during TSA. These methods are not without risk, however, and anti-fibrinolytic agents like tranexamic acid (TXA) have seen increased use as an alternative method of reducing perioperative blood loss. Recent studies have demonstrated that intravenous TXA, given prior to incision, reduces total blood loss, drain output, and lessens postoperative changes in hemoglobin and hematocrit.

Description of the Case: At a rural facility, a 64-year-old female underwent right total shoulder arthroplasty. Standard monitors were applied, and the patient received a standard induction followed by tracheal intubation. The patient was then transitioned into the beach chair position and the surgical site was prepped and draped in sterile fashion. Tranexamic acid 1 gram (g) was administered intravenously (IV) prior to incision. Mean arterial pressure was maintained between 80-100 millimeters of mercury (mm Hg) for the duration of the procedure. The patient received 1000 milliliters (mL) of crystalloid and recorded blood loss was 550 mL at the end of the case. Overnight, post-operative hemoglobin and hematocrit levels remained stable and the patient was discharged on post-operative day two without complication.

Discussion and Conclusions: Demand for TSA is steadily rising; patients undergoing TSA are often older with a variety of comorbid conditions. Due to the risks associated with historical methods, intravenous TXA has seen increased use as a means of reducing perioperative blood loss. Recent literature has examined the efficacy of TXA in this role; findings of these studies demonstrate that when given prior to incision, TXA is effective in reducing total blood loss, drain output, and post-operative declines in hemoglobin and hematocrit values. This approach may be of particular benefit in the older patient population who may poorly tolerate lower mean arterial pressures. Future research may focus on determining the optimal dose of TXA and evaluating its safety in high-risk populations.