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Poster Abstracts

Research

Abstract #1

A Retrospective Study of Initial Safety and Recovery Data in Diverse Procedural Sedation

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Introduction: Increasing patient acuity in the procedural setting demands utilizing drugs that minimize hemodynamic and respiratory impact. Remimazolam, a new ultrashort-acting benzodiazepine, offers a pharmacokinetic and pharmacodynamic advantage over commonly used procedural sedation medication. Limited literature existed beyond pharmaceutical sponsorship and transitioned from weight-based dosing to fixed dosing based on the American Society of Anesthesiologists physical status classification system(ASA-PS). The purpose of this study was to examine real-world utilization of remimazolam in diverse procedural and patient populations to support the development of a nurse sedation protocol with remimazolam and fentanyl utilizing a non-ASA physical status dosing strategy.

Methods: This observational study reviewed charts of 358 adult patients (≥ 18 years) who received remimazolam during procedural sedation administered by anesthesia providers between June 1, 2021, and December 31, 2021. The study protocol was reviewed and approved by the institutional review board. Patient and procedural characteristics were retrospectively extracted through our institution's electronic medical records system and collected using a web-based Research Electronic Data Capture survey. Patients were categorized by the type of sedation medication received, including: remimazolam alone; remimazolam and fentanyl; remimazolam and propofol; and remimazolam and other. Data were analyzed using logistic and linear regression.

Results: A total of 292 patients receiving remimazolam during procedural sedation were included in our analysis. The median time to alert in patients receiving remimazolam alone was 12 minutes (IQR 10, 17) and increased when additional sedation medications were utilized. After adjusting for age, gender, body mass index (BMI), procedure type, ASA physical status, remimazolam total dose, and sedation length, those who received remimazolam alone had a time to alert average of 11.4 minutes (95% CI [2.5, 20.3], $p = 0.012$) faster than those in the remimazolam and other group. Receiving additional sedative medication significantly increased the odds of hypoxia (OR 2.77, 95% CI [1.30, 5.91], $p = 0.008$) after adjusting for BMI, ASA physical status, and total remimazolam dose. There was a 25% increase in odds of experiencing hypoxia for every 5 kg/m2 increase in BMI (95% CI [1.01, 1.54], $p = 0.037$). No breakpoints were noted for time to alert by age or BMI.

Discussion: The present study suggests that remimazolam alone reduced both recovery time

and the risk of hypoxia compared to its co-administration with other sedatives and opioids. Variations in remimazolam dosing were observed to be outside the Federal Drug Administration dosing guidance, yet the safety profile of remimazolam appeared unchanged. Dosing breakpoints were not evident in this study and dosing by ASA physical status score proved to be appropriate in most procedure types; however, existing literature suggest potential options in tailoring dosages based on age or weight. The observed relationships between remimazolam and fentanyl on time to alert and adverse reactions aided in the introduction of remimazolam into the nurse sedation setting. Potential limitations are those inherent to the retrospective nature of our study such as convenience sampling and misclassification bias, and limited sample sizes did not allow for all adjustments within our risk assessment model. This study did not assess the quality of sedation and utilized an unvalidated post-sedation scoring tool. Further studies could explore remimazolam infusion efficacy and dosing and analyze provider patterns and patient response in greater depth.

Funding: This work was supported through funding by the Mayo Clinic Department of Pharmacy for the statistical analysis and interpretation of data.

Research

Abstract #2

A Survey Evaluation of Student Registered Nurse Anesthetists' Knowledge, Experience, and Perceptions of Endotracheal Cuff Pressure Monitoring

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Introduction: Endotracheal cuff inflation and subsequent monitoring practices among anesthesia providers rely heavily on subjective assessments which are unreliable and inaccurate. Objective assessment with a manometer is the recommended best practice and normalization of deviance from this recommendation leads to adverse patient outcomes. It is unclear how well student registered nurse anesthetists (SRNAs) are prepared to implement evidence-based practice (EBP) for cuff pressure assessment. This national survey evaluated SRNA knowledge, experience, and perceptions of endotracheal cuff pressure monitoring practices and manometer use. Barriers to best practice adherence and knowledge gaps were identified to inform recommendations for future nurse anesthesia curricula development.

Methods: Upon review of the literature, the authors developed a 20-question electronic survey. The survey content was assessed by eight subject matter experts using a content validity rating index tool. The target population was nurse anesthesia students/residents graduating from an accredited nurse anesthesia educational program in the United States in 2023 or 2024. The survey link was emailed to 130 program administrators and made publicly available by the Council on Accreditation with a request to forward to the desired audience. The survey was open for one month and de-identified survey results were collected using Qualtrics software. Descriptive statistics attained via SPSS statistical software and thematic analysis of qualitative data were used to analyze survey results from 249 respondents. This project was reviewed and approved by the institutional review board and participants were provided an Exempt Study Information Sheet that explained the project purpose and participant risks and protections.

Results: The 249 SRNA respondents had a varied distribution among the seven different AANA regions of the United States. The two most selected cuff pressure monitoring methods students reported being taught in the didactic setting were manometer use (69%) and pilot balloon palpation (61%). Two-thirds of students correctly identified safe cuff pressure, but only 4% of students answered a series of four knowledge questions correctly and only 29% felt knowledgeable on this topic. In the clinical setting, the most used method to assess cuff pressure was pilot balloon palpation (PBP), followed by injecting a fixed volume of air. The infrequency of manometer use was further explained by 75% of students agreeing that clinical

staff they worked with rarely or never used a manometer and 49% agreeing that they are influenced by what they see staff do in clinical. The primary barrier to manometer use was limited access and secondary barriers were unsupportive work culture, lack of policy, and insufficient education.

Discussion: An education breakdown is evident given that a minority of students use a manometer or feel knowledgeable about cuff pressure monitoring and manometer use, despite receiving education on this topic. Based on survey results, one recommendation to help bridge this gap is to create a standardized educational tool to integrate into didactic and clinical environments. Another is to have faculty demonstrate the inaccuracy of PBP through experiential learning, given that half of students prefer this assessment method. We also suggest developing a proposal to purchase manometers, at least for faculty responsible for teaching this content. Addressing the challenge of limited access is paramount as this is the primary impediment to student utilization. Lastly, preceptor education on cuff pressure monitoring and manometer use could be implemented at affiliate clinical sites by SRNAs, with the help of faculty. This project was limited in that the survey lacked other validity measures and a biostatistician did not review the survey before dissemination, which would have optimized conditions for data analysis. Future research should assess the outcomes of these recommendations once implemented, focusing on a Delphi approach to validate an educational tool, skills check-off, knowledge assessment, and compliance in the clinical setting, and ultimately relating patient outcomes to EBP.

Research

Abstract #3

Bispectral Index (BIS): Does Timing of Commencement of Monitoring Impact the BIS Score Related to Muscle Relaxant Administration?

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Introduction: The Bispectral Index (BIS) monitoring system, approved by the U.S. Food and Drug Administration for assessing anesthesia depth, has shown unexpected BIS value decreases in nonsedated patients following paralytic administration, suggesting that eelectromyography (EMG) data may influence its proprietary algorithm. Our research aimed to answer whether the timing of the commencement of BIS monitoring in relation to the administration of the neuromuscular blocking agents (NMBA) such asrocuronium affects BIS values during the first 10 minutes after anesthesia induction. We hypothesized that starting BIS monitoring after paralysis would avoid "awake" EMG data integration and lead to more accurate sedation levels. This research aimed to enhance anesthesia practices by examining if BIS accuracy is improved when monitoring is delayed until after administering NMBAs, in this case rocuronium.

Methods: Our prospective, observational study used convenience sampling on elective cardiac surgery patients, securing institutional review board approval and informed consent. To detect a clinically significant five-unit BIS value difference pre- and post-NMBA, we calculated a sample size of 15, then doubled it to 30 to offset potential attrition. Two BIS monitors were used in a bifrontal setup. The first BIS monitor was started before NMBA administration, with readings taken every 15 seconds throughout the study. A second monitor started 5-7 minutes post-NMBA, with subsequent readings every 15 seconds for 10 minutes. The study duration was up to 25 minutes. Study variables recorded included BIS, EMG, Spectral Quality Index (SQI), electroencephalogram (EEG) suppression ratio, and asymmetry. Data analysis used a linear mixed model in BlueSky statistics with the BIS value as the dependent variable, “monitor” as the explanatory variable, and “time” as a covariate. Statistical significance was set at $p < 0.05$. A Bland-Altman plot assessed agreement between time-matched pairs.

Results: A total of 22 patients participated in the study. However, two subjects were excluded due to the use of a different paralytic and a sensor failure. According to the linear mixed model, the mean BIS value and EMG value from the second monitor did not significantly differ from the first monitor (for BIS: estimated difference 0.32, 95% CI [-0.10, 0.75], $p = 0.142$; for EMG: estimated difference -0.08, 95% CI [-0.32, 0.15], $p = 0.49$). Results from the Bland-Altman plot showed an average difference between BIS values of -0.32, indicating minimal bias

between the two sensors. The standard deviation of the values was 4.70, with upper and lower limits (95% CI) of 8.90 and -9.54, respectively. The SQI values remained high throughout the study period, implying that the corresponding BIS values are reliable. The study protocol was consistently adhered to for all participants, ensuring the validity of the research.

Discussion: Our study findings suggest that the timing of initiating BIS monitoring in relation to muscle relaxant administration does not influence the BIS value. Thus, obtaining a baseline BIS value before administering NMBA is unnecessary. Clinicians can start BIS monitoring before or after administering muscle relaxants without affecting outcomes. It is important to emphasize that BIS is just one of many tools available, and its usage should be based on a comprehensive evaluation of other relevant patient factors. Relying solely on BIS readings is discouraged due to various considerations, including the balance between the risk of intraoperative awareness and excessive sedation. Clinical judgment and healthcare provider expertise remain vital in ensuring optimal anesthesia management. The study's limitations include the potential bias from convenience sampling and the risk of recording errors from manually entering data from two BIS monitors into a digital spreadsheet. Also, a possible limitation is using diverse induction agents, but the study reflects common practical settings. Future research could explore the effects of BIS monitoring in conjunction with NMBA on minimizing anesthetic use and enhancing emergence and recovery times.

Research

Abstract #4

Deep Sedation with a Natural Airway is a Viable Alternative to General Anesthesia with Endotracheal Tube for Isolated Transcatheter Pulmonary Valve Implantation

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Introduction: The number of invasive cardiac procedures for congenital heart disease performed outside the operating room is rapidly rising and associated anesthetic techniques continue to evolve. There is growing interest in utilizing deep sedation with a natural airway (sedation) rather than general endotracheal anesthesia (GETA) due to the presumed hemodynamic benefits and faster postprocedural recovery, although there is a paucity of data to support these assumptions. In this retrospective chart review, we collected data on anesthetics given to patients undergoing transcatheter pulmonary valve implantation (TPVI) in the cath lab. The primary outcome was the rate of periprocedural complications. We hypothesized that the rate of complications would be lower in patients who had deep sedation with a natural airway compared with those who had GETA.

Methods: We performed a retrospective chart review of 85 patients undergoing isolated TPVI in the cardiac cath lab at a large academic medical institution in the Midwest between May 2018 and March 2023. De-identified data was collected and stored in REDCap software, a secure database. Patient characteristics were compared between anesthetic groups using Fisher exact and Kruskal-Wallis tests as appropriate. Incidence of periprocedural complications was the primary outcome measured. These included access site rebleeding, access site hematoma, unplanned intubation, pulmonary hemorrhage, arrhythmia requiring intervention, intubation greater than 48 hours, cardiac arrest, placement of a pacemaker, and blood transfusion. Complications were analyzed using logistic regression. To adjust for age, a multivariable logistic regression was performed. Secondary outcomes compared between groups using Fisher exact test or Kruskal-Wallis test included procedure and anesthesia duration, vasopressor/inotrope requirement, and recovery disposition.

Results: Out of 85 patients who met the inclusion criteria, 51 received GETA and 34 received deep sedation. Univariable analysis showed significantly more patients in the GETA group who experienced a complication compared to the deep sedation group (41.2% vs. 14.7%, $p = 0.015$). Two patients (5.9%) included in the deep sedation group were converted to GETA due to procedural complications unrelated to respiratory compromise. The median procedure time was 140 minutes for deep sedation and 179 minutes for GETA ($p = 0.010$). The median

anesthesia time was 202 minutes for deep sedation and 251 minutes for GETA (p = 0.001). The use of vasoactive medications was significantly higher in the GETA group (78.4% vs. 41.7%, p = 0.005). There was a higher rate of intensive care unit admissions in the GETA group (74.5% vs. 50%).

Discussion: In this patient cohort, the difference in risk of periprocedural complications in patients with deep sedation with a natural airway compared to GETA was lower. The deep sedation with a natural airway cohort also had shorter anesthetic and procedural duration, and lower rate of admission to a monitored unit. These data support the feasibility of sedation with natural airway as an alternative to GETA for isolated TPVI. A potential weakness of our study is a risk of selection bias of GETA versus natural airway. This was not a blinded study and anesthetic approach was left to provider preference. We hope these results may serve as a basis for stimulating more research. Further prospective study is needed to better understand specific patient factors that might make one approach preferable over the other in specific patient subgroups.

Research

Abstract #5

Empowering CRNAs: Achieving Opt-out from Physician Supervision

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Introduction: In the United States, the anesthesia care team is a widely used approach for providing anesthesia care. This entails a physician anesthesiologist overseeing a maximum of four CRNAs who possess the ability to provide anesthesia autonomously and without supervision. Redundant care is inefficient, leading to higher expenditures and suboptimal staff utilization. CRNAs currently may practice without supervision in 24 states that have opted out of the Centers for Medicare & Medicaid Services (CMS) physician supervision requirements for CRNAs. This article examines the strategies employed by the five states that opted out of these requirements most recently and highlights similarities in the methods they employed and courses of action they pursued. A nationwide opt-out may be achieved through a concerted effort utilizing the input, support, and alignment of various professional organizations, entities, and individuals who represent and/or identify with CRNAs collective interests.

Methods: A comprehensive review of CINAHL, PubMed, Cochrane databases, and grey literature was performed to evaluate the available data on the removal of the supervision requirement. Due to the paucity of information in the literature, a qualitative research approach was conducted using structured interviews of key CRNA leaders from the last five states to have successfully opted out of the CMS supervision requirements. Interviewees were sent a list of 10 questions related to the opt-out. Consent was obtained for audio/video recording. Insights were gathered on the process, challenges, benefits, and outcomes of opting out of physician supervision in these states. Three reviewers then examined the recorded interviews and evaluated them for consistent themes. This article aims to comprehensively analyze the benefits and implications of empowering CRNAs through opt-out from physician supervision. It utilizes data from the literature review and firsthand insights from CRNAs interviewed.

Results: Our literature review and interviews revealed several recurring themes that contributed to the elimination of supervision requirements. Some emerging themes included fostering alliances with hospital associations, endorsement letters from physicians, engagement by members of state associations, fundraising, and the use of lobbyists. AANA's involvement during the process was crucial. They reinforced the benefits of safety, efficiency, and cost-effectiveness, provided mentoring from experts, and financial assistance to increase support from stakeholders.

Discussion: Professional awareness campaigns are necessary to promote accurate information about the role of CRNAs to the public, physicians, and key stakeholders. The regular presence of CRNAs at governor-related events leads to relationship building, establishespolitical ambassadors, and fosters an understanding of the state's political landscape. Coalitions with other healthcare organizations are essential to increase influential power and improve political support. In conclusion, each state pursuing the opt-out must personalize its approach based on its individual circumstances to ensure success. Successfully opting out of the CMS supervision requirements for CRNAs is made possible by coordinated group efforts toward CRNA advocacy among state governmental leadership, PAC funding, lobbying, and forging relationships with healthcare organizations interested in enhancing access to care. The strategy analysis provided in this article could be used by CRNA leaders to create an action plan for policy revision in their states.

Research

Abstract #6

Impact of Preoperative Evaluation (POE) for Patients on Methadone, Buprenorphine, and Naltrexone: A Retrospective Study

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Introduction: The use of methadone, buprenorphine, or naltrexone for chronic pain or substance use disorder (SUD) poses significant perioperative challenges. Due to the complex pharmacology of these drugs, perioperative recommendations continue to evolve; deviations from these recommendations may result in poorly controlled perioperative pain and an increased risk of relapse. Despite the well-known advantages of preoperative evaluation (POE) clinic assessments in other patient populations, the impact of these assessments on patients using methadone, buprenorphine, and naltrexone for chronic pain or SUD remains understudied. This study evaluates the effectiveness of formal POE clinic assessments and their impact on peri- and postoperative outcomes in these patient populations. Additionally, an analysis was performed to assess the use of formal POEs before surgical procedures within this population.

Methods: With institutional review board approval, we completed a retrospective chart review of records of adult surgical patients on methadone, buprenorphine, or naltrexone for chronic pain or SUD between 2010 and 2020 at a large tertiary medical center. We reviewed charts for the following perioperative factors: opioid use, multimodal analgesics, hospitalization length, readmission, pain service consultation, withdrawal, relapse, and incidence of postoperative complications. We defined postoperative complications as cerebrovascular accident, deep vein thrombosis, pulmonary embolism, renal replacement therapy, ICU admission, or in-hospital, 30-day, and 90-day mortality. Patients were dichotomized into groups consisting of those who were assessed and those who were not assessed in a POE clinic for comparisons. A subanalysis was performed comparing outcomes of patients with SUD and chronic pain. Continuous variables were analyzed using linear regression and binary outcomes with generalized estimating equations, and p values of ≤ 0.05 were considered statistically significant.

Results: Of the initial 981 subjects, 714 were included based on a rigorous inclusion and exclusion criteria process to ensure reliability and validity of the study. Of this final population, 228 patients had a formal POE in a clinic while 486 did not. The indication of chronic pain predominated in our study with a population of 572. Opioid doses were converted to oral morphine equivalents (OMEs) and calculated as the sum of operating room post-anesthesia care unit and inpatient. The median OME for perioperative opioids among chronic pain

patients who underwent POEs was 76.1 mg versus 56 mg for non-POE patients (p = 0.087). The odds of receiving perioperative multimodal analgesics were higher among chronic pain POE patients (p = 0.016). The median OME for perioperative opioids among SUD POE patients was 48.1 mg versus 30.1 mg for non-POE patients (p = 0.942). The remaining outcomes did not significantly differ between groups. Although not clinically significant, patients who had POEs in a clinic for both chronic pain and SUD had fewer postoperative complications and fewer readmissions.

Discussion: This study showed that chronic pain patients seen in a POE clinic had significantly more perioperative multimodal analgesic use compared with those not seen in a POE clinic. This suggests POEs aided anesthesia providers in developing a multimodal analgesic approach during patient care. Although this did not reach statistical significance, both chronic pain and SUD patients had fewer postoperative complications and fewer readmission rates when seen in a POE clinic. These are clinically significant as decreasing complications and readmissions benefits patients' health and satisfaction while lowering institutional healthcare costs. Limitations within this study include its retrospective nature, reliance on limited availability and accuracy of data found in chart reviews, and a new electronic medical record system implementation during the study period. This study may lack generalizability due to increased referrals by some surgical specialties, limited diversity due to geographical location, and a smaller sample size after extensive exclusionary criteria. Future studies are needed that include larger sample sizes and increased diversity to examine the impact within these populations. Integration of a standardized POE for chronic pain patients on methadone, buprenorphine, or naltrexone can provide practice guidance to anesthesia providers and improve patient perioperative outcomes and satisfaction.

Funding: The Division of Pain Medicine provided a grant for $8,000 with the Anesthesia Clinical Research Unit.

Research

Abstract #7

Postoperative Nausea and Vomiting (PONV) Prophylaxis in Women Undergoing Laparoscopic Surgery: A Retrospective Study Comparing the Efficacy of Droperidol and Haloperidol

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Introduction: Postoperative nausea and vomiting (PONV) is a common adverse event after general anesthesia. Many drugs are available to prevent PONV, including the anti-dopaminergic drug droperidol. Droperidol usage significantly declined after the Food and Drug Administration issued a black box warning in 2001. Subsequent drug shortages forced many facilities and individual anesthesia professionals to replace droperidol with haloperidol to prevent and treat PONV. However, the efficacy of haloperidol as a replacement for droperidol in patients at moderate to high risk of developing PONV is not well studied. Therefore, the objective of this study was to compare the efficacy of haloperidol and droperidol for PONV prevention in adult female patients undergoing laparoscopic surgery.

Methods: After institution review board approval, a single-institution retrospective quantitative study was performed in adult (age ≥ 18) female patients who had general anesthesia for laparoscopic surgery between January 1, 2019 and July 1, 2022 and received droperidol or haloperidol for PONV prophylaxis. Patients who received total intravenous anesthesia were excluded from this study. All clinical outcomes, such as length of surgery, opioids used, antiemetics received, and postanesthesia care unit (PACU) length of stay, were obtained from the electronic health records. PONV was defined as requiring rescue antiemetics in the PACU setting. Groups were compared using the two-sample t-test (or rank-sum test) for continuous variables and the chi-square test for categorical variables.

Results: Upon completion of the chart reviews, 1,679 eligible patients were divided into two groups: 539 had received haloperidol and 1,140 had received droperidol. Demographic comparisons showed no significant differences in body mass index, ASA physical status, PONV history, anesthetic choice, and total opioids. However, age, smoking status, additional antiemetics, and surgery length differed significantly among the two groups ($p < 0.05$). Those who received haloperidol exhibited a higher PONV incidence (11.5% vs. 7.4%; $p = 0.003$). Patients who received haloperidol demonstrated higher mean PACU Richmond Agitation-Sedation Scale values (-1.35 vs. -1.55, $p < 0.001$) and PACU pain scores (5.0 vs. 4.6, $p = 0.034$). Those who received haloperidol also exhibited higher mean total PACU opioids (9.07 vs. 7.66, $p = 0.012$) and longer PACU stays (109.8 vs. 95.54, $p < 0.001$). Additionally, those who received

haloperidol had 61% greater odds of PONV than those who received droperidol (OR 1.61, 95% CI [1.13, 2.28], $p = 0.008$). Other variables showed no significant influence on PONV.
Discussion: This retrospective study was designed to identify differences in PONV rates between droperidol and haloperidol in female patients undergoing general anesthesia for laparoscopic surgery. The results show that haloperidol is less effective than droperidol in the population studied. Although this retrospective study is limited to a single institution, it is the most extensive study performed comparing droperidol and haloperidol to date. The results of this study provide a step toward better understanding the efficacy of different anti-dopaminergic drugs for preventing PONV. Future trials should explore optimal antiemetic combinations and dosages to further inform clinical practice.

Research

Abstract #8

Postoperative Nausea and Vomiting Following Gender Affirming Surgery: A Case-matched Controlled Study

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Introduction: People who are transgender/gender diverse (TGD) have gender identities and expressions that do not align with societal stereotypes for sex assigned at birth. Gender-affirming hormone therapy (GAHT) may be used for TGD patients seeking gender-affirming care. TGD patients assigned male at birth (AMAB) take anti-androgen medications, estrogen and occasionally progesterone hormones, while TGD patients assigned female at birth (AFAB) take testosterone. Female sex is a major risk factor for postoperative nausea and vomiting (PONV), and it is unclear if estrogen plays a role in that risk. There is also a paucity of evidence in the medical literature to determine if GAHT influences the risk of PONV for TGD surgical patients compared to cisgender patients. The aim of this study was to determine rates of PONV in TGD patients on GAHT compared to cisgender patients undergoing similar procedures.
Methods: This retrospective chart review was approved by the institutional review board. We identified TGD patients from 2018 to 2023 who underwent surgical procedures at our quaternary academic medical center. TGD patients who had undergone facial feminization, genitourinary or chest procedures were matched to cisgender patients who had undergone similar surgical procedures based on age, duration of procedure, year of procedure and smoking status. Rates of PONV were analyzed for TGD AMAB patients, TGD AFAB patients, and the matched cisgender patients. The incidence of PONV was analyzed and compared between the TGD and cisgender patients. The analyses were performed using generalized estimating equations with a logit link and robust “sandwich” covariance estimates. Results were summarized by the point estimate and 95% confidence interval for the odds ratio. Both univariable analyses and multivariable analyses were performed with covariates included for variables with an absolute standardized difference > 0.1. Due to the small number of events, a covariate-adjusted analysis was not performed when comparing TGD AFAB vs cismale patients.
Results: A total of 397 TGD AMAB and 194 TGD AFAB patients were matched with cisgender controls. To improve validity of results, PONV rate and risk were compared between TGD patients and both cismale and cisfemale control groups. Rates of PONV were similar among all groups. Patient and perioperative characteristics were analyzed via standardized mean difference (Std-Diff). Std-Diff was < 0.5 in all categories except ≥ 3 prophylactic antiemetics

administered; more were administered to cisfemales and TGD AFAB. To determine risk of PONV, logistic regression was performed with and without adjustments for covariates to improve reliability. Data was reported as odds ratios and 95% confidence intervals. TGD AFAB and cismales were compared without covariate adjustment analysis due to low events of PONV in the cismale control group. Both unadjusted and adjusted analyses did not find evidence that PONV risk differed between cisgender and TGD patients ($p > 0.41$ for all unadjusted and $p > 0.22$ for all adjusted comparisons).

Discussion: This study's results imply that anesthesia providers should consider sex assigned at birth when evaluating risk factors for PONV. The area postrema has an incomplete blood-brain barrier which can detect emetogenic agents in both the blood and cerebral spinal fluid and in response initiates a vomiting reflex. The neurons in this area are rich in androgen and estrogen receptors. The area postrema in females compared to males has greater numbers of neurons with estrogen receptors. However, manipulation of female sex hormones in adult female rats does not affect the number of these receptors. These receptors may not be influenced by exogenous hormone therapies in humans either. This could explain why GAHT does not affect rates of PONV in the TGD population. Limitations of this study include the following: Indirect measures of the incidence of PONV were used; 1:1 and exact surgical type matching were not possible for all study participants; and GAHT was used for some but not all TGD patients before surgery. In addition, PONV/motion sickness history is a significant risk factor not used in comparison. A prospective randomized control study where data collection of PONV incidence is directly recorded and variables such as prophylactic antiemetic administration, PONV/motion sickness history, and GAHT are factored into the selection process may provide more conclusive evidence.

Research

Abstract #9

Postoperative Sedation on General Care Wards: A Retrospective Cohort Study

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Introduction: The association between patient/procedural factors and residual sedation during anesthesia recovery in the postanesthesia care unit (PACU), as well as episodes of respiratory depression in the PACU and on general care wards, has previously been described and associated with adverse events. However, the association between patient/procedural factors and sedation that manifests on general care wards after discharge from the PACU has not been studied in large patient cohorts. Identifying such factors and comparing outcomes in a large cohort may help improve postanesthesia care. Therefore, we aimed to 1) evaluate the incidence of sedation in adult patients on general care wards following PACU discharge after general anesthesia, 2) assess associations between patient/procedural factors and risk of sedation in the general care ward, and 3) compare outcomes among patients with and without sedation in the general care ward.

Methods: This study was performed at a large tertiary medical center between 2018 and 2020 and approved by an institutional review board. We completed a retrospective chart review of 23,766 patients ages 18 and older who underwent procedures requiring general anesthesia and were discharged to a general care ward following PACU recovery. Discharge scoring, including Richmond Agitation Sedation Scale scores for patients who moved from the PACU to a general care ward, as well as perioperative clinical factors related to acute decompensation within 72 hours of PACU discharge, were reviewed. Data were summarized as median for continuous variables and frequency (%) for categorical variables. Patient and perioperative characteristics were analyzed separately using rank sum or x2 tests, as appropriate. Multivariable logistic regression was used to assess the association between clinical factors and sedation in the general care ward. Postoperative outcomes were compared between ward sedation and without ward sedation groups. A p value < 0.05 was used to denote statistical significance.

Results: A total of 23,766 patients met inclusion criteria, of which 1,131 (4.8%) fit the definition of postoperative ward sedation, an incidence of 4.8 (95% CI [4.5, 5.0]) per 100 patients who had undergone procedures with general anesthesia. These patients were admitted to a general care ward. Half of ward sedation cases occurred within 32 minutes of PACU discharge and 60.4% of cases occurred within the first hour. Patient factors associated with ward sedation included female sex, low body mass index, diabetes, and kidney disease. Procedural factors

associated with ward sedation included general surgery, procedure > 4 hours, increased fluid administration, and use of gabapentinoids. Risk of residual sedation in the general care ward increased with the depth of PACU sedation. Adverse events requiring an emergency intervention were noted for 418 patients and were more common among patients with sedation on the general care ward (8.1%) than those without (1.4%, $p < .001$). Total hospital length of stay and mortality were greater among patients with ward sedation compared to those without.

Discussion: During our study, most ward sedation events occurred shortly after PACU discharge suggesting that ward sedation is likely linked to residual anesthesia effects and/or the administration of sedating medications in the PACU. Deeper sedation during PACU recovery was closely associated with increased risk of sedation in the general care ward, and patients with ward sedation had higher rates of adverse events and worse outcomes. Moreover, adverse events in patients with ward sedation were often attributable to comorbid conditions, suggesting that comorbid conditions and procedural adverse events may increase the propensity for ward sedation. Therefore, the presence of deeper levels of PACU sedation should be conveyed to the accepting ward to alert staff and enhance monitoring during the early hours after transfer. Our observations are limited to those of a single quaternary medical center where monitoring for levels of sedation may differ from other practices. Our findings provide information regarding the significance of discharging sedated patients from PACU to general care wards and this message has universal implications for postoperative care. These results warrant further investigation to determine if a change in practice, such as mandating extended PACU duration for sedated patients, would reduce the incidence of sedation and/or adverse events in the general care ward.

Funding: Department of Anesthesiology and Perioperative Medicine, Mayo Clinic

Research

Abstract #10

Substance Misuse and Drug Diversion Among Anesthesiology Professionals: Implementation of an Educational Intervention for SRNAs and Their Support Systems

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Introduction: Anesthesiology professionals are at a greater risk for substance misuse and drug diversion compared to the general population and other practice specialties due to high stress levels, increased access to highly addictive medications, and potential environmental sensitization to their effects. The impaired individual is often the last to recognize the problem, making it essential that relatives, friends, and coworkers understand symptom recognition and how to seek help. The purpose of this project was to pilot an educational intervention for student registered nurse anesthesiologists (SRNAs) and members of their support systems that focuses on substance misuse and drug diversion among anesthesiology professionals to improve knowledge of symptom recognition and likeliness of reporting suspected individuals.
Methods: In July 2023, a descriptive comparative study was conducted at a large university in the northeast region of the United States. After obtaining approval from the institutional review board, SRNAs at the university were recruited to participate via email. Using snowball sampling, each SRNA had the opportunity to invite a member of their support system. The educational intervention included a live presentation of Rodrigo and Claudia Garcia's lecture "Catch Me if You Can: The Impaired Provider." Pre- and post-electronic surveys collected data about perception, knowledge, and likeliness of reporting impaired anesthesiology professionals. Participation was completely voluntary and all information collected was anonymous. Indirect identifiers were used to compare pre- to post-surveys. Descriptive statistics were utilized, and analysis was conducted using the Wilcoxon signed-rank test. Qualitative data were reviewed for initial themes then coded and sorted appropriately.
Results: Sixty-seven paired pre- and post-surveys were analyzed. Post-surveys demonstrated a statistically significant change ($z = 2.4$, $p < .02$) related to overall perception of substance misuse to reflect that it is both a choice and a disease. There was also a significant increase in participant knowledge of steps they can take to improve the safety of an impaired anesthesiology professional ($z = -770$, $p < .001$). The most impactful component for participants was hearing the speakers' personal testimony and 100% of participants found it valuable to receive education from a CRNA who had both personal and professional experience with this topic. After review by six faculty members and experts in the field, the survey tool's system content validity index calculation was 0.98, solidifying its validity (> 0.79).

Discussion: Overall, the results showed a significant positive improvement in the participants' perception, knowledge, and likeliness of reporting, indicating that the intervention was a productive way to teach about this topic. Additionally, the number of participants who believed they were somewhat or very likely to misuse substances or divert drugs in their lifetime doubled (n = 8). This increase demonstrates a deeper awareness of susceptibility in the profession. Finding ways to encourage reporting rather than stigmatize the act will help provide a safer environment. The primary limitation of this study was that the influence of the intervention was measured immediately following its conclusion. It is possible that participants' long-term knowledge will vary. The strength is that to our knowledge, this is the first study to measure these particular domains regarding SRNAs and members of their support systems. There is ample room for future scholarship with the results of this study. Replicating this study at other programs would allow for enhanced generalizability. Most importantly, individual institutions should strive to establish a universal policy for reporting impaired providers. This intervention exceeded COA requirements and helps establish a formal program to serve as a model for nurse anesthesia programs across the country.
Funding: AANA Foundation Art Zwerling Memorial Fund

Research

Abstract #11

The Effect of a Mindfulness Application on the Perceived Stress and Anxiety of Nurse Anesthesia Students

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Introduction: Nurse anesthesia education places high demands on students (Foley, 2021), creating stress and anxiety that can impact their success (Mesisca, 2021). Researchers have identified the short-term benefit of mindful meditation using a mindfulness app. Although some research has focused on the health and well-being of graduate students (Hoying et al., 2020), there is a paucity of research specifically with nurse anesthesia students (Foley, 2021; Mesisca, 2021). This research is important because there are no identified published studies that have tested the longitudinal effectiveness of a mindfulness application over a sustainable period of time. Framed in Watson's caring theory, the research question posed for this study was: What is the effect of a mindfulness application on the perceived stress and anxiety of nurse anesthesia students.

Methods: A quantitative comparative research design was used to determine the effect of a mindfulness meditation application, Mindshift, on the perceived stress and anxiety of student registered nurse anesthetists (SRNAs) over time. The stress and anxiety subscales of the Depression Anxiety Stress Scale 21 (DASS-21) were used to measure the effectiveness of the intervention. After institutional review board approval was obtained (NSULA: 23-013), the 2024, 2025, and 2026 SRNA cohorts were invited to participate in the study (N = 56). Thirty-six students (64.3%) agreed to participate, completing the electronic informed consent and the electronic DASS-21 baseline measure. The Mindshift app was downloaded from the app store onto their personal devices and the mindfulness meditation exercises were integrated into their daily routine. The stress and anxiety subscale of the DASS-21 was repeated at 1 month, 3 months, and 6 months, with 31 students completing all measures (86.1%). The difference over time was computed using a repeated measures analysis of covariance (ANCOVA).

Results: Instrument reliability and validity was reconfirmed (stress: $\alpha = .890$; anxiety: $\alpha = .788$; $\chi 2 = 232.898$, $p < .001$). There was no difference in the student's stress over time ($F = 2.62$, $p = .079$, $\eta 2 = .086$). When the intervention was considered, stress decreased at the 3-month ($F = 4.497$, $p = .014$, $\eta 2.138$) and 6-month ($F = 7.998$, $p < .001$, $\eta 2 = .222$) intervals. Post-hoc analysis revealed no change between baseline and 1 month ($p = .245$) but improved from 1 month to 3 months ($p = .014$), 1 month to 6 months ($p < .001$), and 3 months to 6 months ($p = .007$). There was no difference in the students' anxiety over time ($F = .326$, $p = .683$, $\eta 2 = .011$) or at the 3-month interval ($F = .647$, $p = .488$, $\eta 2 = .024$), but anxiety decreased at the 6-month

interval (F = 4.686, p = .004, η2 = .143). Post-hoc analysis revealed no change between baseline and 1 month (p = .261) or 1 month to 3 months (p = .132). However the students' anxiety significantly improved from 1 month to 6 months (p < .001) and 3 months to 6 months (p = .014).

Discussion: The DASS-21 demonstrated good reliability and validity with this sample. The mindfulness meditation intervention reduced perceived stress and anxiety levels over time. The gradual decline in stress and the delayed improvement in anxiety suggest that continuous interventions are needed to achieve positive results. It is recommended that mindfulness meditation techniques are integrated into the curriculum highlighting the importance of longitudinal interventions. Faculty should also assess student well-being throughout the program at specific intervals and maintain open communication channels that encourage students to express when they are feeling stressed. One limitation of the study results is that application use was self-reported and a larger, more diverse group of SRNAs would enhance generalizability. Another limitation is that factors in the environment could have caused the decrease in the SRNAs' stress and anxiety rather than the use of the Mindshift app. Future researchers should consider the intensity and duration of the intervention, whether a supervised meditation is more effective than an app, and how personality traits and cultural variations could affect results. In conclusion, the mindfulness meditation intervention reduced perceived stress and anxiety levels over time, highlighting the importance of sustained interventions.

Funding: Northwestern State University of Louisiana Ray P. Oden Endowed Professorship

Research

Abstract #12

The Impact of Maternal Obesity and Additional Surgical Factors on Cesarean Delivery Duration

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Introduction: Maternal obesity rates are increasing, and obesity is associated with substantially higher cesarean delivery (CD) rates with higher risk of surgical complications. CD procedural time and anesthesia time likely increase as patient body mass index (BMI) increases and consequently may influence neuraxial technique selection. We hypothesized that obese patients undergoing scheduled CD would have longer procedural times compared to nonobese patients. Additionally, we theorized that a history of prior CD and/or performance of a concurrent procedure, such as salpingectomy, would also likely increase procedural duration time. Understanding the influence of these factors on CD procedural times can support anesthesia providers' clinical decisions and assist in determining the optimal anesthetic technique in these patients.

Methods: Approval was obtained from the Mayo Clinic Institutional Review Board for a single center retrospective superiority study completed at Mayo Clinic Rochester (MCR) and Mayo Clinic Health System (MCHS) through review of electronic medical records of patients undergoing scheduled CD from June 2018 through October 2022. Inclusion and exclusion criteria were implemented, and additional obstetric conditions were evaluated. A meaningful change in time was defined as 15 minutes or greater. Groups were defined by BMI using mean (SD) for continuous variables and count (%) for categorical variables. Comparisons across groups were performed using analysis of variance (ANOVA) for continuous variables and the chi-square test, or Fisher's exact test, for categorical variables. Analyses were performed separately for MCR and MCHS.

Results: A total of 4,304 patients were included. Concurrent procedures were received by 15% of MCR patients and 27% of MCHS patients. A spinal was used in 82% of MCR patients and 99.7% of MCHS patients. The mean (SD) procedure time for MCR was 84 (21) minutes and 66 (17) minutes for MCHS. Patients with a BMI of 24.9 or less had a mean (SD) procedure time of 81 (20) minutes at MCR and 60 (15) minutes at MCHS. Patients with a BMI of greater than 50 had mean (SD) procedure times of 100 (23) minutes at MCR and 78 (18) minutes at MCHS. Increases in BMI independently increased overall case duration, block placement to incision, incision to delivery, and delivery to closure (all $p < 0.001$). Increase in number of prior CDs increased these times ($p < 0.001$) except for block completion to incision time. Concurrent

procedures increased overall case time and delivery to closure time ($p < 0.001$). Combined spinal-epidural (CSE) was utilized most often in patients with a BMI of 50 or greater; only 42% received a spinal as the primary anesthetic. The time to completed neuraxial technique increased as BMI increased.

Discussion: Maternal obesity offers unique challenges and risks. Obese women undergoing CD have longer procedure times. Contributing factors include BMI, number of previous CDs, and concurrent procedures. Results concluded that spinal anesthesia is adequate for most CDs and is least challenging to perform in obese patients with a BMI less than 50. Use of CSE should be considered for patients with a BMI of 50 or greater to prolong anesthesia when increased case duration is predicted. The information obtained from this study will support evidence-based clinical decision making for anesthesia providers. The limitations of this study include the use of a retrospective study design. In addition, we were unable to determine the rationale behind anesthetic choice this is provider dependent and not documented. We were also unable to determine maternal satisfaction with the anesthetic technique chosen. Supplementary data that were not collected and may prove beneficial in further research are the administration of supplemental anesthetics during CD. We defined conversion to general anesthesia as endotracheal tube placement, although further analysis may find a portion of patients receive multi-modal adjuncts during CD. Additionally, the patient population included in this study may not translate to all patient populations based on individual institution logistics and OB provider procedural preferences.

Funding: Mayo Clinic Small Grant: Clinical & Translational Science Award (CTSA) UL1TR002377 from the National Center for Advancing Translational Sciences (NCATS)-National Institutes of Health (NIH).

Research

Abstract #13

The Reproductive Consequences of Sevoflurane in Male Drosophila Melanogaster

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Introduction: Sevoflurane has an established safety profile for clinical use, yet its long-term effects on reproduction in anesthesia providers remain unclear. Emerging evidence suggests a link between chronic exposure to anesthetic gases and reproductive risks, such as altered offspring sex ratios (OSR) and increased rates of spontaneous abortions. Current research primarily focuses on the reproductive impacts on females, leaving the effects on males largely unexplored. Moreover, the bulk of existing research relies heavily on observational studies, lacking experimental investigation. Consequently, it is necessary to address this research gap with laboratory experimentation. This study aims to extend existing research by simulating occupational exposure to sevoflurane in male Drosophila melanogaster, focusing on potential alterations in OSR and offspring counts.

Methods: An experimental laboratory research design was employed to evaluate the reproductive effects of sevoflurane in male Oregon R Wildtype Drosophila melanogaster. The study had two phases reflecting conditions faced by anesthesia providers: acute exposure to 2% sevoflurane for 30 minutes and chronic exposure to 0.1% sevoflurane for 7 hours divided over 4 days. Control groups were exposed solely to ambient room air. Drosophila were paired for mating in food vials, each containing one male and one female. Virgin females were used to ensure reliability in offspring attribution to a specific male. After 7 days, mating pairs were removed. Offspring were counted and sexed daily for 7 days. Total number of offspring was analyzed via independent t-test. OSR data were evaluated using both Fisher's exact test and Mann-Whitney U test. Offspring were also subjected to quantitative polymerase chain reaction (qPCR) analysis to examine changes in slowpoke (slo) gene expression. qPCR data were subjected to analysis of variance (ANOVA) testing for interpretation. An alpha level of 5% was used to denote significance.

Results: No significant differences were found in total number of offspring following acute (p = 0.46) or chronic (p = 0.90) exposure to sevoflurane. Evaluation of OSR data revealed no statistically significant differences after acute exposure to 2% sevoflurane (Fisher's exact p = 0.38; Mann-Whitney U p = 0.29). Chronic exposure to 0.1% sevoflurane was found to significantly skew OSR toward female offspring (Fisher's exact p = 0.0018; Mann-Whitney U p = 0.017). Incidentally, it was discovered that chronic exposure to sevoflurane increased parental male mortality (Fisher's exact p = 0.048; relative risk = 4.5). Notably, qPCR analysis discovered

that chronic exposure to sevoflurane also significantly reduced slowpoke gene expression in the progeny of exposed males (ANOVA $p < 0.0001$).

Discussion: The data evaluating the reproductive impact of sevoflurane in male Drosophila uncovered notable insights. While acute exposure did not affect offspring numbers or OSR, chronic exposure led to a significantly higher proportion of female offspring, hinting at long-term effects of sevoflurane on male reproduction. Changes in slo gene expression in progeny of sevoflurane-exposed males suggest influences of this anesthetic on a cellular level. This aligns with the developmental instability theory, suggesting stressors such as occupational exposure to sevoflurane may have epigenetic impacts. The data emphasize the importance of vigilant handling of gases, active checking for leaks and proper scavenging, and minimizing exposure to anesthetic gas, particularly for those who are pregnant or trying to conceive. Despite limitations such as a novice research team, time constraints, and limited sample size, these findings underscore the importance of stringent guidelines governing sevoflurane exposure and further research to explore reproductive and genetic consequences of this gas. Future studies should enhance experimental design, explore exposure of females or gravid flies, investigate the effects of varied chronic exposure timeframes, seek further insights into epigenetic alterations, and extend research to mammalian models for a comprehensive understanding of sevoflurane's reproductive impacts.

Research

Abstract #14

The Role of Stigma in Cannabis Use Disclosure: An Exploratory Study

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Introduction: Despite increasing cannabis use, societal acceptance, and changing legislation, cannabis remains federally illegal in the United States. This study investigates the frequency of cannabis use disclosure in healthcare, considering the impact of stigmatization. Examining four stigma domains (perceived, anticipated, enacted, internalized), the study aims to enhance understanding of providers' challenges in delivering collaborative and informed patient care.

Methods: The Northeastern University Institutional Review Board (IRB# 22-06-17) granted exempt status for this study under DHHS Review Category #2 and revised common rule 45CFR46.104(d)(2)(ii). Employing a descriptive exploratory design, data collection utilized an anonymous online national survey with a convenience sample recruited through electronic media from July to December 2022. Participants were adults (> 21) who self-identified as cannabis users and had accessed the U.S. healthcare system within the last five years. The survey covered demographics, cannabis use, and disclosure patterns. Stigma was measured using modified SU-SMS and SASSS scales. Ordinal logistic regression models evaluated associations between cannabis use disclosure patterns and stigma categories, assessed through chi-squared or Fisher's exact tests.

Results: Data from 249 respondents revealed that 57.1% initiated cannabis discussions with healthcare providers. In 27.8% of cases, cannabis was never discussed, and providers initiated discussions only 15.1% of the time. Anticipated stigma 95% CI [1.045, 1.164] and total stigma 95% CI [1.001, 1.039] were significantly associated with nondisclosure. Annual household income (p = .04), chronicity of cannabis use (p = .03), frequency of use (p = .02), and known CBD amount (p = .01) showed statistically significant associations with cannabis use disclosure frequency.

Discussion: Discussions surrounding cannabis use within the patient-provider relationship are most often initiated by the patient and depend largely on the comfort level with the healthcare provider. The results of this study should be used to inform the development and validation of a new cannabis-specific stigma scale. Limitations include a homogenous sample population of small size; therefore, results may not be generalizable. Screening for cannabis use is important but should be conducted in an unbiased manner. Special consideration should be paid to the role anticipated stigma has in influencing the frequency of cannabis use disclosure. Further education of healthcare providers is needed to decrease cannabis-related stigma, promote

transparent conversations, and improve assessment practices for patients in the healthcare setting.

Research

Abstract #15

Use of the Revised Second Victim Experience and Support Tool (SVEST-R) to Examine Second Victim Experiences of Respiratory Therapists

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Introduction: Respiratory therapists (RTs) work alongside allied health staff, nurses, and physicians during stressful and traumatic events that can be associated with emotional and physiological implications known as second victim experiences (SVEs). Too often, second victims suffer in isolation and don't know where to turn for support. This study aims to evaluate SVEs of RTs, including both positive and negative implications, supportive resources utilized and most desired, specialty-specific triggering events, and incidence of SVEs among RTs. While SVEs among CRNAs and heterogeneous groups have been studied extensively, to our knowledge this is the first study examining SVEs among RTs as a homogenous, high-risk group of healthcare professionals.

Methods: Respiratory care professionals within a large academic healthcare organization across Minnesota, Wisconsin, Florida, and Arizona were asked to participate in an anonymous survey that included the validated Second Victim Experience and Support Tool - Revised (SVEST-R) to assess SVEs as well as desired support services. Supplemental questions assessed demographic variables. Data were summarized using standard descriptive statistics using means with standard deviation (SD) for SVEST-R scores and counts with percentages (%) for categorical variables. This study was institutional review board exempt.

Results: The response rate was 30.8% (171/555), of which 91.2% (156/171) had been part of a stressful work-related event and 59.0% (92/171) reported feeling like a second victim (SV). Emotional/physiologic implications included anxiety 39.1% (61/156), reliving the event 36.5% (57/156), sleeplessness 32.1% (50/156), and guilt 28.2% (44/156). After an event, 14.8% (22/149) had psychological distress, 14.2% (21/148) had physical distress, 17.7% (26/147) indicated lack of institutional support, and 15.6% (23/147) had turnover intentions. Enhanced resilience was reported by 9.5% (14/147). Forty-nine out of 156 respondents (31.4%) felt their ability to provide safe care was compromised; 42.9% (21/49) reported feeling this way for more than a week. Eighty-seven out of 152 respondents (57.2%) indicated adequate availability of resources as SVs; however, 36.8% (56/152) felt stigma related to seeking help, and 55.9% (85/152) felt a lack of acknowledgment of SVEs. Among respondents who reported feeling like an SV, 49.4% (77/156) indicated it was due to COVID-19-related events. Peer support was the most desired support by 57.7% (90/156), followed closely by by 57.0% (89/156) who desired a

peaceful location in which to recover.

Discussion: RTs are involved in stressful events resulting in psychological/physical distress and turnover intentions. COVID-19 had a significant impact on RTs' SVEs, along with other clinical and nonclinical events. Acknowledgement of events and their potential impact is essential to establish a culture of safety. Nearly half of respondents indicated awareness of the institution's SV peer support program, but less than 2% used it as SVs. The perceived stigma related to seeking help may contribute to reluctance to use formalized peer support. Many RTs considered or did leave their professional role due to SVEs, having potential repercussions such as higher costs and lack of cohesiveness. Among RTs, the most desired support is talking with a respected peer, which strongly correlates with other studies. The sense of stigma and the belief that SVEs are not routinely acknowledged can negatively influence work culture and may serve as barriers to utilizing supportive resources. Education on SVEs among RTs is essential to normalize emotions, reduce stigma, and foster growth. Study limitations include limited generalizability, recall bias, and nonresponder bias. Future research should continue to explore SVEs in the RT population. Specifically, the influence of years of experience and age on SVEs could be examined, along with investigating SVEs in specialized RTs such as pediatrics.

Funding: Respiratory Therapy Department, Mayo Clinic, Rochester, MN

Evidence Based Practice/Quality Improvement

Abstract #16

Addressing Certified Registered Nurse Anesthetist (CRNA) and Student Registered Nurse Anesthetist (SRNA) Burnout

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Introduction: Burnout is a complex human experience characterized by emotional exhaustion, loss of personal accomplishment, and depersonalization. Those suffering from burnout are more likely to experience anxiety, depression, and substance abuse. Patient safety may be at risk as burned out anesthesia providers are prone to making medication errors. Burnout also correlates with job turnover, which incurs enormous costs for healthcare organizations. The purpose of this project was to evaluate and compare burnout levels among CRNAs and SRNAs working at a large academic medical center and to increase awareness of the consequences of burnout. A two-part educational podcast series introduced listeners to evidence-based methods to mitigate burnout. Literature supports the use of podcasts to foster learning and increase engagement among a variety of audiences.

Methods: This project was reviewed and received approval by an institutional review board. An online survey was created in REDCap and included the Maslach Burnout Inventory-Human Services Survey (MBI-HSS) for medical personnel. The MBI-HSS was chosen as the data collection tool as it is considered to be the gold standard for assessing burnout. Demographic questions and a free response to report stress management strategies were included in the survey. Data analysis was conducted via REDCap and Microsoft Excel. Descriptive statistics were used to summarize demographic data. Measures of central tendency were calculated for the three subcategories of the MBI-HSS and scored as low, moderate, or high levels of burnout. A t-test was performed to compare MBI-HSS results between CRNAs and SRNAs using a 95% confidence interval. Two podcast episodes were recorded and published on Spotify. Podcast content included survey results and evidence-based methods to mitigate burnout. Listener engagement was evaluated via the number of listens each episode received.

Results: Ninety-one providers completed the survey: 32 CRNAs and 59 SRNAs. Among CRNAs, 39% reported working more than 40 hours per week, with 26.8% working 13-23 hours of overtime per month and 24.4% working more than 24 hours of overtime per month. The CRNA group reported a moderate degree of burnout for all three categories of the MBI-HSS: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). The SRNA group showed a moderate degree of burnout for EE and DP and a high degree of burnout for PA. When comparing the SRNA group to the CRNA group, the SRNA group had a statistically significant low personal accomplishment score compared to the personal accomplishment score

for CRNAs ($p < 0.04$). First-year SRNAs had the highest depersonalization score while also reporting the highest sense of personal accomplishment. Third-year SRNAs had the highest emotional exhaustion score and interestingly had the lowest score for sense of personal accomplishment among the three cohorts. Both CRNAs and SRNAs reported experiencing a moderate to high degree of burnout. The most prevalent answers to the free-response question about stress-mitigation techniques included exercising, prioritizing sleep, and spending quality time with family and friends.

Discussion: This project is among the first to compare burnout between CRNAs and SRNAs and explore how burnout differs between SRNA cohorts. Increasing provider knowledge of the implications on wellbeing, patient care, and healthcare delivery is the first necessary step in addressing this problem. A recommendation for practice is the incorporation of mindfulness as a stress-relief technique both in and out of the OR and is presented on the podcast. The development of a podcast as a modality for education delivery is convenient, cost-effective, and engaging. Further exploration is needed to evaluate the effectiveness of these podcasts to increase providers' ability to recognize burnout. A limitation of the project was that, due to restrictions from the creator of the MBI-HSS, individual burnout scores were unable to be shared with survey-takers. Future recommendations include repeating the survey to measure if burnout rates decreased and determine if listeners utilized the resources included in the podcast.

Funding: Students received the DNP Student Scholarly Project Grant from the University of Cincinnati College of Nursing Office of Research to support the efforts of this project.

Evidence Based Practice/Quality Improvement

Abstract #17

Addressing Mental Wellness in Student Registered Nurse Anesthetists (SRNAs)

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Introduction: SRNAs face challenging didactic content and rigorous clinical requirements throughout their curriculum that can have an impact on their mental wellness resulting in stress and anxiety. SRNAs report their academic and clinical responsibilities as their primary sources of stress. They are also burdened with stressors in their personal lives such as relationships, finances, sleep deprivation, and inadequate time for leisure activity. The demand for professional and personal scrupulousness puts pressure on SRNAs that can negatively impact their wellbeing and lead to clinical depression and anxiety. The purpose of this project was to assess stress and anxiety in SRNAs at a nurse anesthesia program and provide asynchronous mental wellness resources via mobile application to these SRNAs.

Methods: The Iowa Model & Implementation Framework was used to guide the development of this project. A mobile application was created as a repository of wellness education and resources to address mental wellness in the SRNAs at this academic institution. Stress and anxiety were assessed in the SRNAs using the Perceived Stress Scale-10 and Penn State Worry Questionnaire, respectively. Both assessments were collected anonymously to protect the SRNAs' privacy. A baseline assessment was collected before offering the mobile application. Stress and anxiety were reassessed four times at one-month intervals beginning in October 2023 and ending in January 2024. The final post-intervention assessment included a free-text survey where SRNAs could comment on their current stressors, their coping mechanisms, and recommendations they had to address stress and anxiety within the program.

Results: The findings of this project revealed that there was a linear decrease in perceived stress levels from the baseline assessment to the fourth post-intervention assessment. A paired t-test was performed on the assessment results. There was a statistically significant decrease in perceived stress levels at the fourth post-intervention assessment ($p = 0.026$). The anxiety results did not show a statistically significant change. Increased application use was associated with decreased stress and anxiety scores. However, there was not a statistically significant correlation between application use and stress or anxiety scores. Results of the free text assessment revealed that SRNAs at this institution report time management as a top stressor. SRNAs reported healthy coping mechanisms such as exercise and meditation. However, some students reported unhealthy behaviors, including alcohol. Finally, recommendations made by the SRNAs included having a counselor available specifically for SRNAs, regular advisor check-ins, and increased time off.

Discussion: This project demonstrated that SRNAs at this academic institution experienced moderate levels of stress and anxiety on average. It was also shown that wellness training can have a positive impact on stress and anxiety levels. Although the mobile application was not found to be statistically useful, the results suggested that some form of wellness management reduces stress and anxiety levels. However, there is a need for additional interventions to address stress and anxiety in SRNAs in the future. Nurse anesthesia programs should consider evaluating their current wellness promotion practices as students would benefit from a more robust wellness program. Prioritizing wellness can enhance the SRNA experience, prepare students for managing stress and anxiety as CRNA professionals, and lead to safer, higher-quality anesthesia care.

Evidence Based Practice/Quality Improvement

Abstract #18

Analyzing Emergent Cesarean Delivery Rates after External Cephalic Version following an Obstetrical Practice Change: A Retrospective Cohort Study

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Mayo Clinic School of Health Sciences

Introduction: Cesarean delivery (CD) is the most common method of delivery for a fetus in breech presentation as vaginal delivery has been found to be associated with increased neonatal morbidity and mortality. External cephalic version (ECV) is a noninvasive procedure used to reduce cesarean delivery rates by increasing the rate of cephalic presentation. The use of neuraxial blockade increases the success rate of ECV. A retrospective review of the practice at our institution found an increased rate of emergent CD in patients who received neuraxial anesthesia for ECV. A practice change was introduced to reduce the rate of emergent CD after ECV including moving the location of ECV from the operating room to the labor room and using lower doses of local anesthetic. The purpose of this study was to assess the impact of these practice changes.

Methods: This retrospective cohort study of women who underwent ECV at a single institution was approved by an institutional review board. Data abstraction occurred through a review of the electronic health record. The primary outcome was emergent CD following ECV. Prior to ECV, patients were given the choice to undergo neuraxial blockade after meeting with both the anesthesia and obstetric teams. Neuraxial blocks were defined as anesthesia or analgesia based on dosage. A standard neuraxial analgesic was intrathecal 2.5-5.0 mg bupivacaine plus 15 mcg fentanyl via a combined spinal-epidural technique. The procedure was performed in the labor room unless patient condition warranted it be done in the operating room. Emergent CD was defined as CD performed within four hours of ECV due to nonreassuring fetal status. The rate of emergent CD following ECV was summarized using a point estimate and exact binomial 95% confidence interval. Fisher's exact test was used to compare the rate of emergent CD in the present study to those found in the prior study.

Results: There were 133 ECVs completed during the study period and 128 were analyzed after exclusions. The type of neuraxial block performed varied by location, with those receiving an anesthetic dose more likely to have the ECV in the operating room. There was no statistical association between neuraxial blockade type and emergent CD or between ECV location and emergency CD. Patients receiving an anesthetic dose were more likely to require vasopressors. Due to the low number of outcomes, no confounding variables were adjusted for. The rate of emergency CD during this study period was 0.78% (95% CI [0.02%, 4.28%]). The historical

emergent CD rate prior to the practice change was 3.7% (95% CI [1.21%, 8.4%]). The difference in emergent CD rates between studies was not statistically significant. In our study compared with the previous study done at our institution, there was a lower rate of emergency CD after ECV when comparing an analgesic dose from the current study with an anesthetic dose from the previous study (1/91, 1%; 95% CI [0.03%, 5.97%] vs. 5/58, 8.6%; 95% CI [2.8%, 18.9%]; p = 0.03). There was a lower rate of emergent CD when comparing ECV procedures performed in the labor room in the current study compared with those performed in the operating room in the previous study (0/118, 0%; 95% CI [0%, 3.0%] vs. 5/59, 8.47%; 95% CI [2.8%, 18.6%]; p = 0.003).

Discussion: The main purpose of this study was to assess the impact of practice changes made to ECV procedures at our institution after a previous study showed a rate of emergent CD during ECV of 3.7%, which was higher than expected. Although not statistically significant, we believe the 0.7% rate of emergent CD in this study shows our practice changes were successful in reducing emergent CD associated with ECV. It was not possible to conclude whether modifying the neuraxial dose or changing the location had the greater impact on the decline in emergent CD following ECV. We believe moving the location to the labor room versus the operating room was likely a significant component. Limitations of this study include the low number of outcomes limited the ability to perform statistical analyses that could have corrected for confounding variables or better quantified the impact of individual variables. Although our data may not be generalizable to everywhere, it may help other institutions create or revise their procedures for performing an ECV.

Evidence Based Practice/Quality Improvement

Abstract #19

Cannabis Use and Postoperative Opioid Consumption after General Anesthesia

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Introduction: Increased access to cannabis and cannabis products increases the likelihood that anesthesia professionals will provide care for a cannabis user (CU). Uncontrolled pain in the postoperative period can cause delays in patient recovery and decreased patient satisfaction. Evidence from animal-model studies shows that cannabinoids cause inhibitory modulation of pain in various pain pathways. The purpose of this integrative review was to determine if differences exist in postoperative opioid requirements between adult CUs compared to noncannabis users (NCUs). Greater understanding of the effects cannabis use may have on pain perception in this population could improve perioperative care and lead to improved postoperative outcomes.

Methods: The following PICOT question was presented: In adults aged 18 years or older undergoing general anesthesia, is there a difference between patients who self-report cannabis use compared with patients who report no cannabis use on total opioid consumption in the postoperative period up to six months after surgery? A systematic search was performed using Embase, PubMed, and MEDLINE databases. Each database was searched by the key terms “cannabis,” “postoperative period,” and “pain.” Inclusion criteria included adults aged 18 or older, general anesthesia, a separate cannabis group from control group, and a quantitative measurement of opioid consumed postoperatively. Exclusion criteria included studies lacking any of the three inclusion qualities. The integrative review was exempt from institutional review board approval. Findings from the evidence will be implemented into clinical practice by an educational presentation using an Internet-based audience response system in a pre-/post-test design to facilitate participant engagement and assess learning.

Results: Embase yielded 45 results using key terms with Embase’s suggested synonym function. PubMed yielded 14 results with the inclusion of the synonyms “marijuana,” “morphine,” or “morphine milligram equivalents.” MEDLINE yielded 10 results with the key terms. Synonyms were utilized to narrow the search for relevant studies. Duplicates and studies lacking any of the three inclusion qualities were removed. Four papers were identified to have relevance to this problem. The studies were each cross-referenced to their citations, resulting in one additional study. The five studies were retrospective cohort analyses. One study reported no difference in morphine milligram equivalents (MME) consumed between CUs and NCUs. One study found a statistically significant ($p < .05$) reduction in MME consumed by CUs. The remaining three studies had mixed significant ($p = .05$) results within surgical procedure subgroups, each with

one subgroup that presented no difference between CUs and NCUs, and each with one subgroup that presented an increase in MME of CUs compared to NCUs. The accuracy of data was limited by the retrospective nature of the studies and various design flaws. The findings from the evidence will be implemented into clinical practice by an educational event featuring an Internet-based audience response system to assess prior knowledge and postevent understanding of the material.

Discussion: Results of the examined studies yielded disparate outcomes of postoperative opioid consumption up to six months after surgery comparing CUs with NCUs. CUs had decreased, increased, or no change in opioid consumption postoperatively. Consequently, evidence cannot produce a definitive answer at this time regarding differences in postoperative opioid consumption between CUs and NCUs. The unknown effects of cannabis on postoperative opioid consumption challenge the ability to recommend changes in anesthesia practice. Further study is needed to isolate variables such as gender, surgery method, and reasons for cannabis consumption to best determine postoperative opioid requirements for adequate pain control. Providers should exert caution and careful observation of CUs for opioid requirements. High-quality research is lacking due to the federally prohibited status of cannabis. The available studies are limited in design and accuracy due to retrospective review. The effects of cannabis use on the consumption of postoperative opioids remain unknown.

Evidence Based Practice/Quality Improvement

Abstract #20

Clevidipine for Hemodynamic Control in Cardiac Surgery

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Introduction: Blood pressure management during cardiac surgery is essential and at times can be difficult. Historically, vasodilators such as nitroglycerin and sodium nitroprusside have been used to produce nitric oxide which activates cyclic guanosine monophosphate (cGMP) production causing dilation of the venous capacitance. Clevidipine is a newer antihypertensive that is a rapid-acting, dihydropyridine L-type calcium channel blocker (CCB) that works through arterial dilation and has an ultrashort half-life of approximately one minute. Evidence suggests that clevidipine is efficacious in rapidly achieving desired hemodynamics due to its mechanism of action. The purpose of this integrative review was to compare clevidipine with nitroglycerin and sodium nitroprusside for management of blood pressure in adult cardiac surgery patients during the perioperative through 24-hour postoperative period.

Methods: The PICOT question was as follows: In adults 18 years or older undergoing cardiac surgery, does clevidipine compared with nitroglycerin and sodium nitroprusside more effectively control blood pressure within the predetermined range of the perioperative through 24-hour postoperative period? The method for this review was a systematic search that was performed in PubMed and Cochrane Library using the search terms clevidipine AND cardiac surgery. Inclusion criteria of the studies included adult patients, nitroglycerin or sodium nitroprusside, cardiac surgery, and the time period of perioperative through 24 hours postoperative. Exclusion criteria was all surgeries other than cardiac surgery. Best-evidence articles were chosen from the remaining citations producing three randomized controlled trials (RCTs) and a case study. This integrative review was exempt from institutional review board approval. The findings will be implemented into clinical practice by an education event using a pre-/post-test design to assess learning.

Results: Database search results were as follows: PubMed yielded 19 studies and Cochrane Library 11 studies. Duplicate studies and those failing to meet criteria were eliminated leaving three RCTs and one case study. A total of 1,643 subjects underwent cardiac surgery and received infusion of either clevidipine, nitroglycerin, or sodium nitroprusside titrated per protocol to the predetermined, desired blood pressure. All RCTs measured effective blood pressure management by the area under the curve for the total time and magnitude each patient's blood pressure was outside the target range. One of the three RCTs found clevidipine to be significantly more effective at controlling blood pressure within the target range compared with nitroglycerin and sodium nitroprusside. The case study described an incidence of tachyphylaxis

with nitroglycerin boluses, where the desired hemodynamics failed to be achieved during aortic decannulation. Furthermore, the studies reported that clevidipine had fewer adverse hemodynamics such as tachycardia and decreased cardiac output during cardiac surgery compared with nitroglycerin and sodium nitroprusside. Implementation of these findings into clinical practice will be through an education event using a pre-/post-test design to assess learning.

Discussion: Evidence supports the use of clevidipine for managing blood pressure in cardiac surgery. Therefore, it is recommended to have clevidipine available as an alternative treatment should the initial treatment of nitroglycerin or sodium nitroprusside fail to achieve the desired hemodynamics. Clevidipine should be considered for initial treatment if there is a concern for tachycardia or decreased cardiac output. The current, available studies vary widely in the titration infusion protocols and the target blood pressure range. This integrative review is relevant for all anesthesia providers working in cardiac surgery to gain insight on new, alternative antihypertensive medications and what is best practice for managing hemodynamics in patients under our care.

Evidence Based Practice/Quality Improvement

Abstract #21

Does Hypotension in the Operating Room Affect Postoperative Mental Status in Cardiac Surgery Patients?

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Introduction: Postoperative delirium (POD) was noted to have occurrence rates between 13%-50% in cardiac surgery patients postoperatively. Research on POD is being utilized to determine meaningful practice change within the field of anesthesia for prevention. One regularly cited risk factor for POD is intraoperative hypotension (IOH), the management of which remains a challenge in certain patients receiving anesthesia due to their preoperative comorbidities. Evidence suggests that IOH is highly important to monitor due to its impact on tissue perfusion and blood flow to the brain in the perioperative period. This integrative review identified various research articles and their significance in addressing whether there is a relationship between POD and IOH in cardiac surgery patients. There was inconclusive data as to whether POD correlated with IOH in the perioperative period.

Methods: The PICOT question was as follows: Among adult patients over the age of 18 years undergoing cardiac surgery, does IOH, defined as a mean arterial pressure (MAP) 40-60 mm Hg, compared with maintaining normotension, defined as a MAP greater than 70 mm Hg, throughout the procedure, influence the risk of developing POD up to seven days after surgery? A systematic search of Embase and CINAHL for relevant literature using a date range from 2015 to 2024 was completed. A combination of search terms included cardiac surgery, heart surgery, intraoperative hypotension, acute hypotension, hypotension, postoperative delirium, postoperative confusion, and delirium. Further limits included English only and adults 18 years or older. Resultant article references were also reviewed to determine relevance to addressing the topic. The integrative review was exempt from institutional review board approval. The findings will be implemented into clinical practice by hosting an educational event and using a pre-/post-test design to assess learning.

Results: Database search results were as follows: Embase yielded 52 citations and CINAHL retrieved 18 citations. Duplicate studies and the addition of limits narrowed the results to 45 citations. Articles failing to meet topic criteria were further eliminated and yielded best-evidence articles including one systematic review and two observational analyses. Each research article aimed to investigate if IOH during cardiac surgery affected the development of POD. The systematic review included a total of 15 studies, only two of which found statistical significance based on probability values ($p < 0.05$) between POD and IOH. Overall, two of the three resultant articles found no association between IOH and POD, displaying low internal and external

validity. However, an observational study found a statistically significant correlation between IOH and POD during the postcardiopulmonary bypass period with an adjusted odds ratio between 1.72-1.94. Despite the odds ratio values being valuable, the article had several limitations, further questioning its validity. Overall, the studies showed minimal to no association regarding the relationship between IOH and POD in cardiac surgery. Implementation of these findings into clinical practice will be through an education event using a pre-/post-test design to assess learning.

Discussion: The integrative review identified gaps in knowledge regarding the relationship between IOH and POD in cardiac surgery patients. These patients had a heightened risk of IOH and POD due to their hemodynamic status preoperatively and other comorbidities such as age and sex. However, the evidence does not support practice change, as there were many limitations and a lack of studies directly testing the association. Inconsistencies existed in the definitions and measurement tools for IOH and POD as well as in the surgical types studied, hindering generalizability. Although the confusion assessment method/intensive care unit screening test was used consistently, different studies employed varied criteria for defining and measuring POD, making comparison challenging. Although MAP targets were generally similar across studies, there were differences in their ranges. Additional studies should be designed to examine specific time frames throughout the perioperative period, which would better facilitate identification of a relationship.

Evidence Based Practice/Quality Improvement

Abstract #22

Evidence-based Practice Implemented: Ultrasound IV Insertion Education

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Introduction: Peripheral intravenous catheter (PIV) insertion is a common procedure performed by healthcare providers across various clinical settings. However, despite its routine nature, PIV insertion can be challenging in patients with difficult intravenous access (DIVA). Difficult PIV insertions can lead to multiple attempts, patient discomfort, delayed treatment initiation, and an increased risk of complications. The use of ultrasound guidance (UG) for PIV insertion has been shown to mitigate these challenges and improve care for patients with DIVA. The purpose of this evidence-based practice project was to educate same-day surgery registered nurses (SDS RNs)and student registered nurse anesthetists (SRNAs) in UG for PIV (UGPIV) insertions at a large academic medical center. The goal of the project was to increase knowledge and competence in utilizing UGPIV insertions.

Methods: The educational intervention was developed from a comprehensive literature review and the instructor's previous teaching experience. The education began with a 20-minute PowerPoint presentation detailing ultrasound machine functions, vascular anatomy, techniques used for UGPIV insertion, and tips to increase success. The didactic portion was followed by 45 minutes of hands-on simulation using ultrasound machines, gel models, and IV catheters with real-time feedback from course instructors. Pre- and postintervention assessments were completed on paper and measured knowledge and confidence. Knowledge was assessed via a 12-point test, while confidence was assessed via a six-question, five-point Likert scale, with a max score of 30 points. Data was graded using a rubric and analyzed using paired t-tests. A two-week follow-up confidence and knowledge survey was conducted to assess knowledge retention. Institutional review board approval was obtained, and participants were recruited voluntarily with anonymity ensured.

Results: A total of 66 learners were enrolled consisting of 19 SDS RNs, 29 junior SRNAs, and 18 senior SRNAs. Three separate educational interventions were held on different days for each respective cohort. The data analyzed using Microsoft Excel's paired t-test function revealed a statistically significant ($p < 0.01$) increase in both knowledge and confidence following the educational intervention. On the knowledge assessment, SDS RN scores initially increased from an average of 4.44 to 8.88; junior SRNAs from 4.16 to 10.31; and senior SRNAs from 6.47 to 11.08. Their two-week follow-up average scores decreased to 7.85, 8.67, and 9.78 respectively, but still demonstrated a statistically significant ($p < 0.01$) increase in knowledge compared to

the pre-intervention scores. On the confidence assessment, SDS RN scores initially increased from an average of 11.26 to 19.47; junior SRNAs from 14.79 to 24.13; and senior SRNAs from 20.72 to 26.5. Their two-week follow-up average scores increased further to 20.13, 24.83, and 26.67 respectively. All of the increases in confidence among the different cohorts were of statistical significance ($p < 0.01$).

Discussion: This evidence-based practice project demonstrates that UGPIV insertion education improves provider knowledge and confidence. Despite the knowledge scores decreasing slightly among all cohorts in the two-week retained knowledge assessment, the overall increase remained statistically significant. Interestingly, the confidence scores of all cohorts increased in the two-week reassessment period. These results expand upon the current literature surrounding UGPIV insertion education which describes a mixed-modality teaching method but often does not provide details about the education or assessment process. While this study does not investigate healthcare providers' postintervention UGPIV insertion ability, it underscores the ability to build a learner's foundation. Ultimately, having more SDS RNs and SRNAs with the ability to understand and feel confident in utilizing UGPIV insertions will improve care for patients. However, further study is needed to analyze the direct impact of UGPIV insertion education on patients.

Evidence Based Practice/Quality Improvement

Abstract #23

Effectiveness of Erector Spinae Plane Block Versus Paravertebral Block in Breast Surgery Based on Patient-reported Pain Scores within 24 Hours Post Operation

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Introduction: Breast surgery is commonly associated with significant pain in the postoperative period, leading to a high incidence of chronic pain syndromes in this population. While the paravertebral block (PVB) has proven effective for postoperative pain control in breast surgery, it is technically challenging, especially for novice anesthesia providers, and may pose an increased risk of complications due to the close proximity of vital structures and local anesthetic deposition. The erector spinae plane block (ESPB) is a novel technique that is technically easier to perform and does not require local anesthetic deposition in such close proximity to high-risk anatomical structures. This review aimed to explore the effectiveness of a novel regional anesthesia technique compared with the currently recognized gold standard for postoperative pain control in breast surgery.

Methods: The PICOT question was as follows: For adult female patients undergoing breast surgery, what is the impact of an ESPB versus a PVB on postoperative pain scores within the first 24 hours after surgery? PubMed, CINAHL, and Embase were systematically searched in December of 2023. The search terms were breast surgery, erector spinae plane block, paravertebral nerve block, and postoperative pain. Inclusion criteria were adult subjects at least 18 years of age, English language, breast surgery, and female gender. Exclusion criteria were study designs based on other than the listed inclusion criteria. All studies that met criteria were assessed for methodological quality and measurable outcome data were extracted. This integrative review was exempt from institutional review board approval. The findings will be implemented into clinical practice by an education event using pre-/post-test design to assess learning.

Results: Database search results were as follows: CINAHL retrieved 48 citations, PubMed 44 results, and Embase 71 citations. Duplicate studies and those failing to meet criteria were eliminated leaving one prospective clinical quality improvement project, three randomized controlled trials, and one systematic review with meta-analysis. A total of 575 patients who underwent breast surgery were included in this integrative review. All blocks were performed under ultrasound guidance in the preoperative period prior to induction of general anesthesia. The most common local anesthetic used for each of the block techniques was ropivacaine 0.5%-0.75%, while one study used bupivacaine 0.25%. The total amount of local anesthetic used for each block technique ranged from 16-30 ml. Two of the five studies found significant differences

in postoperative pain scores within the chosen time frame. One study favored PVB at two and six hours into the postoperative period, while the other study favored ESPB at eight and 12 hours. However, it is important to note the study favoring PVB lacked consistency in dose and concentration of local anesthetic used. The other three studies found no significant difference in pain scores between the groups within the chosen time frame. Implementation of these findings into clinical practice will be through an education event using pre-/post-test design to assess learning.

Discussion: According to research findings, preoperative ultrasound-guided ESPB appears to be a safe, simple, and effective alternative to the well-established PVB for postoperative pain control within the first 24 hours after surgery in adult female patients undergoing mastectomy procedures. Due to a lack of evidence comparing these block techniques in a general variety of breast procedures, practice recommendations cannot extend beyond patients undergoing mastectomies at this time. Anesthesia providers must evaluate their comfort level and skill in performing each block technique in order to ensure analgesic efficacy and minimize potential block-related complications. Future studies should continue to focus on building this body of research in order to expand current conclusions beyond mastectomies to a variety of breast procedures, as well as exploring outcomes such as block-related complications, optimal local anesthetic dose and concentration, potential utility of continuous catheter techniques, and overall patient satisfaction.

Evidence Based Practice/Quality Improvement

Abstract #24

Efficacy of Dexmedetomidine as an Analgesic Adjunct to Labor Epidurals with Fewer Side Effects Compared with Traditional Opioids

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Introduction: Parturients report labor pain as the worst pain they have experienced, causing extreme suffering during the birth process. Opioids are commonly used in labor epidurals to aid in the relief of throbbing, shooting, sharp, and intense pain of labor and to decrease the dose of local anesthetic. Side effects of epidural opioids, such as pruritis, urinary retention, reduced mobility, nausea, and vomiting, negatively affect patient experience and have triggered the search for alternatives. The incidence of pruritis post epidural opioid use is up to 60%. Evidence suggests that the use of dexmedetomidine as an adjunct to opioid use in labor analgesia results in fewer side effects. The purpose of this integrative review was to appraise the efficacy and side effects of dexmedetomidine as utilized in clinical practice for labor analgesia.

Methods: The PICOT question was as follows: In adult parturients with epidural analgesia, does the addition of dexmedetomidine to ropivacaine, compared with the addition of opioids to ropivacaine, improve the analgesic effect of the epidural through the use of a visual analog pain scale, with decreased incidence of side effects such as sedation and pruritis, during labor? Systematic searches were performed in November 2023 in PubMed, Embase, and CINAHL using the search terms labor, epidural, dexmedetomidine, and analgesia. Inclusion criteria included publications within the last five years and human participants. Four randomized controlled trials (RCTs) were chosen and reviewed for methodological quality and data were extracted. This integrative review was exempt from institutional review board approval. These findings will be presented at an educational event for consideration of incorporation into clinical practice. Learning will be assessed through the use of pre- and post-tests.

Results: Database search yielded 54 citations from Embase, 20 from PubMed, and 11 from CINAHL with inclusion criteria. Duplicate studies and intrathecal methods were eliminated, leaving four RCTs. A total of 513 parturients received labor epidurals with various doses of dexmedetomidine or traditional opioids as adjuncts to the local anesthetic ropivacaine. Collectively, studies showed superior pain control via visual analog scale and decreased incidence of side effects in dexmedetomidine groups versus opioid groups. The use of dexmedetomidine eliminated pruritis and significantly reduced side effects, such as maternal and fetal bradycardia, maternal hypotension, excessive sedation, respiratory depression, nausea, and vomiting. Conflicting evidence from one study reported increased incidence of

motor blockade with Bromage scores greater than one in the 0.5 mcg/mL concentration of dexmedetomidine (p = 0.007), whereas other studies noted no motor blockade increase utilizing the same concentration. Variability among dosing concentrations and volumes caused difficulty in ascertaining optimal dosing. However, despite the dose variations, superior pain control was demonstrated with reduced side effects as compared with traditional opioids. Implementation of these findings will be measured through an education event using pre-/post-test design to assess learning.

Discussion: Evidence supports use of dexmedetomidine as an analgesic adjunct to labor epidurals in parturients aged 20-35, ASA physical status I or II, singleton pregnancy, and gestation 37 weeks. The variability in dosage of dexmedetomidine among studies provided a range from 0.25 mcg/mL to 0.5 mcg/mL, with the most common concentration being 0.5 mcg/mL. The majority of studies demonstrated superior pain control and no significant side effects at dexmedetomidine concentrations of 0.5 mcg/mL. One study reported fewest side effects at 0.4 mcg/mL. Current evidence supports utilization of dexmedetomidine doses of 0.4 to 0.5 mcg/mL; however, it would be of value for future studies to determine the optimal dose. The recommendations of this discussion are of moderate strength.

Evidence Based Practice/Quality Improvement

Abstract #25

Endotracheal Tube Cuff Pressures in the Operating Room of a Pediatric Hospital: A Quality Improvement Initiative

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Introduction: Endotracheal tube (ETT) cuff pressures are frequently out of the recommended range of 20-30 cmH20 for pediatric patients. This can lead to multiple iatrogenic complications ranging from cough, sore throat, and tracheal edema to more serious medical issues like tracheal stenosis, aspiration, nerve injuries, and tracheal rupture. Additionally, current methods to inflate endotracheal tube cuffs vary between anesthesia providers and are not consistently in the recommended range. The objective of this project was to use quality improvement science to increase the percentage of cuff pressures in therecommended range of 20-30 cmH20 from 24% to 60% in nine months.

Methods: This initiative was deemed to be quality improvement and required no additional review. The team adhered to Standards for Quality Improvement Reporting Excellence (SQUIRE) 2.0 and used quality improvement science by applying the Institute for Healthcare Improvement Model for Improvement methodology. A fishbone diagram and key driver diagram were created to aid in categorizing barriers to accurate and precise cuff pressure maintenance and implementing interventions. Four Plan-Do-Study-Act (PDSA) cycles were completed. PDSA 1 used addition of air to the ETT cuff, PDSA 2 examined tidal volume titration, PDSA 3 assessed removal of air from the ETT cuff, and PDSA 4 implemented the removal of air on a large scale. The primary outcome measure was the percentage of endotracheal tube cuff pressures within the recommended range of 20-30 cmH20. A statistical process control p-chart was used to measure the impact of our interventions over time with control limits set at 3 standard deviations.

Results: In total, we measured 150 cuff pressures. The median age of patients included was 6 years old, with a median weight of 24 kg. Pre-implementation data were collected to establish baseline ETT cuff pressures at Nationwide Children's Hospital. The mean ETT cuff pressure was 36 ± 23 cmH20 with a range of 0 cmH20 to 98 cmH20. Cuff pressures were out of the recommended range in 76% (*n* = 19) of cases. PDSA cycle 1 had a mean cuff pressure of 33 ± 14 cmH20. Cuff pressures were out of the recommended range 64% (*n* = 16) of the time. The mean cuff pressure in PDSA cycle 2 was 14 ± 10 cmH20 ranging from 1 cmH20 to 41 cmH20. Cuff pressures were out of the recommended range 84% of the time (*n* = 23). PDSA cycle 3 had a mean cuff pressure of 20 ± 4 cmH20 and pressures ranging from 14 to 28 cmH20. Cuff pressures

were out of the recommended range 50% (n = 13) of the time. PDSA 4 results demonstrated cuff pressures out of the recommended range 54% of the time (n = 27). This was a statistically significant increase in the frequency of accurate measurements ($p < 0.001$) compared to the other methods examined. The mean cuff pressure was 19 ± 6 cmH20, ranging from 8 cmH20 to 30 cmH20. The removal of air method produced the most accurate and consistent cuff pressures.

Discussion: ETT cuff pressures are often out of the recommended range of 20-30 cmH20 for pediatric patients. This has been demonstrated in the literature and was also evident during our quality improvement initiative. Using quality improvement science, we had an increase in the percentage of cuff pressure within the recommended range of 20-30 cmH20 using removal of air from the cuff. Limitations of this initiative included being conducted at a single institution and using a convenience sample. Also, as anesthetists became aware of the project, a change in practice could have occurred since clinical behaviors may change when providers know they are being observed. This project adds to the vast amount of literature demonstrating that current inflation methods produce an unacceptable high rate of cuff pressure outside the recommended range. The initiative also establishes data to support changes in clinical practice. These results determine that removing air until auscultation of an audible air leak may be an effective and practical tool providing additional safety in the anesthetic management of pediatric patients.

Evidence Based Practice/Quality Improvement

Abstract #26

Esophageal Cooling and the Incidence of Severe Ulcers in Patients Undergoing Ablations for Atrial Fibrillation

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Introduction: Atrial fibrillation (AF) affects 3.5 million people worldwide. Radiofrequency ablation (RFA) is the primary treatment beyond medical management. Severe esophageal ulcers from these procedures pose risks, including fistula formation and fatal outcomes. When severe ulcers and fistulas occur, the reported mortality is up to 80%-90% without treatment and 50% with treatment. Despite recognized complications, no preventative interventions exist. Esophageal cooling during RFAs emerges as a promising avenue for prevention, administrable by anesthesia providers. Existing evidence suggests cooling mitigates severe esophageal injury. The purpose of this integrative review was to assess the impact of esophageal cooling on esophageal ulcers and injuries post-RFA, including overall complication incidence, severe injury reduction, and practical aspects of cooling administration.

Methods: The PICOT question guiding this study was as follows: In adult patients undergoing RFAs for AF, does the use of esophageal cooling compared to no esophageal cooling affect the incidence of esophageal injury diagnosed by esophagogastroduodenoscopy (EGD) within 24 hours to seven days post-procedure? Systematic searches were conducted in PubMed, MEDLINE, and Embase using combinations of search terms, including esophageal cooling, atrial fibrillation, radiofrequency ablation, and esophageal ulcers. Inclusion criteria encompassed subjects aged > 18 years, postoperative EGD evaluation for injury, and RFA. The odds ratio (OR) and incidence percentage were utilized for outcome comparison. The integrative review was exempt from institutional review board approval. The findings from the evidence will be implemented into clinical practice through an educational event for anesthesia professionals employing pre-/post-test assessments to evaluate learning outcomes.

Results: The search yielded 74 related results: PubMed yielded 33 studies, MEDLINE 11, and Embase 30. Studies failing to meet inclusion criteria were excluded leaving two systematic reviews with meta-analysis (SRMA) and one retrospective observational review. Data from three studies using orogastric tube cooling were pooled, finding no effect on overall incidence (OR = 0.6, 95% CI [0.15, 2.38], p = .4), but finding reduced severe esophageal injury incidence (OR = 0.39, 95% CI [0.17, 0.89], p = .02). A second SRMA analyzed four studies using orogastric and silicone tube cooling, showing no reduction in overall incidence (OR = 0.86, 95% CI [0.31, 2.51], p = .78), but finding reduced severe esophageal injury incidence (OR = 0.21, 95% CI [0.05, 0.80], p = .02). A retrospective study of 14,224 patients and silicone tube cooling reported a reduced

incidence of atrial-esophageal fistula after institution of cooling during RFA (prior to esophageal cooling 0.146%, post esophageal cooling 0%, $p < .0001$). The plan for implementation of the findings into clinical practice is slated for an education event using an orogastric tube as a visual aid and pre-/post-test assessment of participant learning.

Discussion: Based on the analysis of current research, evidence suggests that esophageal cooling is effective in reducing the incidence of severe esophageal ulcers diagnosed by EGD in adult patients undergoing RFA for AF. Although esophageal cooling may fail to decrease the overall incidence of injury, its low-risk nature and reduction of severe esophageal injury warrants consideration in clinical practice. The recommendation is to incorporate esophageal cooling for all patients undergoing RFA. This intervention can be easily administered via orogastric tubes with ice water/cold water and using supplies readily available in the operating room. The accessibility and simplicity of esophageal cooling make it a feasible procedure to implement into clinical practice. Limitations of esophageal cooling include the lack of standardization in cooling methods, timing of esophageal cooling initiation, and timing of postoperative EGD. Addressing these limitations could enhance the effectiveness of cooling on the overall incidence of injury.

Evidence Based Practice/Quality Improvement

Abstract #27

Green Anesthesia: Reducing the Carbon Footprint of Waste Anesthetic Gases with Total Intravenous Anesthesia and Low Fresh Gas Flows

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Introduction: Healthcare provision is a major contributor to climate change, comprising 4.6% of total greenhouse gas emissions in the United States. Green anesthesia practices can positively impact the delivery of care by reducing waste and improving efficiency through a commitment to sustainable practices. The purpose of this project was to promote sustainable practices in the delivery of anesthesia care, reduce greenhouse gas emissions associated with anesthesia, and reduce waste. Climate change is a major issue that affects the entire planet, and the anesthesia community has a responsibility to participate in global green efforts.

Methods: A quality improvement project was proposed and implemented at a large academic healthcare institution in South Florida to promote sustainable anesthesia practices by using fresh gas flow (FGF) rates to reduce volatile anesthetic waste and promote use of total intravenous anesthesia (TIVA). Prior to and after implementation of educational materials, data were collected to evaluate FGF rates, amount of total sevoflurane use, and frequency of TIVA use. TIVA use was measured by the number of general anesthesia cases where inspired sevoflurane was greater than 0% for less than 30 minutes A voluntary knowledge test was conducted prior to and after use of an educational module to evaluate change in anesthesia practitioners' knowledge of environmentally conscious anesthesia practices.

Results: Prior to implementation of the educational materials, general anesthesia cases in a 7-day period (n = 215) showed mean total sevoflurane use per case was 8.32 mL, mean FGF rate while inspired sevoflurane concentration was greater than 0% was 3.13 L/min, and 12 cases in which sevoflurane time was less than 30 minutes. An original online educational module was distributed via email to all CRNAs, physician anesthesiologists, and residents employed at the facility. A total of 37 website views were observed after the email distribution. One week was provided to allow additional employees to view the website prior to collection of subsequent data. After implementation, general anesthesia cases in a 7-day period (n = 211) showed mean total sevoflurane use per case was 7.42 mL, a decrease of 10.8%. The mean FGF rate while inspired sevoflurane concentration was greater than 0% was 3.14 L/min, a slight increase of 0.3%. There were 14 cases in which sevoflurane time was less than 30 minutes. These findings suggest that average sevoflurane use decreased and use of TIVA increased 16% after receiving education. Twenty-one anesthesia practitioners participated in a pre- and post-knowledge test regarding environmentally conscious anesthesia practices, and findings showed a 36% increase

in mean knowledge test scores.

Discussion: Findings from this project suggest that when provided education, anesthesia practitioners employ more environmentally conscious anesthesia techniques. Limitations include the relatively short observation period for data collection: A longer observation period would allow for more robust data which may demonstrate more significant practice changes. Additionally, many part-time CRNAs, as well as physician residents, are employed at this facility, leading to frequent staffing changes. This may have contributed to the limited exposure of the education module to overall staff. To further this initiative, education should be reinforced as needed and shared periodically to ensure consistent exposure. Recommendations suggest high FGF are directly connected to the amount of anesthetic gas wasted, and use of low flows is effective in reducing waste. Utilizing TIVA as a primary anesthetic minimizes the environmental impact of anesthetic gas waste. Reduction of the healthcare sector's contribution to climate change by promoting sustainable anesthesia practices creates a healthier environment.

Evidence Based Practice/Quality Improvement

Abstract #28

Hello Professor, It's Me, Margaret: Showing Students You Care through Quality Online Course Design

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Introduction: Since the Covid-19 pandemic, many programs include online learning formats. Nurse anesthesiology students frequently experience stress and anxiety. Recent studies suggest a correlation between stress, anxiety, and impacts on academic performance. Faculty teaching online courses might recognize changes in the quality of work and explicit expressions of worry or stress as prompts to enact caring behaviors as prioritized by students. Evidence-based faculty-caring behaviors can be implemented in the online environment to address and improve student wellbeing. Integrating intentional course design adhering to the Quality Matters Higher Education Rubric can maintain course rigor and quality. By adhering to evidence-based andragogical and pedagogical practices, dual goals of student well-being and course quality and rigor in an online learning environment were evaluated.

Methods: The institutional review board at Mount Marty University determined the project exempt from further review. Students from the graduate program in nurse anesthesiology were surveyed prior to the start of the semester using the validated Student Perspectives of Caring Online survey tool to gauge their perspective of whether a caring environment can be created in the online classroom and to rank faculty-caring behaviors on a Likert scale. The survey consisted of the Student Perspectives of Caring Online survey, two questions assessing the students' perception of caring environments in online classrooms, and two demographic questions. The priority faculty-caring behaviors were identified through survey responses and cross mapped to the Quality Matters Higher Education Rubric. Specific review standards were integrated into the design of two online graduate nurse anesthesiology courses. Upon completion of each course, students were surveyed to assess their perception of the faculty-caring behaviors in the course and the effect of those behaviors on their success.

Results: Results of both surveys were fairly similar, with mild variations from pre- to post-perceptions. All students in both surveys responded that faculty can create a caring online learning environment and that they experienced a caring online learning environment within these two courses. Nearly 90% of students answered that a caring online classroom can, and did, influence success in their class. Faculty responding to student emails within 24-48 hours was very important for 86% of the students in the pre-survey, but only 65% in the post-survey. However, faculty responding to student emails on the weekend was very important to only 7% of students in the pre-survey, but increased to 24% on the post-survey. Faculty expressing to the

class that students will be successful was very important to more than 50% of respondents. More than 90% of the respondents answered that it is very important to have clear instructions and schedules. Having face-to-face or video opportunities to interact with the instructor was only moderately important in both surveys. Having a discussion board dedicated only to student questions was deemed very important, increasing from 34% on the pre-survey to more than 50% on the post-survey. Themes expressed in the free text response included faculty-caring behaviors experienced by students that contributed to their well-being or success, such astimely email responses, organization, genuine feedback, support of students, and getting to know students personally.

Discussion: The results validated that adhering to the Quality Matters Higher Education Rubric for course design and implementing evidence-based faculty-caring behaviors can address and improve student well-being and success in the online learning environment. Implementing perceived faculty-caring behaviors along with the Quality Matters Rubric standards can have a profound impact on student well-being and success by decreasing stress and anxiety while maintaining the high rigor of graduate nurse anesthesiology courses. Next steps are to educate more faculty on the faculty-caring behaviors and have all online courses designed to the standards of the Quality Matters Higher Education Rubric. Limitations to this project do exist. The project only spanned one semester in two online courses. Further, implementing the rubric requires faculty to take costly online courses through Quality Matters to understand and apply it. Limitations in implementing the rubric in every online course requires faculty time and desire.

Evidence Based Practice/Quality Improvement

Abstract #29

Implementation of an Antiemetic Prophylaxis Clinical Practice Guideline for Postoperative Nausea and Vomiting

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Introduction: In a regional hospital in the Midwest, postoperative nausea and vomiting (PONV) is the second most common complication in surgical patients who have undergone general anesthesia. The incidence of PONV is high without antiemetic prophylaxis. A standard consensus guideline for PONV prophylaxis is lacking at an institutional level and compliance with the clinical guidelines is poor. The implementation of consensus guidelines on PONV prophylaxis will improve the compliance of anesthesia providers, lower the incidence of PONV, enhance patient satisfaction, and eventually reduce healthcare costs. The purpose of this project was to develop a standard PONV prophylaxis clinical guideline; assess the current knowledge, attitude, readiness, and barriers to the PONV prophylaxis practice of anesthesia providers; and implement the consensus PONV prophylaxis clinical guideline through staff education.

Methods: This project was conducted in a Midwestern Level I trauma hospital and its two affiliated tertiary hospitals. A standard practice guideline for PONV management was developed based on best-evidence attained from a literature review. Current hospital needs and practices on PONV management were taken into consideration. Institutional review board exemption was approved by the participating hospital. Informed consent was obtained from the participants before pre- and post-education surveys were administered. Staff education on PONV management was conducted through an oral seminar presentation and an infographic poster for viewing by anesthesia providers. Surveys were completed by online questionnaires to measure the participants' knowledge of, attitude about, and readiness for the PONV prophylaxis standard practice guideline. Barriers to implementing consensus PONV prophylaxis guidelines were assessed in both surveys. The survey datacollection process was completed using Microsoft Forms and the data analysis was performed with Microsoft Excel.

Results: One hundred and forty-three anesthesia providers were invited to participate in the study. The response rates to the pre- and post-education surverys were 43% and 30%, respectively. All participants agreed that PONV prophylaxis was important in their practice and were very confident in their knowledge and skills to manage PONV; however, the pre-education survey revealed a lack of knowledge on PONV management and unawareness of practice guidelines among the anesthesia providers. Readiness for a consensus practice guideline for PONV management was high. In assessing the anesthesia providers' current clinical practice,

only 24% of participants used clinical guidelines from evidence-based practice and 11% followed hospital policy. Only 29% of participants used the PONV risk stratification tool for administration of antiemetics and 44% routinely gave just two antiemetics: Zofran and Decatron. The most important barrier to the anesthesia providers was a lack of simple consensus guidelines, followed by a lack of knowledge on antiemetics. The post-education survey showed dramatic positive changes in their knowledge, attitude, and confidence. The top three barriers identified in the pre-education survey greatly declined. The most important barrier was shifted from "a lack of simple consensus guidelines" to "no access to some antiemetics."

Discussion: This study created a solid foundation for implementing a consensus practice guideline for PONV management in the clinical setting. Although the anesthesia providers seemed very confident in their knowledge and skills in managing PONV, the study revealed a need for staff education on PONV and the implementation of a consensus practice guideline for PONV management. Education greatly improved the anesthesia providers' knowledge, attitude, confidence, and readiness and significantly reduced the barriers in clinical practice. This study also provided direction for the hospital management team, as the findings demonstrated that intervention from the hospital is necessary to overcome some of the barriers to implementing a consensus clinical guideline. One major limitation of this study was the small sample size/low response rate. Another limitation was the high proportion of student registered nurse anesthetists among the participants, which may skew the study results. Other limitations included survey fatigue and a narrow survey window.

Evidence Based Practice/Quality Improvement

Abstract #30

Implementation of Obstetric Hemorrhage Checklist: Interdisciplinary Simulation

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Introduction: Obstetric hemorrhage is the leading cause of maternal morbidity and mortality. The Preventing Maternal Deaths Act of 2018 and obstetric hemorrhage safety bundles encouraged states to form Maternal Mortality and Morbidity Review committees to evaluate maternal mortality. California found that 95% of hemorrhage-related deaths could be prevented, with delays in diagnosis and treatment of hemorrhage being the most common causes of mortality. To avoid delays, unit-based simulation and post-drill debriefings are recommended to improve teamwork and communication. A simulation conducted with a checklist allows the interdisciplinary team to review the four stages of hemorrhage management. This project aimed to improve provider recognition and treatment of obstetric hemorrhage by utilizing the American College of Obstetricians and Gynecologists (ACOG) hemorrhage checklist.

Methods: This evidence-based practice project was determined exempt by the university institutional review board. Three interdisciplinary simulations were performed at an academic medical center and a community hospital. Before implementation, project facilitators participated in simulation training, which included assessment and debriefing. Simulations consisted of a prebriefing to familiarize the nurse with the ACOG hemorrhage management checklist. In situ labor and delivery rooms were used with access to medications, an intrauterine device, and a high-fidelity mannequin. The debriefing discussed teamwork and communication, measured by the Perinatal Emergency Team Response Assessment (PETRA) scale, as well as interventions missed. Participants completed a post-simulation Likert scale survey that assessed knowledge, management, and likeliness to use the checklist. The Likert scale was evaluated by an average of scores prebriefing to debriefing. A paired t-test was used for interventions met on the ACOG checklist comparing prebriefing and debriefing. .

Results: Three interdisciplinary teams were evaluated. The paired t-test for the ACOG checklist showed no statistical significance in any of the four stages. Workload management and communication improved between all participating teams, as measured by the PETRA scale. The PETRA scale is a five-point scale. Workload management had a possible total of 25 points. For all simulations, there was an average of a five-point increase between prebriefing and debriefing. Communication had a possible total of 35 points. There was an average increase of four points between prebriefing and debriefing. Results from the Likert scale were clinically significant.

Perceived knowledge of hemorrhage management increased by two points on a seven-point Likert scale. The ability to manage hemorrhage also increased by two points on a seven-point Likert scale. Participants reported an increase in the likelihood of consulting a checklist in the future by two points on a seven-point Likert scale.

Discussion: The ACOG checklist showed no statistical significance. The authors suspect this could be due to time limitations and the team not fully partaking in the debriefing simulation. Participants were unaware that a checklist was available on the hemorrhage cart at both hospitals. The simulation allowed participants to practice the use of the checklist during the scenario. The simulation recognized system-wide delays in hemorrhage response with the OB-stat pager. The debriefing session reviewed closed-loop communication, JADA uterine vacuum device use, and adherence to the checklist. Limitations included a lack of buy-in from staff members and staffing issues that interfered with the ability to carry out the simulation. Strengths of this project include an already existing hemorrhage bundle policy and supplies in place at each hospital. This project filled the gap in establishing a culture for huddles and debriefing after an obstetric hemorrhage, as recommended by the obstetric hemorrhage bundle.

Evidence Based Practice/Quality Improvement

Abstract #31

Implementing a TEG® 6s Algorithm for Trauma Surgery at a Military Treatment Facility: An Evidence-based Project

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Introduction: Modern thromboelastography (TEG®) technology can quickly and accurately identify fatal coagulopathies. TEG® provides the ability to monitor coagulation phases in real time, allowing providers to deliver goal-directed hemostatic resuscitation. William Beaumont Army Medical Center (WBAMC) recently purchased TEG® 6s devices; however, institutional clinical practice guidelines have not been established for anesthesia providers. This has led not only to underutilization of the devices, but also to inappropriate clinical application. Therefore, this project intended to create an evidence-based goal-directed hemostatic resuscitation algorithm for adult patients experiencing either surgical trauma or trauma-induced coagulopathies.

Methods: Systematic literature searches were conducted in PubMed, Embase, and Google Scholar. Sixteen articles were included after evaluating methodological quality, level of evidence, and application to the project. Selected literature was then synthesized into a clinical interpretation algorithm tailored to the available resources at WBAMC. The Model for Evidence Based Practice Change by Rosswurm and Larrabee was used as the theoretical framework to implement the proposed evidence-based practice changes. A convenience sample of 30 physician anesthesiologists and Certified Registered Nurse Anesthetists (CRNAs) were provided pre-and post-implementation questionnaires (5-point Likert scales). The questionnaires were completed anonymously and assessed the anesthesia providers' confidence, general perceptions, and TEG® 6s utilization frequency for adult trauma patients. A Mann-Whitney U test was used to compare responses between pre-and post-implementation questionnaires ($p < 0.05$ significance).

Results: The authors created a comprehensive TEG® 6s clinical practice algorithm with the best available evidence and incorporated feedback from the department of anesthesia through surveys and presentations. The authors achieved a 93% response rate on the pre-and post-implementation questionnaires (28/30). A comparison evaluating data from the pre-and post-implementation questionnaires demonstrated a significant increase in providers' confidence and general perceptions using TEG® 6s for adult trauma patients. In total, 15/20 questions achieved a statistically significant increase in responses relating to confidence and perceptions using TEG® 6s ($p < 0.05$). Reported TEG® 6s utilization also increased following the clinical interpretation algorithm implementation ($p < 0.05$).

Discussion: The authors' TEG® 6s evidence-based clinical interpretation algorithm and treatment protocol positively influenced WBAMC anesthesia providers' confidence, perceptions, and reported device utilization for trauma patients with suspected coagulopathies. The authors recommend conducting future prospective research to determine the impact of the TEG® 6s clinical interpretation algorithm on patient outcomes. A potential limitation is that this algorithm and treatment protocol may not be generalizable to other military treatment facilities due to nonstandardized blood component allocation across the Defense Health Agency.

Evidence Based Practice/Quality Improvement

Abstract #32

Increasing Intercultural Competence in Nurse Anesthesia Students through Transnational Peer Mentorship

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Introduction: Nurse anesthetists provide care in over 45 countries, yet exposure to global peers is not part of the curriculum for many nurse anesthesia programs. Training in global health has traditionally used modalities such as lectures, online modules, and international field experience. Barriers such as cost and ethical concerns, along with the coronavirus pandemic, have given rise to interest in virtual global health opportunities. Virtual global mentorship is an emerging concept in healthcare training as it transcends geographic boundaries and fosters reciprocal partnerships. Virtual peer mentorship offers a sustainable and environmentally conscious way to meet the International Federation of Nurse Anesthetists (IFNA) first objective, which is to promote the cooperation of nurse anesthetists internationally.

Methods: This project was implemented at two universities with graduate programs in nurse anesthesia. The first was a large Midwestern university in the United States and the second was a European university, both with well-established nurse anesthesia programs. A transnational mentorship program was established using Deardorff's framework of intercultural competence with the aim of increasing cultural awareness in nurse anesthesia students. All participants were in their last year of education and training. Students completed a mentorship interest form, and mentorship pairs were intentionally assigned based on commonalities between applicants. Hour-long virtual Zoom meetings with preset agendas provided for each session were attended by participants. Topics ranged from the structure of nurse anesthesia education and clinical training in each country, student stressors, the importance of student wellness, and current challenges within the profession. Students were able to identify commonalities in their experiences as well as learn about innovative advancements coming out of each country.

Results: Outcome data were obtained using a pre- and post-intervention surveys. Descriptive statistics were used to summarize the project outcomes. Free-text feedback from students was used to gather subjective and nonquantifiable data regarding the success of this project. Open-ended feedback was used to identify common themes and ideas for future projects. Twenty-three students participated in the pilot mentorship program (92% participation rate). The outcome measure selected to evaluate the program was cultural awareness. A modified cultural awareness scale (mCAS) was utilized using pre- and post-surveys. The mCAS is validated and its functionality across cultures has been established by several different studies measuring intercultural awareness, thus can be a beneficial tool when working with international students.

Pre-intervention mCAS scores had an average cultural awareness of 55.8/80 (69%), demonstrating a moderate level of cultural awareness. After the intervention, the average mCAS score was 60.5/80 (75%). Students exhibited an overall increase in mean cultural awareness. All participants stated on their exit surveys that it was a beneficial experience and were able to state multiple benefits of global collaboration.

Discussion: Virtual peer mentorship offered an accessible and sustainable opportunity for exposure to global diversity. Innovative, cost-effective technologies that stimulate interest in global health have become an important priority not only for clinicians and educators but also higher-education institutions to broaden and strengthen global-engagement efforts. Using a structured peer mentorship program, nurse anesthesia students explored similarities and differences in anesthesia practices, education, and training in each country. Limitations included a small sample size, which challenges the generalizability of results. Furthermore, survey participation decreased throughout the project (86% pre-intervention to 59% post-intervention). Recommendations for future projects include a longer duration for the mentorship program or the addition of a clinical component. Integrating exposure of nurse anesthesia students to global peers will allow for a future supply of interculturally competent and engaged anesthetists.

Evidence Based Practice/Quality Improvement

Abstract #34

Ketamine Use for Prevention of Tourniquet-induced Hypertension

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Introduction: Tourniquet use can cause dull pain, hypertension, and tachycardia if a tourniquet is inflated for prolonged times, such as more than 35 minutes. Tourniquet hypertension has been defined as an increase in diastolic or systolic pressure by 30% or more and can occur in 11% of tourniquet use. Tourniquet hypertension is difficult to treat with traditional analgesics and depth of anesthesia. The N-methy-D-aspartic acid (NMDA) receptor may be involved in the development of hemodynamic responses to tourniquet use. Evidence suggests that ketamine, an NMDA antagonist, may affect the hypertensive response to prolonged tourniquet use. The purpose of this research is to determine if ketamine administration prior to tourniquet inflation affects the incidence of tourniquet-induced hypertension.

Methods: The PICOT question investigated was as follows: In patients undergoing general anesthesia with intraoperative tourniquet use, can the administration of intravenous ketamine prior to tourniquet placement affect the incidence of hypertension while the tourniquet is inflated during surgery compared with not administering ketamine? A systematic search of PubMed and Embase was performed in November 2023 using the keywords tourniquet and hypertension. Only English-written publications were reviewed. Inclusion criteria consisted of populations who underwent general anesthesia with tourniquet use, ketamine administration prior to tourniquet inflation, comparison to a control, and blood pressure observation. This integrative review was exempt from institutional review board approval. Results of the studies were reviewed, and *p* values were analyzed to determine statistical significance. The findings of this investigation will be implemented into clinical practice with a dissemination of the research and appraisal of understanding with questions prior to and after presentation.

Results: A systematic search of the databases found 53 articles in PubMed and 161 articles in Embase. Duplicate studies and articles not meeting inclusion criteria were excluded. Four randomized controlled trials (RCTs) matched these criteria. Diversity in the methodology of the studies reviewed made comparability between the studies more difficult. This diversity included varied dosages of ketamine, different data collection timeframes, and administration of ketamine infusion in addition to a bolus dose. Dosages of 0.1 mg/kg, 0.2 mg/kg, 0.25 mg/kg, 1 mg/kg, or 0.1 mg/kg followed by a 2 mcg/kg/min infusion of ketamine were analyzed. Three of these studies analyzed hemodynamics up to one hour after tourniquet inflation, and one analyzed data up to two hours after tourniquet inflation. Further, these studies excluded patients who were classified as ASA physical status 3-5 or had dementia or ischemic heart

disease. The four reviewed studies demonstrated that there can be a reduction in tourniquet-induced hypertension when ketamine is administered prior to tourniquet inflation when compared with a control. These findings will be disseminated through an educational presentation, along with a pre- and post-presentation questionnaire to assess learning.
Discussion: The evidence supports that ketamine administration prior to tourniquet inflation can be beneficial in decreasing the incidence and severity of tourniquet hypertension in patients receiving general anesthesia. However, additional research should be conducted to include patients who are ASA physical status 3-5 or have dementia or ischemic heart disease to investigate if similar results apply to a greater subset of the anesthesia population. Additional research to study the effects of ketamine over longer timeframes is also necessary. Ketamine may have a role in decreasing tourniquet hypertension; however, until more research is available on the topic, anesthesia providers should use their best judgement to decide if the patient and the timeframe are appropriate for ketamine administration.

Evidence Based Practice/Quality Improvement

Abstract #38

Perioperative Anesthesia Protocol for Adults with Developmental Disabilities

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Introduction: In the United States, approximately 2.1 million adults have developmental disabilities (DD) including diagnoses such as autism, cerebral palsy, and Down syndrome. Adults with DD report traumatic experiences when transitioning their anesthesia care from pediatric to adult hospitals. These reports are consistent with the global incidence of increased gaps in care for adults with DD transitioning to adult settings, whereas many as 40% begin refusing care. This project's purpose was to develop an evidence-based protocol to educate anesthesia providers on considerations for this population. The project goals included increased provider knowledge and confidence in caring for adults with DD, with a future goal to reduce traumatic experiences. Provider education inclusive of pharmacologic and non-pharmacologic interventions was implemented to improve the unique care of adults with DD undergoing anesthesia.

Methods: This project was guided by the follow PICOT question: In anesthesia providers, does education on an evidence-based perioperative protocol compared with no protocol and no education increase provider knowledge of rendering care to adults with DD? A literature review provided five sources supporting the clinical problem, six sources describing interventions to be implemented, and 19 sources detailing specific pharmacologic interventions. Interventions such as preanesthetic planning prior to surgery, development of a storyboard for patients and support persons, access to oral anxiolytics, and distraction items such as fidget toys were put into place. Provider education on anesthetic considerations and interventions were presented during anesthesia grand rounds. Pre- and post-test knowledge assessments were distributed before and after the education. Providers chose unique four-digit codes to maintain anonymity. Descriptive statistics were used to analyze data. The project team obtained university nonhuman subject institutional review board determination before implementation.

Results: Data were collected from 37 participants. Results demonstrated an increase in both knowledge and comfort in delivering anesthesia care to adults with DD. Correct answers to knowledge-based questions increased from 72.2% to 91.6% before and after the education session, respectively. Approximately 26.98% of providers reported being comfortable with rendering care to adults with DD prior to the education session, where 51.11% reported being comfortable after the education session. Validity was established by field experts reviewing the pre- and post-test questions for applicability. Researchers concluded education on a perioperative anesthesia protocol does increase provider knowledge of rendering care to adults

with DD. The post-survey results demonstrated a remaining knowledge gap on when it is appropriate to administer intramuscular (IM) ketamine, evidenced by 13.33% of respondents incorrectly choosing early IM ketamine administration to obtain intravenous access as an appropriate preoperative intervention for adults with DD. When asked what the recommended action is when a patient spits out oral midazolam, only 53.33% of respondents correctly chose administration of a full IM Ketamine dose.

Discussion: This project aimed to provide evidence-based recommendations for anesthesia providers when caring for adults with DD. The results demonstrated that education increases provider knowledge and comfort levels in rendering anesthesia care to adults with DD. The project team is optimistic that continued implementation of interventions and provider education will result in fewer reports of traumatic patient experiences. There were no qualitative data to assess at the studied facility, as patient reports of poor care were undocumented. The study's results were limited by provider response. Although 63 providers were present for education, only 37 test results could be included due to incompletion of pre- and post-tests or nonadherence to using the same identifier for both tests. The project team recommends additional provider education on the appropriate timing and dose of IM ketamine to close this knowledge gap. In addition, future scholarship should include assessing the patient's experience prior to and after the protocol's implementation.

Evidence Based Practice/Quality Improvement

Abstract #39

Postoperative Residual Paralysis Education Session for Postanesthesia Care Unit Nurses

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Introduction: The postanesthesia care unit (PACU) is a demanding, high-acuity unit. Patients present with multiple comorbidities who have received inhalational agents, opioids, and paralyzing medications, all altering their respiratory, hemodynamic, and mental statuses. Most significantly, nondepolarizing neuromuscular blocking agents (NMBAs) can linger when not properly reversed, causing postoperative residual paralysis (PORP). Complications of PORP can range in level of severity from short-term hypoxia requiring supplemental oxygenation to respiratory distress and aspiration requiring emergent reintubation. Because evidence-based education sessions have been shown to increase healthcare providers' comfort with and knowledge of a new topic, an evidence-based education session was presented to PACU nurses at an academic, high-acuity hospital to increase the nurses' knowledge of PORP.

Methods: The project received approval by the University Institutional Review Board (IRB) for the nonhuman subjects research protocol based on its educational nature. No further oversight was needed. There were also no conflicts of interest related to the project. An education session, consisting of a PowerPoint presentation and a case scenario discussion, was created. This included what PORP is, why it occurs, how to recognize it, and how to intervene to reduce adverse events and patient complications. To evaluate the intervention, each participant completed identical pre- and post-education session evaluations which were accessible via a QR code. The evaluation consisted of five demographic and five knowledge-based questions. Each participant was asked to select a unique 4-digit identifier to maintain anonymity of submitted data. The data were compiled in an excel document to view and analyze. Descriptive statistics were used to compare pre- and post-item mean scores.

Results: Assessment of the pre-education session knowledge-based questions resulted in an overall mean score of 79.99%. Assessment of the post-education session knowledge-based questions resulted in an overall mean score of 93.33%. For Question 1, which addressed specific signs and symptoms of PORP that PACU nurses might witness during the recovery phase, the pre-session score was 66.66% and post-session score was 100%. For Question 2, which addressed the need for reversal agents and possible risk of PORP without their administration, the pre-session score was 66.66% and post-session score was 100%. For Question 3, which addressed types of reversal agents available for administration, the presession score was 100% and post-session score was 66.66%. For Question 4, which addressed types of non-depolarizing NMBAs administered in the operating room, the pre-session and post-session scores were both

100%. For Question 5, which addressed significant side effects of Sugammadex administration, the pre-session score was 66.6% and post-session score was 100%. The increase in overall mean score after presentation of the evidence-based PORP educational material demonstrated that the evidence-based education session was effective in increasing the PACU nurses' overall knowledge of PORP, including: what it is, why it occurs, how to recognize it, and how to effectively intervene if they suspect their patient is experiencing PORP to avoid adverse events and complications.

Discussion: Despite recommended standards from professional anesthesia organizations on the monitoring and reversal of nondepolarizing NMBAs, there are many healthcare facilities that do not have quantitative peripheral nerve stimulators readily available due to cost constraints. These financial barriers also lead to limitations on the administration of Sugammadex. This contributes to a PORP incidence range of approximately 16.8% to 88%. It is imperative that PACU nurses recovering patients from anesthesia have the knowledge to recognize PORP signs and symptoms and the skills to intervene to prevent respiratory adverse events. Continued education on PORP occurrence and increased collaboration with anesthesia providers are recommended to decrease future complications. One limitation of this project was reduced attendance at the session due to high patient census and low staffing. PACU nurse shortages can make it necessary to construct educational alternatives that are available in multiple formats, such as online modules and in-person seminars.

Evidence Based Practice/Quality Improvement

Abstract #40

Preoperative Warming for Prevention of Unplanned Intraoperative Hypothermia

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Introduction: Hypothermia, considered a temperature below 36 °C, occurs commonly in patients under anesthesia. Around 60% of patients become hypothermic within one hour after anesthesia induction. Unplanned intraoperative hypothermia can lead to impaired wound healing, increased surgical site infection, delayed recovery, coagulopathies, and impaired drug metabolism, consequently resulting in negative surgical outcomes. Research reports 30 minutes of active prewarming with forced air warming devices can significantly decrease the incidence of unplanned intraoperative hypothermia. This project aimed to improve staff knowledge regarding unplanned hypothermia and its impact, identify barriers to utilization of forced air warming devices preoperatively, and promote their use with the ultimate goal to decrease unplanned hypothermia episodes intraoperatively.

Methods: This quality improvement project was implemented in the preoperative area at an academically-affiliated community hospital in South Florida. Implementation included pre- and post-education surveys of staff to evaluate barriers to active prewarming, followed by an educational session to address potential knowledge gaps, and culminating in increased utilization of the available forced air warming devices in the preoperative phase. De-identified body temperature data collected included cases of patients 18 years of age and older who presented for elective surgical procedures requiring general anesthesia. Body temperature was collected prior to surgery, one hour after anesthesia induction, and on arrival to the PACU. Data collected from the pre- and post-education surveys were statistically analyzed using a Wilcoxon signed rank test for knowledge, a repeated-measures analysis of variance (ANOVA) for changes in temperature throughout the surgical experience, and an independent samples t-test for changes in the duration of hypothermic episodes.

Results: A total of 20 staff members participated in the educational session and completed the surveys. The most common barriers identified were time limitations and use of forced air warming devices not being identified as a priority during preoperative preparation, with 30% (*n* = 6) and 20% (*n* = 4) of responses, respectively. In the pre-education survey, 70% (*n* = 14) strongly agreed that hypothermia negatively affects surgical outcomes, while 90% (*n* = 18) agreed that hypothermia negatively affects surgical outcomes in the post-education survey. Similar improvement was noted when asked about the importance of warming patients, with 50% (*n* = 10) answering “strongly agree” in the pre-education survey compared to 90% (*n* = 18) choosing “strongly agree” in the post-education survey. The incidence of unplanned

intraoperative hypothermia decreased from 18 cases pre-education to 12 cases in the post-education period, representing an overall decrease of 15%. The mean duration of the unplanned hypothermia episode decreased from 70.3 minutes pre-education to 56.3 minutes post-education. The median duration of unplanned hypothermia episodes also showed a decrease from 70.0 minutes to 42.5 minutes pre- and post-implementation, respectively. Results showed no statistically significant difference in changes in temperature at the different times collected.

Discussion: This quality improvement project successfully achieved a 15% decrease in the overall number of unplanned intraoperative hypothermia episodes, while significantly improving staff's knowledge regarding unplanned hypothermia and its impact. This is a notable result that can serve as the first step toward a sustainable evidence-based practice change. Continued efforts are necessary to ensure sustainability and further success of this initiative. It is important to maintain staff engagementand available resources, and to include other members of the patient care team such as anesthesia practitioners and surgeons. Greater collaborations ensures that similar initiatives can drive positive changes in surgical departments. Possible limitations of this project include inconsistencies in the site where temperatures were taken during different phases of care, unavailability of documentation regarding length of time forced air warming devices were used, and differences in the type of thermometer used to check temperatures intraoperatively versus pre- and postoperatively.

Evidence Based Practice/Quality Improvement

Abstract #41

Quadratus Lumborum Block Versus Erector Spinae Plane Block for Postoperative Analgesia Following Cesarean Section

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Introduction: Cesarean section (CS) is the most performed surgical procedure; however, suboptimal postoperative pain relief can lead to heightened morbidity, maternal dissatisfaction, and increased hospital expenses. Regional anesthesia plays a pivotal role in multimodal analgesia, aiming to reduce postoperative opioid requirements and associated adverse effects. While evidence suggests potential advantages of quadratus lumborum block (QLB) and erector spinae plane block (ESPB) due to their possible spread of local anesthetic (LA) into the paravertebral space providing analgesia, the most effective regional technique remains uncertain. The purpose of this integrative review was to compare the efficacy of QLB and ESPB in alleviating postoperative pain following CS.

Methods: The PICOT question was as follows: In female adult patients over 18 undergoing CS under spinal anesthesia, how does ultrasound guided QLB impact post-operative pain relief compared with ESPB as evidenced by pain scores, total opioid consumption, and duration of analgesia in a 24-hour period? A systematic search of Embase and ProQuest Research Library was conducted using the date range 2019-2024 and a combination of terms, including cesarean section, spinal anesthesia, quadratus lumborum block, erector spinae muscle, nerve block, and ultrasound. Inclusion criteria were as follows: subjects over the age of 18 undergoing CS under spinal anesthesia, and both QLB and ESPB as interventions. Articles were excluded if they did not meet inclusion criteria. This integrative review was exempt from institutional review board approval. The findings will be incorporated into clinical practice through an educational event utilizing a pre-/post-test design to assess learning outcomes.

Results: The database search yielded 25 results from Embase and 20 from ProQuest Research Library. After eliminating duplicate studies and those failing to meet inclusion criteria, six randomized controlled trials and one retrospective comparative study remained. All seven studies reported no statistically significant difference in pain scores between QLB and ESPB at any time point in the first 24 hours following CS. Five studies also evaluated pain scores with movement and found no statistically significant difference in pain scores between the blocks. All seven studies found both QLB and ESPB to be comparable in amount of rescue opioid required. One study compared QLB and ESPB to a control group that received no block, finding both blocks to be more effective than receiving no block. An additional study compared QLB and ESPB to a control group that received intrathecal morphine and found the intrathecal morphine

group had longer duration of analgesia than ESPB. However, total amount of opioid consumed was similar in all groups. Implementation of these findings into clinical practice will be through an education event including poster presentation and assessment of learning with a pre-/post-test design.

Discussion: Best-evidence literature suggests that both QLB and ESPB are effective modalities for reducing postoperative pain in adult women undergoing CS under spinal anesthesia. No conclusive evidence exists to suggest that one approach is superior to the other in terms of pain scores, opioid consumption, and duration of analgesia. Therefore, both QLB and ESPB are suitable additions to multimodal analgesia protocols aimed at reducing opioid use and subsequent side effects in CS patients. However, studies were conducted with different dosing strategies and choices of LA and opioids, leading to an unknown optimal dosing regimen. Additionally, variations in QLB approaches were observed across studies, further complicating the determination of an optimal approach. Consequently, additional research is warranted to ascertain the best QLB approach, optimal LA dose, and to compare QLB and ESPB with other peripheral nerve blocks. The recommendations of this discussion are of moderate strength.

Evidence Based Practice/Quality Improvement

Abstract #42

Quiet KIDZ (Keep It Down Zone): An Evidence-based Project to Assess and Improve Distraction in the Operating Room during the Critical Period of Induction of General Anesthesia at Mott Children's Hospital

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Introduction: During anesthesia induction, it is crucial to maintain a quiet OR to enhance provider concentration and precision. However, providers often face significant distractions. Leading healthcare authorities, including the Joint Commission, Association of periOperative Registered Nurses, American Society of Anesthesiologists, and American College of Surgeons, endorse measures inspired by aviation's "sterile cockpit concept" to mitigate distractions. This evidence-based practice project aimed to minimize distractions such as noncritical conversations, music, and other noise sources. By engaging a comprehensive team of intraoperative staff—CRNAs, anesthesia residents, surgeons, and nurses—the project sought to foster a safer, more focused environment from the patient's OR entry to completion of anesthesia induction.

Methods: In the pre- and post-interventions design of this study, phase I involved anesthesia providers completing a survey to assess their perception of distractions during the induction of anesthesia. Phase II evaluated the effectiveness of the interventions through a post-implementation survey to gauge changes in described distractions. The interventions were multifaceted: The first created a distraction-free induction environment that included education and awareness sessions for perioperative and anesthesia staff along with the formation of a multidisciplinary team of "Change Champions." The second intervention involved placing "Quiet KIDZ" signs on OR doors and turning off music prior to patient arrival. The third intervention included a protocol to remind staff via verbal reminders to avoid side conversations, music, and loud noises, and reinforce the importance of maintaining low noise levels if they rise. Data were collected using a QR code-based survey system, allowing for detailed analysis of the interventions' impact on reducing distractions in the OR.

Results: The pre-implementation survey conducted with anesthesia providers in Mott operating rooms revealed that a considerable number of respondents were aware of specific distractions during anesthesia induction, with 92% observing side conversations, 64% hearing music, and 64% noticing loud noises, including door breaches. Eighty percent of respondents felt distracted by these factors, which also reportedly affected their ability to hear alarms (56%), diverted their attention from patient care (79%), and impaired staff communication (81%). Post-

implementation of the Quiet KIDZ initiative, 94% of providers reported fewer distractions from side conversations and 74% from loud noises. Quantitative data from nursing QR audits showed a 50% reduction in music, a 36% reduction in side conversations, and a complete elimination of inadvertent loud noises during induction after Quiet KIDZ implementation. Overall, there was a 24% increase in distraction-free inductions. Additionally, induction times decreased by 25% and door breaches were reduced by 29% on average. Although changes in decibel levels were not statistically significant, ambient noise levels in OR rooms remained above Environmental Protection Agency recommended guidelines.

Discussion: The Quiet KIDZ initiative, designed to minimize distractions during anesthesia induction, has shown significant enhancements in creating a focused environment crucial for patient safety. Endorsed by healthcare authorities, the initiative incorporated a thorough assessment strategy with pre- and post-implementation surveys and quantitative audits. Initial findings indicated a high prevalence of distractions, with a majority of anesthesia providers noting these disruptions. Despite the positive feedback from perioperative staff, CRNAs, anesthesiologists, and surgeons, changing deeply embedded cultural norms and attitudes within a large organization remains a substantial challenge. This project highlights the need for broader implementation and ongoing cultural shifts to maximize the interventions' impact on patient safety and care-quality, thereby aligning Mott operating rooms with the hospital’s mission to prioritize patients and families.

Evidence Based Practice/Quality Improvement

Abstract #43

Retrospective Review of Failed Epidural Analgesia during Labor: A Quality Improvement Project

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Introduction: This quality improvement project aimed to identify significant risk factors of failed epidural analgesia (FEA) during labor through a retrospective chart review and to propose clinical practice recommendations to improve labor epidural success rates at an urban academic medical center. Research indicates epidural analgesia is the most effective way to reduce labor pain in parturients. However, FEA can lead to poor maternal satisfaction, decompensation to control the physiologic response to pain, general anesthesia for a cesarean delivery (CD), and postpartum depression. Research demonstrates FEA ranges from 8% to 23% with diverse factors contributing to these failures, such as greater body mass index (BMI), increased catheter duration, and multiple medication boluses. Additionally, there is a recurring recommendation to review and determine the underlying reasons behind FEA.

Methods: Data were gathered from 100 patients who experienced successful epidural analgesia (SEA) and 100 patients who experienced FEA from January 1, 2023, to September 30, 2023. Patients were grouped based on the presence of one epidural procedure note for the SEA group and multiple epidural procedure notes for the FEA group. Patients were included only if they received an epidural for labor analgesia. The exclusion criterion was neuraxial procedures performed within 45 minutes of the patient receiving a CD. The university institutional review board determination for this project was nonhuman subjects research. Patient confidentiality and compliance with HIPAA standards were upheld by collecting data in REDCap. Descriptive statistics were performed on all variables. Subsequently, chi-square and Fisher's exact tests were conducted for ordinal and nominal variables identified by the project team from the descriptive statistics.

Results: A total of 239 charts were reviewed and 39 were excluded to obtain 200 charts. After statistical analysis, various factors were found to be more common in the FEA group than in the SEA group. Increased BMI was found to be a significant factor in the FEA group (p = 0.0019). Chorioamnionitis significantly increased the risk for epidural failure (p = 0.0012), as 74% of the patients with chorioamnionitis had their epidural replaced. The risk for FEA was higher in patients who received traditional epidural technique as opposed to dural puncture epidural (DPE) technique. Common treatments for a poorly functioning epidural, such as medication redosing of a labor epidural (p =< 0.0001) and use of epidural fentanyl (p =< 0.0001), were

significantly higher in the FEA group. Incidence in the FEA group occurred with accidental dural puncture (p = 0.0324), gestational hypertension (p = 0.0446), chronic hypertension with superimposed preeclampsia (p = 0.0143), and preeclampsia (p = 0.0407). However, chronic hypertension was not found to increase the risk for FEA. Data gathered on ethnicity showed no health disparity existed in FEA (p = 0.462). The presence of cocaine, methamphetamine or marijuana use did not increase the risk for FEA. Data were gathered on the use of ultrasound for epidural placement, but only 11% of epidurals were placed with ultrasound assistance.
Discussion: Many factors identified in the chart review were consistent with risk factors found in the literature. In patients with a BMI > 40 kg/m2, gestational hypertension, preeclampsia, and chorioamnionitis were identified as high-risk. DPE technique was a significant factor in decreased FEA risk. Due to this, the project team recommends the use of DPE technique in all high-risk groups. A trial of neuraxial ultrasound use in patients with a BMI > 40 kg/m2 is also recommended to investigate if this improves epidural efficacy in the higher BMI population. This project consisted only of patients from one hospital with a population of 200. Though this does not reflect the larger population, it demonstrates the anesthesia team's efforts to minimize health disparity and improve the provision of analgesia to all patients. Another limitation identified was inconsistency in provider entry into the electronic medical record. Despite these constraints, this project will be useful in future quality improvement at the hospital of implementation.

Evidence Based Practice/Quality Improvement

Abstract #44

Anesthetic Considerations for Skeletal Muscle Channelopathies: An Educational Initiative

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Introduction: Skeletal muscle channelopathies encompass five syndromes that include hyperkalemic periodic paralysis, hypokalemic periodic paralysis, myotonia congenita, paramyotonia congenita, and Andersen-Tawil syndrome. These syndromes stem from genetic defects of muscle tissue electrolyte channels that cause exacerbations of muscle weakness, paralysis, or rigidity. Although the incidence of these conditions is rare, anesthetic considerations such as medication administration, electrolyte balance, and temperature management are required to prevent exacerbations. The first set of approved anesthetic guidelines from the Periodic Paralysis Association has emerged regarding the anesthetic care of patients with skeletal muscle channelopathies. The goal of this project was to share this information with current and future anesthetic providers to ensure patient safety.

Methods: The project intervention sites included an urban Midwest academic medical center and a university campus. The intervention population consisted of Certified Registered Nurse Anesthetists (CRNAs) and student registered nurse anesthetists (SRNAs). The project obtained university nonhuman subjects research determination before implementation. An education session including a pre- and post-test assessment was provided to the population. Following the anonymous pre-test, a 30-minute PowerPoint presentation on the anesthetic considerations for skeletal muscle channelopathies was presented followed by a question-and-answer session. After the education presentation, an anonymous post-test was administered to assess participant knowledge. A paired t-test was run to measure statistical differences between the pre- and post-test results and to identify areas for improvement.

Results: A total of 35 individuals participated in the education session and completed the pre- and post-tests; 18 were CRNAs and 17 were SRNAs. Before the education session, 91.4% of total participants stated a "Poor" rating on a self-reported confidence scale regarding knowledge of anesthetic considerations for patients with skeletal muscle channelopathies and 8.6% of total participants stated a "Fair" rating. Only 2.9% of total participants recorded having provided care for a patient with a skeletal muscle channelopathy. Following the education session, 20% of total participants stated an "Excellent" rating on a self-reported confidence scale regarding knowledge of the considerations for patients with skeletal muscle channelopathies, 71.4% stated a "Fair" rating, and 8.6% stated a "Poor" rating. The average pretest score of content questions was 39.8% for CRNAs and 31.9% for SRNAs. The average post-test score was 89% for

CRNAs and 84.6% for SRNAs. Statistical significance of the scores utilized a confidence interval of 95%, producing an average *p* value of improvement of 0.0005. The most commonly missed questions regarded the pathophysiology behind the conditions.

Discussion: Although skeletal muscle channelopathies are rare, research proves that the conditions can be directly triggered by anesthesia. Anesthesia providers should be knowledgeable about the anesthetic considerations for patients with these conditions to maintain patient safety and provider competency. There is a knowledge and confidence gap in anesthesia providers regarding the care of patients with these conditions as evidenced by a pre-test average knowledge score of 35.9% and a confidence level rating of "Poor" by 91.4% of participants before the education. The implemented education increased both CRNA and SRNA self-reported confidence levels and post-test scores. Future goals of the project include making the educational session and anesthetic guidelines available to providers for reference via an online webpage. More emphasis will also be placed on understanding the pathophysiology of the conditions in future presentations. Project limitations included a small sample size of 35 participants and implementation at only two sites.

Evidence Based Practice/Quality Improvement

Abstract #45

Anesthetic Implications for Patients Who Vape: A Review of the Latest Evidence

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Introduction: According to data from the National Center for Health Statistics and the Centers for Disease Control and Prevention (CDC), about 8.1 million adults and 2.55 million adolescents in the U.S. use electric cigarettes (ECs). With the number of vaping individuals in the U.S. increasing and the damage done by ECs to the lungs being so hazardous, in 2020 the CDC was forced to declare an outbreak of e-cigarette or vaping product use-associated lung injury (EVALI). EC users, who consider themselves distinct from traditional cigarette smokers, identify as vapers. This may present challenges for anesthesia providers in assessing smoking status before surgery, potentially leading to complications during the perioperative period. This literature review examined the acute and chronic side effects of ECs and their impact on surgical patients under anesthesia. The review also offers recommendations for anesthesia providers managing patients who vape.

Methods: An exhaustive database search of PubMed, the Cumulative Index to Nursing and Allied Health Literature (CINAHL), and MEDLINE (ProQuest) was performed. A total of 14,536 articles were obtained from all databases and following screening processes and filtering of language, date published, and removal of duplicate articles, 26 articles were full-text screened. Following full-text screening, 11 articles were chosen to be included in this review. The goal of this literature review was to determine the side effects associated with use of ECs and analyze how these effects may impact the administration of anesthesia. A secondary outcome will be to advocate for a preoperative assessment tool to assist in guidance of anesthetic perioperative management. The information gathered from this literature review will be used to create an educational learning tool for anesthesia providers to gain knowledge on the health hazards of ECs and the anesthetic implications to practice in the perioperative period. Institutional review board exemption was obtained from the university.

Results: The 11 articles chosen evaluated the acute and chronic effects of EC use on various organ systems and how these effects should be considered by anesthesia providers to optimize anesthetic plans for patients undergoing surgical procedures. The neurological effects associated with EC use are alterations in the concentrations of neurotransmitters, impairment of neurovascular health, and cognitive dysfunction. Ocular effects associated with EC use are tear film instability, overproduction of tears, and changes to the integrity of the corneal surface. Oropharyngeal effects associated with EC use are genotoxicity, cytotoxicity, and deregulation of key genes related to cancer pathways. Pulmonary effects associated with EC use are worsening

ventilatory function, inflammatory changes to the lung tissue, and decreased air quality. Cardiovascular effects associated with the use of ECs are hemodynamic derangements, increased evidence of oxidative stress, and platelet dysfunction. Future directions of research would focus on acute versus chronic effects of ECs and how their effects impact the various organ systems of the body while undergoing anesthesia.

Discussion: The neurological effects of ECs can impact the effectiveness of medications administered during induction, increase the risk for postoperative nausea and vomiting, and delay emergence. The ocular effects of ECs can affect an anesthesia provider's ability to administer anticholinergics and opioids, increase the risk for corneal abrasions, and lead to negative postoperative outcomes due to anatomical changes in the eye. The oropharyngeal effects of ECs can influence the anesthesia provider's airway management techniques and put the patient at increased risk for infection and unanticipated trauma. The pulmonary effects of ECs can prove challenging when managing ventilation during the perioperative period. Pulmonary inflammatory processes, prolonged emergence, and delayed return of airway reflexes can occur, further complicating emergence. Patients who vape are at increased risk for cardiac complications similar to cigarette smokers and warrant close hemodynamic monitoring, especially with nicotine use.

Evidence Based Practice/Quality Improvement

Abstract #46

The Effect of an Opioid-free Anesthesia Plan on Postoperative Pain Scores in Adult Thoracic Patients

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Introduction: The United States has experienced an increase in the number of opioid-related deaths, and healthcare systems are attempting to curb this growth. Exposure to opioids during anesthesia may contribute to the rising number of people suffering from substance use disorder. Opioids provide proven pain control although they are associated with negative side effects. The notion that opioids are required for adequate postoperative pain relief should be reexamined. Evidence suggests that other analgesic modalities may provide similar pain management. The purpose of this integrative review was to delve into opioid administration by anesthesia professionals to determine if there are differences in postoperative pain levels in patients who undergo thoracic procedures using opioid-free anesthesia versus opioid-based anesthesia.

Methods: The PICOT question was as follows: In thoracic surgical patients aged 18 and older what is the effect of opioid-free anesthesia (OFA) with or without regional techniques versus opioid-based anesthesia (OBA) with or without regional techniques on postoperative pain scores and opioid consumption 24-48 hours after surgery? PubMed and Embase were probed in February 2024 for relevant literature with a date range from 2010 to 2024 by using the following search terms: opioid-free anesthesia, opioid-free anesthesia, opioid-free anesthesia and thoracic surgery, opioid-free and anesthesia plan, opioid-free AND surgery. Inclusion criteria were adult patients between 18 and 65 years undergoing thoracic surgery. Exclusion criteria were studies where patients in the OFA group received opioids intraoperatively. The integrative review was exempt from institutional review board approval. The findings of this research project will be implemented into clinical practice by an educational event conducted by the authors, using a pre-test/post-test measurement tool to assess learning.

Results: The systematic search retrieved 178 citations from PubMed and 1,037 from Embase. Inclusion and exclusion criteria narrowed the results to 61 and 14 citations, respectively. Best-evidence available were one systematic review and meta-analysis (SRMA), two randomized controlled trials (RCTs), and one individual case-controlled study. The SRMA reported no statistical differences in 24-hour postoperative pain scores nor 48-hour morphine milligram equivalents (MME) between OFA and OBA. One RCT reported no significant differences in postoperative numeric pain rating scale (NPRS) scores at 24 hours nor postoperative tramadol consumption between OFA and OBA. The second RCT reported more patients had an NPRS ≥ 4

(10/80) in the OFA group than in the OBA group (0/79) at 24 hours. In the case-controlled study, there were no differences in median postoperative pain scores (0-3 verbal rating scale) and mean postoperative MME at 24 hours. The preponderance of data demonstrates there are little to no differences in postoperative pain scores and opioid consumption in patients undergoing thoracic surgery who receive OFA compared with those who receive OBA. The findings of this research project will be implemented into clinical practice by an educational event for anesthesia professionals conducted by the authors using a pre-test/post-test measurement tool to assess learning.

Discussion: There were no differences in postoperative pain scores in three of four studies and one study reported more patients experiencing pain ≥ 4 in the OFA group than the OBA group. There were no differences in postoperative opioid consumption between groups in three studies. The evidence demonstrates that OFA and OBA provide equivocal pain control without the concomitant exposure to opioids. Limitations to the current evidence includes small study samples, differences in anesthesia technique, and variable regional anesthesia techniques. Avoidance of opioid administration during anesthesia for thoracic surgery may enhance patient recovery from surgery by avoiding opioid-associated adverse effects. Questions remain regarding the ideal OFA agents for thoracic surgery and other procedures. No adverse effects were attributed to OFA in the studies. The current evidence indicates that patients receiving OFA for thoracic surgery have similar pain scores and opioid consumption after surgery compared to patients who receive OBA.

Evidence Based Practice/Quality Improvement

Abstract #47

The Effect of GLP-1 Receptor Agonist Medications on Fasting Gastric Volumes

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Introduction: The use of glucagon-like peptide-1 (GLP-1) ragonists has increased 40-fold over the past five years for both medically guided weight loss and diabetes management. Medications that delay gastric emptying pose an aspiration risk to patients undergoing anesthesia because an actual fasting state cannot be confirmed. The U.S. Food and Drug Administration (2023) revised the warning label for semaglutide to include ileus. The purpose of this integrative review is to gather data on the effect of GLP-1 agonists on fasting gastric volumes and bring awareness to anesthesia providers on the implications for adult surgical patients undergoing general anesthesia. This integrative review examined data on fasting gastric volumes in adult patients taking GLP-1 agonists and applied it to an anesthesia setting.
Methods: The PICOT question for this integrative review was as follows: In adult patients 18 years and older, what is the effect of GLP-1 agonists (semaglutide and liraglutide) compared to no GLP-1 agonists on gastric content volume (measured in mL) at ≥ 8 hours fasting? PubMed and MEDLINE were systematically searched for relevant literature using a date range from 2000 to 2024 with a combination of search terms including “GLP-1” OR “glucagon-like peptide 1,” “gastric volume,” and “fasting.” Limits were applied such as “English language” and “scholarly (peer reviewed) journals.” Inclusion criteria were limited to adult patients. Exclusion criteria were medications that cause gastroparesis. This integrative review was exempt from institutional review board approval. The findings will be disseminated into clinical practice at an anesthesia department educational event using a pre-/post-test design to assess learning and presentation effectiveness.
Results: PubMed and MEDLINE systematic search yielded 34 and 26 citations, respectively. Studies that failed to meet inclusion and exclusion criteria were removed. Best-evidence articles were identified, yielding two randomized controlled trials, one observational study, one prospective study, and one case report. Fasting gastric volumes were assessed in 600 patients across the four studies. Various methods were used to measure fasting gastric volumes and the presence of gastric solids including intravenous Tc-pertechnetate injection, gastric ultrasound, and upper endoscopy with aspiration and direct measurement of stomach contents. GLP-1 agonists semaglutide and liraglutide significantly increased fasting gastric volumes and/or solids compared to placebo in three of four studies. Fasting gastric volumes were significantly increased in two studies ($p < .05$), while one study demonstrated significant solids in 90% of patients taking semaglutide after an overnight fast ($p = 0.005$). Variability in measurement

methods increased the difficulty of result comparison; however, all studies but one demonstrated significantly increased fasting gastric volumes and/or solids. These findings will be implemented into clinical practice at an educational event using a pre-/post-test design to assess learning and presentation effectiveness.

Discussion: Evidence supports routine preoperative screening in patients taking GLP-1 agonists along with documentation of last-dose date and time. Patients who have not held preoperative GLP-1 agonists for seven days should receive a gastric ultrasound. Rapid sequence induction or surgical case delay should be considered in patients who have not held GLP-1 agonists and yield > 1.5 mL/kg gastric content under ultrasound. Concerns for aspiration leading to pneumonia, pneumonitis, and airway obstruction have been cited in patients who both have held and who have not held preoperative doses of GLP-1 agonists. Further research regarding the relationship between GLP-1 agonist dosing, fasting times, and gastric volumes is needed. Recommendations of this integrative review are limited due to low levels of evidence, small sample sizes, and retrospective designs.

Evidence Based Practice/Quality Improvement

Abstract #48

The Effectiveness of an Enhanced Surgical Time-out in Preventing Adverse Events in Surgical Patients

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University of North Florida

Introduction: Gaps in organizational time-out protocols fail to address all major safety issues that can result in adverse events in surgical patients. The purpose of this work was to present evidence on the effectiveness of an enhanced surgical time-out at preventing adverse events in surgical patients. A change in practice, based on this evidence, is described.

Methods: The CINAHL, Cochrane Library, and Health and Medicine (ProQuest) databases were searched using keywords from the following PICOT question: Do patients undergoing a surgical procedure (P) who receive an enhanced time-out checklist (I) compared with similar patients who do not receive the same time-out checklist (C) have a lower incidence of adverse events (O) perioperatively (T). The evidence from two randomized controlled trials, an observational cohort study, and a controlled multicenter prospective study consistently found that patients who received the enhanced surgical time-out checklist had fewer adverse events and better communication and behaviors among the perioperative team.

Results: A proposal for a change in practice was developed based on the evidence from these studies. A waiver from the University of North Florida Institution Review Board for implementation of this practice change was submitted and approved.

Discussion: A change of practice was made at Clarinda Regional Health Center by educating the anesthesia department and perioperative staff on the effectiveness of implementing an enhanced time-out checklist. Following educational sessions, there was a 100% increase in perioperative team use of an enhanced standardized time-out checklist. Due to the effectiveness of implementing an enhanced time-out checklist, recurring education was implemented for current staff and for onboarding new perioperative staff to increase the use and accuracy in the perioperative setting.

Evidence Based Practice/Quality Improvement

Abstract #49

The Effectiveness of Ondansetron Administration Prior to Spinal Anesthesia to Reduce Hypotension

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Introduction: Spinal anesthesia is a common anesthetic technique used for parturients requiring elective cesarean section (CS). Sympathectomy following administration and onset of a spinal anesthetic is a major cause of hypotension. It is unclear if parturients undergoing CS who receive ondansetron prior to administration of a spinal anesthetic have less spinal-induced hypotension. The purpose of this work was to describe the evidence on the effectiveness of ondansetron prior to a spinal anesthetic for reducing the incidence of spinal-induced hypotension in parturients. A change in practice was made based on this evidence.

Methods: Keywords from the following PICOT question were used to search four literature databases: Do parturients undergoing CS with spinal anesthesia (P) who receive ondansetron (I) prior to administration of a spinal anesthetic compared with those who do not receive ondansetron (C) experience less hypotension (O) following spinal administration (T)? Evidence from four randomized controlled trials (RCTs) and one systematic review meta-analyses of RCTs consistently found patients who received 4 to 8 mg of ondansetron prior to spinal anesthesia experienced decreased vasopressor drug requirement and decreased hypotension. Based on this evidence, a waiver was obtained from the University of North Florida Institutional Review Board.

Results: Based on this evidence, a change in practice was implemented. A presentation on the evidence was given to 20 anesthesia providers in the obstetric department at Winnie Palmer Hospital on the evidence of the effectiveness of ondansetron prior to a spinal anesthetic for reducing the incidence of spinal-induced hypotension in parturients. Prior to this educational presentation, ondansetron was administered after spinal anesthesia by all providers except two. Two months after the presentation, ondansetron administration before a spinal anesthetic was being utilized by 12 anesthesia providers at Winnie Palmer.

Discussion: A change in practice was made at Winnie Palmer by educating the anesthesia providers on the evidence of the effectiveness of ondansetron administration five minutes prior to spinal anesthesia in parturients. Following this education, there was an increase in the amount of anesthesia providers using ondansetron to reduce hypotension in parturients undergoing CS. Additionally, ondansetron is readily available in all four operating room

omnicells at Winnie Palmer Hospital which should augment sustainability.

Evidence Based Practice/Quality Improvement

Abstract #50

The Functionality and Effectiveness of Virtual Reality Training in Nurse Anesthesia Programs

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Introduction: The purpose of our project was to address the didactic and clinical educational gaps between virtual reality (VR) and its functionality in nurse anesthesia training. VR has started to be incorporated in many fields of medicine, but has limited implementation in anesthesia. Studies have shown VR to increase learners' self-efficacy scores (Fracis et al., 2020) and increase performance scores (Guedes et al., 2019). Our project aimed to demonstrate how important and beneficial it is for nurse anesthesia programs to implement SIMVANA VR into didactic curriculums to better prepare students for clinical practice, increase their knowledge base, and increase exam scores.

Methods: First-year students completed SIMVANA learning lessons related to anesthesia lecture material. Second-year students had the ability to utilize SIMVANA, but it was not incorporated into their didactic curriculums. Third-year students received a PowerPoint presentation explaining SIMVANA, but had no access to SIMVANA. Each cohort received pre- and post-SIMVANA surveys. Exam scores were compared among all cohorts in the course of introduction to anesthesia. Second-year students received an anxiety survey prior to starting clinicals and the same survey one month post-clinical. Clinical preceptors at hospital sites were asked to complete surveys evaluating second-year students. All participants' data were blinded and any participant who dropped out of the project received no repercussion. This project has already been implemented and data analysis was performed on May 31, 2024 to compare all data metrics among all cohorts.

Results: First- and second-year students surveyed prior to using SIMVANA agreed/strongly agreed that their interest in education content would be higher if virtual reality was incorporated (82%) and that SIMVANA would help prepare them for clinicals (89%). After using SIMVANA, post-survey results for first-year students showed 100% of students agreed/strongly agreed that SIMVANA should continue to be incorporated into didactic curriculums and that SIMVANA helped students better understand anesthesia machines and concepts. Post-SIMVANA surveys also showed that 95% of first-year students agreed/strongly agreed that SIMVANA better prepared them for clinicals and helped reduce anxiety going into clinicals. Post-SIMVABA presentation survey results for third-year students showed students agreed/strongly agreed to the following: 83% wanted SIMVANA incorporated into didactic curriculums, 75% thought SIMVANA would have helped them better understand anesthesia concepts, and 67% thought SIMVANA would have better prepared them for clinicals. On May 31, 2024, we extracted the

final important data metrics from our quality improvement (QI) project based on exam scores, anxiety levels, and clinical preceptor rating scales to finalize our QI project results. Based on the results we have extrapolated thus far, our QI project has demonstrated data analysis to support our impact statement.

Discussion: At this time, we cannot make a full determination or conclusion of the benefits pertaining to VR on nurse anesthesia programs, students, and clinical practice until our final data analysis is completed. Based on our preliminary results,the project has demonstrated data metrics to support our impact statement. We expect our final data analysis to show supporting data-driven evidence regarding the impact and effectiveness of SIMVANA VR on nurse anesthesia students and programs. We expect the anesthesia implications to be that nurse anesthesia program implement anesthesia VR into their didactic curriculum and simulation learning labs. The major limitation of our project was that SIMVANA is the only anesthesia VR software on the market, so our study only reflected utilization of SIMVANA. Other limitations were motion sickness, risk for physical harm while in VR, and our inability to measure the effectiveness of first-year students entering clinicals in 2025.

Funding: University of Evansville provided Oculus headsets and SIMVANA memberships for first-year anesthesia students. SIMVANA provided their platform for six months for second-year anesthesia students.

Evidence Based Practice/Quality Improvement

Abstract #51

The Impact of Neuromuscular Blockade Reversal on Processed EEG-Derived Depth of Anesthesia

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Introduction: Signs of arousal including movement, coughing, increased blood pressure, and tachycardia have been reported following neuromuscular blockade reversal (NMBR). The principal aim of general anesthesia is to avoid unwanted arousal and awareness. Processed electroencephalogram (pEEG) monitors quantify depth of anesthesia (DoA) with the aim of avoiding awareness. Current evidence suggests NMBR is associated with a measurable impact on pEEG values. The purpose of this integrative review was to explore the impact of NMBR on bispectral index (BIS) values in patients undergoing general anesthesia.

Methods: The PICOT question was as follows: In adult patients over 19 years old undergoing general anesthesia and receiving rocuronium for neuromuscular blockade, what is the effect of sugammadex compared with anticholinesterase administration for NMBR on BIS values? A systematic search was conducted in December 2023 in MEDLINE, PubMed, and Embase. The following search terms were used: sugammadex, EEG, neuromuscular block*, and emergence. Inclusion criteria were subjects aged 19+ years and undergoing general anesthesia. Exclusion criteria were studies not in English. Studies that met criteria were assessed for methodologic quality, and measurable outcomes data were extracted. This integrative review was exempt from institutional review board approval. The findings of the integrative review, including implications and recommendations for anesthesia practice, will be implemented into clinical practice via an educational event using a pre-/post-test design to assess learning.

Results: Database search results yielded 13 studies from MEDLINE, 14 from PubMed, and 14 from Embase. Three prospective cohort studies with randomization had the highest-level evidence available that met our inclusion and exclusion criteria. All studies reported increases in BIS values following NMBR. Two studies reported that NMBR resulted in (1) a significant increase ($p < 0.05$) in BIS values in participants who had reappearance of muscular activity on electromyography (EMG), and (2) no significant increase ($p \geq 0.05$) in BIS values in participants with no EMG activity. One study compared sugammadex to neostigmine and pyridostigmine in general anesthesia with maintenance using an inhalation agent, while the other two studies compared sugammadex to neostigmine in general anesthesia using total intravenous anesthesia. One study compared BIS values with values of a different pEEG monitor (Entropy) and noted discrepancies within patients between DoA index values based on device used. Findings of the evidence, including implications and recommendations for practice, will be

implemented into clinical practice in a future educational event using a pre-/post-test design to assess learning.

Discussion: Evidence supports that BIS monitor outputs should be interpreted with careful consideration, given the limitations of BIS values to accurately track DoA when NMBR agents are administered. Clinicians cannot be assured that increased BIS values reflect decreased DoA following NMBR because these drugs may interfere with BIS monitoring. Clinicians should combine BIS values with direct clinical observation of the patient's arousal state. Differences between proprietary algorithms in pEEG monitoring may yield discordant outputs. Elevated BIS values following NMBR affirm the necessity of anesthetic maintenance until full restoration of neuromuscular function to avoid episodes of awareness. All studies maintained steady-state anesthesia during administration of NMBR and measurement of BIS values. Maintaining steady-state anesthesia during surgical closure and NMBR is uncommon in clinical practice. Study results should be generalized with caution considering study design. The recommendations of this discussion are of medium strength.

Evidence Based Practice/Quality Improvement

Abstract #52

The Use of Gastric Point-of-care Ultrasound (POCUS) for Surgical Patients Receiving Glucagon-like Peptide 1 (GLP-1) Receptor Agonists to Assess Residual Gastric Content

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Introduction: Glucagon-like peptide-1 (GLP-1) receptor agonists have gained popularity as a modality to combat the obesity and type-2 diabetes mellitus epidemic. One of the mechanisms of GLP-1 agonists is to cause delayed gastric emptying, which increases satiety. This mechanism of action, however, has increased the anesthetic risk through increased and variable fasting gastric volumes in surgical patients. This work aimed to present evidence on the advantages of assessing patients taking GLP-1 agonists through the use of gastric POCUS to assess gastric volumes. The majority of CRNAs have yet to receive any formal POCUS training. The authors developed a structured education curriculum including POCUS simulations. A change in practice based on this evidence is described.

Methods: The CINAHL, Cochrane Library, PubMed, and ScienceDirect databases were searched using the following keywords: glucagon-like peptide-1 receptor agonist, GLP-1, delayed gastric emptying, and residual gastric content. The evidence from five randomized controlled trials and one cohort study consistently found GLP-1 agonists correlated with increased gastric residual content after standard fasting times prior to surgery. A waiver was obtained from the University of North Florida Institutional Review Board for implementation at a rural hospital in the Midwest. A multi-pronged education program was delivered to nine CRNAs and one MD at that hospital. It comprised a formal presentation, a poster board reminder in the common area, and a learning platform for using ultrasound POCUS simulators that measured gastric volumes. A change in practice was implemented using gastric POCUS preoperatively for patients on GLP-1 agonists. Pre-/post-attitudinal survey data regarding provider comfortability, familiarity, and confidence were collected and analyzed.

Results: Pre-/post-survey data showed that participants' comfort with using ultrasound to conduct a POCUS-type assessment increased by 23.4% two months after the educational training. Participants' confidence in performing a gastric POCUS to measure gastric volumes increased by 48.8% two months after the educational training. The anesthesia providers reported using ultrasound daily in practice for regional anesthesia purposes. Participants reported not using gastric POCUS before the training and educational presentation. Participant data indicated that 100% of the providers would change their anesthetic plan given knowledge of abnormal gastric volume status preoperatively. The practice reviewed data post-

implementation and found that 33% of participants encountered gastric volumes greater than expected, which changed the anesthetic plan.

Discussion: A change in practice was made by providing a structured education curriculum, including simulations, to anesthesia providers at this facility. This training equipped the participants with the skills to conduct gastric POCUS on surgical patients presenting on the day of surgery who werre currently taking GLP-1 agonists. These anesthesia providers plan on continuing to conduct gastric POCUS on surgical patients to assess gastric volumes in high-risk patients taking GLP-1 agonists. Recommendations were presented in June 2023 by the American Society of Anesthesiologists and in March 2024 by the American Association of Nurse Anesthesiology on preoperative assessment regarding POCUS and providing guidance on how to utilize the results; however, the recommendations are not guidelines and do not provide definitive guidance for providers taking care of patients on GLP-1 agonists. Barriers reported to conducting gastric POCUS included time, skill, and knowledge. A structured presentation in combination with POCUS ultrasound simulation is an effective method for equipping current anesthesia providers with this important skill set.

Evidence Based Practice/Quality Improvement

Abstract #53

The Use of Intraoperative Intravenous Magnesium Sulfate to Reduce Postoperative Pain and Opioid Use

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Introduction: The use of nonopioid perioperative analgesic drugs such as intravenous magnesium sulfate has been shown to reduce postoperative pain through the antagonism of N-methyl-D-aspartate (NMDA) receptors and subsequent inhibition of the inflammatory response. Magnesium sulfate blocks calcium ion entrance into cells, thus attenuating pain hypersensitivity and inhibiting central sensitization from nociceptive afferent inputs. Magnesium sulfate prevents and reverses neuronal hyperexcitability, producing an analgesic effect (Shin et al., 2020). This evidence-based practice project describes evidence on the effectiveness of intraoperative intravenous magnesium sulfate for improving patient analgesia postoperatively. Based on this evidence, a change in practice has been proposed.

Methods: Keywords from the following PICOT question were used to search CINAHL, PubMed, the Cochrane Library, and the ScienceDirect databases: Do patients undergoing surgery (P) who receive intraoperative intravenous magnesium sulfate (I) compared with patients who did not receive intravenous magnesium sulfate intraoperatively (C) have less pain and use fewer opioids (O) postoperatively (T)? Six randomized controlled trials were critically appraised and consistently showed that intraoperative intravenous magnesium sulfate administration decreases postoperative pain and opioid use.

Results: A change in practice was implemented based on these evidential findings. A waiver from the University of North Florida Institutional Review Board for implementation of this practice change was approved. A presentation was delivered to 22 CRNAs at HCA Florida Memorial Hospital (FMH) in Jacksonville, FL on the synthesized evidence showing the effectiveness of intraoperative magnesium sulfate for reducing postoperative opioid use and pain scores. Additionally, laminated flyers containing facts and information on intraoperative intravenous magnesium sulfate use were placed in all operating rooms at FMH. A QR code was provided on the flyers with the website link containing all information about this evidence-based practice project. There are no results as of yet.

Discussion: Prior to the educational session, data collection included counting the number of bags of magnesium sulfate used by anesthesia providers at HCA over a one-month period. After the educational session, data were collected again to count the number of bags of magnesium

sulfate used by anesthesia providers at FMH over one month to determine if a change in practice was made. A change will be determined to have occurred if the use of intraoperative magnesium sulfate increased after the evidence-based educational presentation. A questionnaire will be completed by PACU nurses to determine if patients who received intravenous intraoperative magnesium sulfate had less pain and required less opioids postoperatively.

Evidence Based Practice/Quality Improvement

Abstract #54

Ultrasound Guided IV Placement in an Ambulatory Surgery Center

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Introduction: The purpose of this Doctor of Nursing Practice project was to implement evidence-based recommendations for the use of ultrasound guidance (USG) to place peripheral intravenous catheters (PIVCs) by preoperative nurses. At the project site, a combination of difficult intravenous access (DIVA) patients and lack of experience and high turnover among nursing staff resulted in suboptimal PIVC placement rates and low patient-satisfaction PIVC placements.

Methods: The Iowa Model & Implementation Framework guided project implementation to bridge the gap between current practices and optimal PIVC insertion. A mastery learning model was developed involving asynchronous education, live demonstration, deliberate simulation practice, and formative and summative assessment of USG PIVC placement. Every simulated procedure was evaluated with a 12-point technique checklist created using the modified Delphi method. Trainee competence was assessed on successful completion of all checklist steps. Frequency of surgical case delays, cancellations, anesthesia consults for PIVC placement assistance, and patient comments related to PIVC issues were collected.

Results: Five preoperative nurses were educated and demonstrated competency in USG PIVC insertion. These individuals collectively placed 124 USG PIVCs in patients during the first three months post-training. Outcomes included an 88.2% USG PIVC success rate. Anesthesia placement of preoperative PIVCs decreased from 6.38% to 0.88% (p = 0.02), and patient satisfaction regarding “skill of nurse inserting PIVC” increased. These five nurses were trained to use the competency-based checklist, monitored for inter-rater reliability, and have started to train other nurses in the ambulatory surgery center (ASC) preoperative area to place PIVCs using USG.

Discussion: Training preoperative nurses to place PIVCs using USG has resulted in decreased calls to anesthesia, improved OR efficiency, reduced case delays and cancellations, and improved patient satisfaction scores. The outcomes of this project support existing literature showing success with nurse-placed PIVCs using ultrasound. The rate of 88.2% successful placement by nurses in the 10 weeks following project implementation compares favorably with published studies. This project used a train-the-trainer model to promote sustainability. The project director trained five nurses to place PIVCs with USG and monitored their success using a 12-point competency checklist developed using a modified Delphi method. These five nurses were then trained to teach other nurses using the same model and checklist. The project

director established inter-rater reliability between the five nurses. Nurses in this ASC have placed 124 PIVCs in DIVA patients using ultrasound guidance. This project empowered these nurses to practice to the full extent of their license.

Evidence Based Practice/Quality Improvement

Abstract #55

Ultrasound Guided Regional Anesthesia Workshop for Student Registered Nurse Anesthetists (SRNAs)

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Introduction: Ultrasound guided regional anesthesia (UGRA) is a complex skill that is difficult to learn and teach. It requires extensive anatomic and pharmacologic knowledge accompanied by repetitive motor-skill training for safe and competent implementation. Despite the vast knowledge and refined motor requirements, UGRA curriculum is inconsistent and insufficient to develop proficient providers. Successful performance of UGRA is best achieved through repeated simulation training, which has been shown to translate to clinical competence and increase the rate of skill acquisition compared to nonsimulation training. This project aimed to identify how a review UGRA education session would improve knowledge, confidence, and procedural skills in nurse anesthesia students.

Methods: Student knowledge, confidence, and procedural skills were assessed through a knowledge and confidence survey and a hands-on ultrasound scanning session. A QR code was used to distribute knowledge and confidence surveys. The hands-on evaluations simulated four nerve blocks. These were graded using a paper rubric by a content expert and then manually input into Microsoft Excel for analysis. Students completed all assessments before and after the UGRA education session. Knowledge and confidence data were transferred from Microsoft Forms to Microsoft Excel for analysis. Paired t-tests and descriptive statistics were utilized to compare knowledge, confidence, and procedural skill before and after the UGRA workshop. A formal review was conducted by an institutional review board. Participants were recruited voluntarily and maintained anonymity by utilizing a unique four-digit code for comparison before and after intervention. There was no collection of identifiable information during the implementation of this project.

Results: Eighteen senior SRNAs participated in knowledge, confidence, and procedural evaluations before and after a UGRA educational workshop. The data were analyzed using Microsoft Excel's paired t-test function. The data were statistically significant ($p < 0.05$). Students demonstrated a 30% increase in knowledge on a 35-question test. Perceived confidence increased by over 2 points on a 6-point Likert scale and students exhibited a 35% increase in procedural skills. Permission was obtained to use preexisting data collection tools. The statistically significant increases in knowledge, perceived confidence, and procedural skills indicate that project aims were met through the UGRA educational workshop. Implementation

and standardization of an ultrasound educational review course can benefit students and lead to the creation of confident and competent providers.

Discussion: This project demonstrated that repeat education and ultrasound scanning improve competence and confidence in students learning to provide peripheral nerve blocks. Standardized education is needed to produce safe providers, and regular education sessions may help to maintain the acquired knowledge and skills. UGRA-proficient providers can increase the implementation of successful peripheral nerve blocks leading to improved patient outcomes. Study limitations included an insufficient volume of data to determine statistical significance for students performing an ankle block. The study had a limited population of 18 students at the same university. All participants had completed a regional anesthesia course but not all had performed UGRA clinically. To determine the impact of a UGRA review workshop, replication by another nurse anesthesia educational program is necessary. Reproduction of this project would also require standardized education parameters and data collection tools.

Evidence Based Practice/Quality Improvement

Abstract #56

Utilization of Artificial Intelligence Algorithms in the Perioperative Management and Reduction of Pain: An Evidence-based Educational Module

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Introduction: The current challenges and limitations within intraoperative pain management stem from traditional approaches and suboptimal real-time pain monitoring, leading to potential opioid under- or overdosing that may impact clinical outcomes and patient satisfaction. This project highlighted the potential of artificial intelligence (AI) to provide data-driven personalized solutions, optimize pain management to enable real-time adjustments, and align with the overarching healthcare goal of delivering safer patient-centered care. The project also supported the evolution of modern anesthesia, where AI-powered algorithms serve as a supportive tool to enhance clinical practice, improve safety, and sponsor personalized care, underscoring the goal of advancing the field of anesthesiology by leveraging AI-powered algorithms responsibly and effectively.

Methods: A literature search utilized PubMed, Embase, Cochrane Library, and ScienceDirect databases. The query used MeSH terms, truncated phrases, key phrases, and Boolean logic. Keywords included "adults," "pain management," "artificial intelligence," "anesthesia," "AI-assisted and/or guided pain management," "nociception monitoring," "AI algorithms," and "intraoperative and/or perioperative opioid administration and/or delivery." The search results were limited to publications from 2018 to 2024 of Level I-IV evidence published in English in the adult population 18 years and older. The Johns Hopkins Research Evidence Appraisal Tool was employed to assess the quality of the studies for inclusion. An educational module detailing the use of AI algorithms to manage perioperative pain was disseminated to anesthesia providers in the southeastern United States in conjunction with a pre-/post-survey measuring awareness and early adoption.

Results: AI-assisted technologies have shown sensitivity and specificity in detecting noxious stimuli, facilitating nociception assessment in anesthetized patients undergoing surgery without compromising anesthesia quality or hemodynamics. The evidence indicates a direct association with a nearly 30% reduction in opioid use, ensuring more precise interventions, shorter extubation time, and faster recovery by minimizing opioid-related complications such as postoperative nausea and vomiting and respiratory depression. AI technologies in clinical settings can improve patient care and safety as tools designed to support pain management strategies. Research on the current state of AI-assisted strategies emphasizes their potential to enhance patient outcomes by exploring AI's role in pain management during surgery,

highlighting strengths, weaknesses, and common limitations such as sample size, ethical considerations, and economic implications. Despite shortcomings, AI-powered algorithms offer valuable benefits in augmenting pain management. While AI holds promise for enhancing intraoperative pain management, there is a need for further research to address context-specific concerns, individualized care, and the integration of AI with multimodal pain management approaches to validate its benefits, broader applicability, and the clinical impact of this novel technology.

Discussion: AI-assisted technologies show sensitivity and specificity in detecting noxious stimuli, facilitating nociception assessment during surgery without compromising anesthesia quality or hemodynamics. There is a direct association with a nearly 30% reduction in opioid use, precise interventions, shorter extubation time, faster recovery, and decreased opioid-related complications. AI technologies can improve patient care and safety as tools to support pain management strategies. The current AI-assisted strategies emphasize their potential to enhance patient outcomes, highlighting strengths, weaknesses, and limitations such as ethical considerations and economic implications. Despite shortcomings, AI-powered algorithms offer valuable benefits in pain management. While AI holds promise to enhance intraoperative pain management, further research is needed to address context-specific concerns, individualized care, and AI integration to validate its benefits, broader applicability, and clinical impact.

Evidence Based Practice/Quality Improvement

Abstract #57

A Teaching Module Utilizing Cryoneurolysis for Pain Management in Patients Undergoing Total Knee Arthroplasty

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Introduction: Over 600,000 total knee arthroplasty procedures are performed in the United States each year. Recovery and return to daily living activities are highly dependent on pain management. Current approaches, such as peripheral nerve blocks, opioid administration, and nonopioid analgesia, have limitations such as short duration of action and potential opioid-related complications. Cryoneurolysis is a revolutionary technique that can improve and initiate pain management before undergoing total knee arthroplasty. This quality improvement project aims to increase anesthesia providers' knowledge through an educational module about the use of cryoneurolysis to the infrapatellar branch of the saphenous nerve and the anterior femoral cutaneous nerve to improve multimodal pain management techniques by reducing opioid consumption, length of hospital stay, and knee rehabilitation functionality.

Methods: A literature review was conducted using the Cochrane Review, PubMed, MEDLINE, and Embase databases. The search keywords included cryoneurolysis, pain management, and total knee arthroplasty. Ten articles were included for review. This project was exempt from Florida International University Institutional Review Board approval. A pre-test questionnaire will be developed and administered via Qualtrics, consisting of 10 items to determine baseline knowledge. The pre-test will be followed by a 10-minute educational video on using cryoneurolysis as a pain management technique for patients undergoing total knee arthroplasty focused on anesthesia providers at a Level 1 trauma center. A post-test questionnaire mirroring the pre-test will be conducted after the educational module to assess increases in knowledge. Descriptive statistics will be used to compare pre- and post-test questionnaires via data gathered in the Qualtrics platform.

Results: To be determined.

Discussion: Literature shows that the use of cryoneurolysis to the infrapatellar branch of the saphenous nerve and the anterior femoral cutaneous nerve one to two weeks before a total knee arthroplasty can significantly reduce opioid consumption, improve knee functionality, decrease hospital length of stay, and enhance overall patient satisfaction. Cryoneurolysis leads to reversible nerve axon changes that allow for the cessation of electrical conduction and modulation of the descending pain transmission pathway. The incorporation of cryoneurolysis into multimodal pain management protocols allows for superior pain control, avoiding the risk of chronic pain development and long-term use of opioids. This evidence-based practice change

brings awareness of the efficacy and safety of using cryoneurolysis to improve pain management techniques. Limitations exist regarding equipment accessibility and provider behaviors and practices to established protocols.

Evidence Based Practice/Quality Improvement

Abstract #58

An Evidence-based Practice Educational Module on Ultrasound-guided Endotracheal Tube Sizing and Placement Verification in the Pediatric Surgical Patient

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Introduction: Demographic-based formulas have been utilized to determine the appropriate endotracheal tube (ETT) size in pediatric patients. Cole's age-based formula varies widely in accuracy, resulting in an overestimated or underestimated ETT size. Implications of an inappropriately sized ETT include subglottic stenosis, ischemia, infection, and irreversible loss of connective tissue around the cartilage. The following PICOT question was developed: In pediatric surgical patients, does an educational module on the utilization of ultrasound for endotracheal tube sizing and placement, compared with traditional age-based formulas, improve provider knowledge and attitude in decreasing reintubation frequency and postextubation stridor? The answer to the PICOT question provides a segue to change anesthesia practice by diminishing inappropriate ETT sizing in support of best-practice recommendations utilizing point of care ultrasound (POCUS).

Methods: The databases utilized in the search included Embase, PubMed, CINAHL, and the Directory of Open Access Journals. The search keywords included variations of pediatric, age-based formulas, endotracheal tube, and ultrasound. Exclusion criteria were meta-analyses and literature reviews. This project was exempt from Florida International University Institutional Review Board approval. A 10-question pre-test will be developed and administered via Qualtrics consisting of four demographic questions, four knowledge questions, and two questions on attitude to determine experience, baseline knowledge, and attitude toward the practice change. This will be followed by a 10-minute Zoom educational module on the proper sequence and use of POCUS to estimate the ETT tube size in the pediatric population. The educational module will focus on anesthesia providers at a Level 1 trauma center. A post-survey will be conducted immediately after the educational module utilizing the same four cognitive-knowledge questions and same two attitude toward practice change questions. Data will be reported utilizing descriptive statistics.

Results: No results to be reported.

Discussion: Research shows that ultrasound appropriately predicts ETT size and is an effective tool compared to traditional age-based formulas to calculate ETT tube size in children. Studies found a strong correlation between ultrasound measurement of the subglottic diameter (SD) and appropriate ETT size. Multiple studies also concluded that ultrasound-guided measurement of the SD was the most effective method for determining appropriate ETT fit in special pediatric

populations. Based on the literature, ultrasound is portable, cost-effective, and eliminates unnecessary radiation exposure to the patient. Recommendations for clinical practice change include integrating POCUS as a valuable tool to assess endotracheal tube placement in combination with ETT verification methods. This evidence-based practice change brings awareness to implement POCUS of the SD in the pediatric surgical patient, while optimizing the management of the pediatric airway. Limitations exist regarding user expertise utilizing ultrasound.

Evidence Based Practice/Quality Improvement

Abstract #59

An Evidence-based Practice Educational Module Utilizing a Risk Stratification Algorithm for Surgical Patients on GLP-1 Receptor Agonists

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Introduction: The recent FDA approval of glucagon-like peptide-1 receptor agonists (GLP-1 RAs) for weight management has increased in popularity. GLP-1 RAs mimic the functions of incretin hormones that curb appetite and increase satiety by delaying gastric emptying. Patients taking GLP-1 RAs present with increased aspiration risk due to residual gastric content despite the American Society of Anesthesiologists (ASA) preoperative fasting guidelines. Currently, there is no standardized protocol to address the optimal fasting times for patients on GLP-1 RA therapy. The following PICOT question was developed: In adult surgical patients taking GLP-1 RAs, does an educational module on a standardized risk stratification guideline for aspiration and fasting times increase provider knowledge and attitude? The answer to the PICOT question will assist anesthesia providers in the perioperative management of patients on GLP-1 RAs.

Methods: The databases utilized in the search included Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and MEDLINE. The search keywords included glucagon-like peptide-1 receptor agonists, GLP-1 agonists, delayed gastric emptying, semaglutide, weight loss, and aspiration pneumonia. Exclusion criteria were systematic reviews, meta-analyses, and non-English publications. Inclusion criteria were publications in the English language, randomized controlled trials, double-blind studies, and published within five years. This project was exempt from Florida International University Institutional Review Board approval. A 12-question pre-test will be developed and administered via Qualtrics, consisting of four demographic questions, six knowledge questions, and six questions on attitude to determine experience, baseline knowledge, and attitude toward the practice change. This will be followed by a 10-minute Zoom educational module. A post-survey mirroring the pre-test will be conducted. Data will be reported utilizing descriptive statistics comparing pre- and post-module assessments via Qualtrics platform.

Results: To be determined.

Discussion: Patients are at a higher risk for aspiration during anesthesia induction and emergence. Patients present in the preoperative area with potential retained gastric contents from delayed gastric emptying. Despite appropriate fasting recommendations from the ASA practice guidelines, complications from aspiration include morbidity, mortality, hypoxia, pulmonary edema, pneumonia, and atelectasis. Research shows that GLP-1 RAs markedly delay gastric emptying of a solid meal in obese nondiabetic, diabetic, elderly, and nonelderly patients.

Studies found a strong correlation between increased gastric residual volume and GLP-1 RA therapy. The implementation of a standardized risk stratification guideline for aspiration and fasting times will bring awareness for patients who are on GLP-1 RAs in avoiding perioperative complications. Limitations exist regarding a standard of care on nothing-by-mouth (NPO) guidelines and risk stratification in the preoperative setting for patients on GLP-1 RAs.

Evidence Based Practice/Quality Improvement

Abstract #60

An Evidence-based Practice Educational Module Utilizing Norepinephrine to Treat Postspinal Anesthesia-Induced Hypotension in Parturients Undergoing Elective Cesarean Section

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Introduction: Maternal hypotension following spinal anesthesia poses a critical risk to both mother and neonate. Decreased systemic vascular resistance and uterine blood flow can result in fetal hypoxia and acidosis as the uteroplacental circulation lacks autoregulation and critically relies on maternal blood pressure. Phenylephrine and ephedrine administration results in bradycardia, tachycardia, and elevated fetal lactate and glucose levels. Norepinephrine's alpha and mild beta activity support maternal cardiac output reducing the risk of decreased uterine blood flow. This evidence-based project aims to answer the following PICOT question: For anesthesia providers administering spinal anesthesia to parturients undergoing elective C-section, does an educational module on the administration of norepinephrine compared with the utilization of phenylephrine and ephedrine increase knowledge and attitude?

Methods: The databases utilized in the search included Embase, PubMed and CINAHL. The search keywords included norepinephrine, postspinal anesthesia-induced hypotension, obstetrics, and anesthesia management. Exclusion criteria were meta-analyses and literature reviews. This project was exempt from Florida International University Institutional Review Board approval. A 15-question pre-test will be developed and administered via Qualtrics consisting of six demographic questions, four knowledge questions, and 11 questions on attitude to determine baseline knowledge and attitude toward practice change. This will be followed by a 10-minute Zoom educational module on norepinephrine's efficacy in managing postspinal anesthesia hypotension focused on anesthesia providers at a Level 1 trauma center. A post-survey mirroring the pre-test will be conducted after the educational module utilizing the same cognitive knowledge and attitude questions to assess for increases in knowledge and attitude. Data will be reported utilizing descriptive statistics comparing pre- and post-module assessments via the Qualtrics platform.

Results: To be determined.

Discussion: Research shows that norepinephrine is a superior vasopressor for managing postspinal anesthesia-induced hypotension. Norepinephrine positively impacts neonatal outcomes without any observed adverse effects on Apgar scores, fetal hypoxia, acid-base balance, and adverse neurobehavioral outcomes. Norepinephrine consistently demonstrates a lower incidence of bradycardia and is critical in maintaining maternal cardiac output, resulting in decreased episodes of reactive hypertension and provider intervention. Recommendations for

clinical practice change include integrating norepinephrine into obstetric protocols and providing regular training on the administration of norepinephrine to treat postspinal anesthesia-induced hypotension. This evidence-based practice change brings awareness of norepinephrine's efficacy to enhance maternal hemodynamic stability and improve patient care. Limitations exist regarding the lack of accessibility to premix norepinephrine and provider practices influenced by established norms and facility protocol.

Evidence Based Practice/Quality Improvement

Abstract #61

Cannabinoid Antagonism for Mitigation of Intraoperative Cardiovascular Instability

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Texas Christian University

Introduction: Cannabis is the most widely cultivated, trafficked, and abused drug in the world, with 2.5% of the world's population (roughly 147 million people) partaking in cannabis. Currently in the United States, more states are legalizing cannabis for medicinal or recreational use. The incidence of cannabis-taking patients is also likely to increase. Current evidence suggests that there are links between cannabis use and intraoperative cardiovascular instability. The purpose of this project is to examine the consequences of cannabis use when undergoing anesthesia and explore the current evidence regarding cannabinoid antagonist therapy. The goal is to understand the physiological effects of cannabis when undergoing anesthesia so that anesthesia providers can anticipate and treat changes to manage their patients effectively.
Methods: The PICOT question was as follows: In patients intoxicated with cannabinoids undergoing nonelective surgery, is cannabinoid antagonist therapy compared with no antagonist therapy efficacious in mitigating the risk for cardiovascular instability? Systematic searches were conducted in PubMed and Embase. The search terms were cannabis, marijuana, heart infarction, and perioperative period. Limitations: research within 10 years and English only. Inclusion criteria were as follows: subjects who reported cannabis use undergoing surgery in the United States admitted for > 1 day, systematic reviews, and cohort studies. Exclusion criteria were as follows: subjects aged < 18 years and > 65 years, no reported cannabis use, and study designs other than those listed in the inclusion criteria. All studies that met the criteria were assessed for methodological quality and extracted. This integrative review was exempt from institutional review board approval. The findings will be implemented into clinical practice by an education event utilizing a pre- and post-test design to assess audience learning.
Results: To be determined.
Discussion: The evidence suggests a relationship between cannabis and cardiovascular instability. The major constituent in cannabis is tetrahydrocannabinol (THC), an agonist at the

main cannabinoid receptors CB-1 and CB-2. CB-1 is expressed ubiquitously in the body, promoting cardiovascular disease pathology: negative inotropy, cardiac ischemia, hypertrophy, and fibrogenesis. CB-2 is expressed in the immune system and is generally anti-inflammatory and cardioprotective with positive inotropy and improvement of cardiac ischemia. THC has a greater affinity for CB-1 than CB-2. Animal studies have demonstrated CB-1 antagonists' ability to both block and reverse THC effects and reduce infarct size. In healthy human subjects, one study showed CB-1 antagonists' ability to reduce THC-induced tachycardia. The data are limited by interspecies variability, patient self-reporting of cannabis use, legal barriers to conducting human clinical trials, confounding variables such as synthetic cannabis, and the lack of parenteral CB-1 antagonists on the market.

Evidence Based Practice/Quality Improvement

Abstract #62

Erector Spinae Plane Block Versus Transversus Abdominis Plane Block in Decreasing Opioid Consumption after Laparoscopic Surgeries: An Evidence-based Module

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Introduction: This evidence-based module project aims to discover a regional anesthetic that can produce better patient outcomes after laparoscopic surgeries, as postoperative (post-op) pain remains an issue for up to 70% of patients because of the addition of visceral pain that is a result of the pneumoperitoneum needed to proceed laparoscopically. Untreated post-op pain leads to prolonged recovery, dissatisfaction, exacerbation of comorbidities, and worse outcomes. Currently, anesthesia providers use opioids or perform a transversus abdominis plane (TAP) block to combat this pain. A TAP block can be inconsistent in blocking necessary spinal levels and does not contain visceral pain-relieving effects. An erector spinae plane (ESP) block is a novel technique that has been increasingly used across various surgeries with promising results in pain-relieving effects due to its wide coverage of analgesia and visceral pain-relieving effects.

Methods: The researcher reviewed PubMed, MEDLINE, and Embase. Inclusion criteria were as follows: published within the years 2017-2023, only randomized controlled trials, participants within the age range of 18-65 years old, written in English, full-text available, and pertinent to the quality improvement topic. Exclusion criteria were as follows: studies that did not have an ESP or TAP block as an intervention, surgery routes other than laparoscopic, pediatric patients, elderly patients, and not written in English. A total of 127 articles were initially identified; however, after duplicates were removed and the inclusion and exclusion criteria were applied, 15 articles were selected. After institutional review board exemption was obtained, an online educational module was created with the intention to send to selected anesthesia staff at a designated facility. Pre and postsurveys will be sent and data will be collected over an eight-week period; aggregate data will be analyzed by Qualtrics. The plan is to disseminate at the AANA national conference and to make an evidence-based protocol for clinical practice.

Results: To be determined.

Discussion: Postop pain remains a critical unsolved issue that leaves the patient vulnerable to post-op complications. IV analgesia has been shown to produce inferior patient outcomes postoperatively when compared with regional anesthetic techniques. Current research concludes that a multimodal approach with the inclusion of an ESP block prior to or immediately after a laparoscopic procedure has been found to be the most effective way to treat post-op pain because of its visceral pain-relieving effects and its ability to provide wider

analgesia coverage. Across the eight articles chosen in the final selection, ESP blocks were shown to decrease opioid consumption, pain scores, and PCA pump usage, and to receive higher patient satisfaction based on questionaries. Evidence across the remaining seven articles shows that TAP blocks have also yielded similar results, further proving that regional anesthesia equates to better outcomes. Limitations included possible low survey participation due to virtual delivery.

Evidence Based Practice/Quality Improvement

Abstract #63

Evaluating and Improving Anesthetic Management of Patients on Medication for Opioid Use Disorder

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Introduction: Upon evaluation of an academic hospital, gaps were identified in the management of patients taking medications for opioid use disorder (MOUD). Anesthesia management for individuals on MOUD presents distinctive complexities, such as the provision of adequate analgesia, prevention of opioid withdrawal, and mitigating the risk of relapse. The need for improvement was substantiated through a literature review, institutional surveillance, and focused interviews with anesthesia providers (APs) and the substance use intervention team (SUIT). This quality improvement (QI) project aims to adopt a multidisciplinary approach to the care of patients on MOUD to optimize outcomes. Evaluation outcomes led to the inclusion of preoperative documentation modifications within the electronic medical record (EMR) system, and practice guidelines aimed to assist APs in caring for patients receiving MOUD.

Methods: This project aims to improve patient outcomes by guiding the anesthetic management of patients on MOUD and was approved by the hospital's institutional review board. The Centers for Disease Control and Prevention Framework for Program Evaluation in Public Health was used in the evaluation of anonymized data through a retrospective chart analysis. Interviews with APs and SUIT members were conducted using the thematic analysis framework. A multidisciplinary team including anesthesiology, addiction medicine, and chronic pain management collaboratively addressed two key areas: identification of patients on MOUD and anesthesia management practices. A needs assessment showed a lack of method to identify patients on MOUD; therefore, a standardized checklist was integrated into the EMR system. The team also explored best practices for the anesthetic management of patients on MOUD, which led to the development of evidence-based guidelines. Next steps for this project include outcome and compliance analysis to measure the project's effectiveness.

Results: To be determined.

Discussion: This QI project developed a preoperative identification checklist for patients on MOUD undergoing surgery as well as evidence-based practice guidelines. While data analysis is ongoing, early indications suggest that this approach has the potential to improve outcomes. Widespread adoption could achieve the following: Standardized care with consistent guidelines ensuring appropriate pain management for MOUD patients; improved patient outcomes with effective pain control, faster recovery, reduced complications, and higher satisfaction; and

enhanced anesthesia-addiction medicine collaboration. Based on findings, it is recommended to identify MOUD patients early using the EMR system and to take a multidisciplinary approach following evidence-based guidelines for longitudinal optimization. Future recommendations may include expanding the multidisciplinary team to include surgical services. A proactive team approach aids in establishing personalized presurgical management plans, leading to improved outcomes.

Evidence Based Practice/Quality Improvement

Abstract #64

Implementation of a Multilingual Epidural Consent Process: An Evidence-based Approach

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University of Cincinnati College of Nursing

Introduction: Labor is among the most painful experiences a patient may be hospitalized for. Neuraxial anesthesia is the preferred method to manage labor pain. Approximately 49% of patients experiencing language barriers have been identified as having difficulty understanding medical instructions. Barriers for patients with limited English proficiency can result in changes to healthcare interventions received. A recent study showed that 66% of Spanish-speaking patients in labor received neuraxial analgesia while 75% of English-speaking patients in labor received neuraxial anesthesia, emphasizing the disparity between pain management in patients who are non-English speaking compared with English-speaking patients. The aim of this evidence-based practice project is to implement a multilingual epidural consent process that brings into focus the inequities in managing pain for non-English speaking patients in labor.

Methods: This quality improvement project went through institutional review board review and was approved as research not involving human subjects. There was no intent to create generalizable knowledge and no identifiable data will be stored or collected by the project. The project involves the creation of a multilingual epidural consent process. This intervention will involve provider education on the multilingual epidural guide including when it will be trialed, as well as increased education on the disparities that exist for this patient population and increased awareness of pain management options for laboring patients. Education will be delivered to obstetric anesthesia providers through an educational session. The multilingual epidural guide will be available for anesthesia providers and provided to non-English speaking parturient patients while obtaining consent for epidural placement. Pre- and post-tests will be provided to analyze the success of implementation by assessing knowledge gained from provider education.

Results: To be determined.

Discussion: Results from this project can be used to form a multilingual obstetrical anesthesia epidural consent process in a Midwest academic medical obstetrical unit. Creating a multilingual consent form process will remove barriers preventing access to medical information for non-English speaking parturient patients. Information about medical procedures will be given to patients in their native language, removing misunderstandings that can occur during the informed consent process of obstetrical anesthesia care options. Utilization of the improved consent process demonstrates the importance of providing equitable healthcare. This project

focused on the Spanish-speaking population and providers in a large Midwest academic medical center. Further research should be done to identify outcomes when patients speak other languages and dialects. Additionally, more needs to be done to determine if this intervention would be impactful in a non-academic medical center.

Evidence Based Practice/Quality Improvement

Abstract #65

Norepinephrine for the Management of Spinal Anesthesia-induced Hypotension in Parturients

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Introduction: Spinal anesthesia-induced hypotension (SAIH) is an undesired repercussion of spinal anesthesia that occurs in 7.4%-74.1% of parturients undergoing cesarean section (CS). Adverse effects of SAIH in parturients include nausea, vomiting, altered consciousness, and decreased cardiac output. Maternal hypotension can compromise uterine perfusion and consequently decrease placental and fetal circulation. Adverse neonatal outcomes include acidosis and depressed Apgar scores. Phenylephrine (PE) is the preferred vasopressor for the prevention and management of SAIH due to the existing volume of supportive data, even though norepinephrine (NE) may have a better pharmacologic profile due to its combined α1 and β1 agonism. The pharmacodynamic profile of phenylephrine is not innocuous. Since 2018, the volume of data supporting the use of norepinephrine for SAIH has increased.

Methods: A PICOT question was created, and a comprehensive review of the literature was completed in PubMed, Embase, Cochrane Library, CINAHL, and Ovid MEDLINE. Filters applied were a date range of 2013-2023, humans, and English language. Twelve articles were chosen. Grades and levels of evidence were assigned using the USPSTF and OCEBM, accordingly. A poster synthesizing the literature review, findings, and recommendations will be presented to nurse anesthesiologists and students. Five identical pre- and post-test multiple-choice questions will be administered to evaluate knowledge transfer based on learning objectives rooted in Bloom's taxonomy. In addition, post-session learner assessment in the form of a Likert scale will be used to determine poster effectiveness and willingness to engage in practice change. QR codes will be used to access the tests and evaluation form. Descriptive and inferential statistics will be evaluated using IBM SPSS software. An alpha value of .05 will be set for analyses. This evidence-based practice project did not require institutional review board approval.

Results: To be determined.

Discussion: NE is not inferior to PE for the management of SAIH in parturients undergoing CS. Both maternal and neonatal outcomes are overall comparable with the utilization of NE and PE in hypotension, reactive hypertension, nausea, vomiting, dizziness, Apgar scores, neonatal acidosis, and urinalysis values. Incidences of bradycardia are significantly decreased with NE use. NE should be initiated at the time of spinal injection, titrated to maintain maternal systolic blood pressure within 90%-110% of baseline, and discontinued based on adequate patient blood pressure. NE dosing can start at 0.05 mcg/kg/min or 2.5-3.5 mcg/min and be titrated as needed, with additional boluses of 3-10 mcg to treat acute hypotension. Potency differences

between NE and PE proved to be confounding variables. Other research limitations included single-center studies and restriction to gravid patients without severe comorbidities. Applications to nongravid populations requiring spinal anesthesia are potential areas for future research.

Evidence Based Practice/Quality Improvement

Abstract #66

Nursing the Nurses: Prioritizing Health and Wellness for Nurse Anesthesiologists

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Introduction: Nurse anesthesiology can be a high-stress career due to long hours, physically demanding work, and emotional strain. This can lead to burnout, compassion fatigue, and physical and mental health issues. Nurses have a higher rate of depression, anxiety, and suicide compared to the general population, with nurse anesthesiologists among the highest in the nursing professions. This affects the individual CRNA and patient care. As practitioners and educators, we instill principles of health and wellness on others but often overlook our own wellbeing. When CRNAs evaluate potential employment opportunities, it is crucial to assess organizational culture and benefits that support personal wellness, as well as traditional considerations such as case types, shift, and work hours. The purpose of this evidence-based practice project was to provide a checklist of wellness items to consider when evaluating employment opportunities.

Methods: A search of scholarly databases and review of organizations to identify benefits/opportunities that contribute to wellbeing were conducted and then categorized into eight dimensions of wellness by two reviewers independently; inconsistencies were decided with assistance from a third reviewer. This project was institutional review board exempt. A survey was created to rate the perception of importance of each dimension of wellness to overall wellbeing, including emotional, spiritual, intellectual, physical, environmental, occupational, financial, and social. In addition, a checklist of workplace opportunities and benefits was developed. We will present this to graduating SRNAs, follow coded surveys maintaining anonymity, and follow up in three months to ask benefits/opportunities at their job. At six months, one year, two years, and five years, the National Institute for Occupational Safety and Health Worker Well-being Questionnaire will be sent. Pearson's coefficient for correlation and Mann-Kendall tests to assess trends over time will be used.

Results: To be determined.

Discussion: Each dimension contributes to wellbeing, but not every individual finds each one equally important. Practice recommendations when choosing employment include looking for things that contribute to one's personal wellbeing, such as nutritious food options, wellness programs, discounts promoting healthy lifestyles, and support for professional development. Other important items may be clear lines of communication, confidentiality, nonpunitive access to mental health resources, and initiatives fostering teamwork and collaboration. Quiet space for contemplation, a common respect for various religious holidays, and practices and policies

supporting diverse spiritual needs may also be desired. Meaningful recognition programs from peers as well as leadership, fair compensation, and comprehensive benefits and bonuses contribute to financial stability and help ensure peace of mind. Limitations of the project include the importance of each dimension of wellness can change over time so we plan to address that in future studies.

Evidence Based Practice/Quality Improvement

Abstract #67

The Effectiveness of Head-of-bed Elevation during Intubation in Obese Surgical Patients

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Introduction: During the induction of general anesthesia with tracheal intubation, oxyhemoglobin desaturation and hypoxemia can occur, especially in the obese patient. Preoxygenation of the patient increases the safe apnea time to perform mask ventilation and tracheal intubation. The purpose of this evidence-based practice project is to describe the evidence on the effectiveness of head-of-bed elevation during preoxygenation prior to the induction of general anesthesia at prolonging the time to oxyhemoglobin desaturation in the obese population. A change in practice has been proposed based on this evidence.

Methods: The Cochrane Library, PubMed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and ScienceDirect databases were searched using keywords from the following PICOT question: Do obese surgical patients undergoing general anesthesia (P) with head-of-bed elevation (I) compared with similar patients in the supine position (C) have a longer time to oxyhemoglobin desaturation (O) during intubation (T)? Five randomized controlled trials and one systematic review with meta-analysis of obese surgical patients were critically appraised.

Results: To be determined.

Discussion: A waiver from the University of North Florida (UNF) Institution Review Board (IRB) for implementation of this practice change has been submitted. Following approval of the UNF IRB application, anesthesia providers at Halifax Health Medical Center (HHMC) in Daytona Beach, FL will be observed to determine whether anesthesia providers elevate the head-of-bed while preoxygenating and inducing obese surgical patients. A presentation will then be given to anesthesia providers at HHMC on the evidence of the effectiveness of head-of-bed elevation during induction of obese surgical patients. After the educational session, anesthesia providers will be observed again over a two-month period to determine if they elevate the head of bed of

obese surgical patients between 20-30 degrees during induction to determine if a change in practice was made.

Evidence Based Practice/Quality Improvement

Abstract #68

Ultrasound-guided Paratracheal Pressure as a Safer Alternative to Traditional Cricoid Pressure

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Introduction: Pulmonary aspiration (PA) of gastric contents accounts for an estimated 5% of anesthesia malpractice claims and incurs a 21% mortality rate. Traditionally, cricoid pressure (CP) has been used to prevent PA during rapid sequence induction (RSI). However, the safety and efficacy of CP have been controversial among airway management experts. This project aims to educate nurse anesthesiologists regarding the discoveries encountered when asking the following PICOT question: During RSI, does paratracheal pressure (PTP) decrease the incidence of PA events compared with CP? Cricoid pressure is linked to decreased intubation success and may cause harm by failing to prevent PA. Ultrasound-guided PTP (USG-PTP) is an attainable and viable alternative to CP, as it allows for objective confirmation of esophageal closure and provides real-time feedback to allow for adjustments.

Methods: References for this project were obtained by searching the CINAHL, Clinical Key, MEDLINE, and PubMed online databases for English-language articles published between 2003 and 2024. In total, 35 articles were identified. The defined population included adult perioperative patients undergoing general endotracheal anesthesia. The culmination of this research yielded an evidence synthesis that will be presented as a poster to a large group of nurse anesthesiologists. Five learning objectives were devised based on Bloom's Taxonomy. A five-question multiple-choice pre- and post-test will be administered to assess knowledge transfer. These tests will be administered as a Quick Response (QR) code that participants can access with their smart devices. SPSS software will be utilized to analyze descriptive and inferential statistics. Statistical significance will be set at a *p* value of 0.05. This evidence-based practice project is exempt from institutional review board restrictions as it does not meet the criteria for human subject research.

Results: To be determined.

Discussion: The number of patients with risk factors for PA is increasing due to the advent of glucagon-like peptide-1 (GLP-1) agonists and an aging population. PA is a rare event associated with significant mortality. Aspiration prevention is critical to safe airway management. CP has been accepted for decades as the standard of care. However, CP is linked to numerous complications. Recommendations for future practice include utilizing USG-PTP in place of CP to avoid many of the issues associated with CP. USG-PTP is a prospectively safer alternative to the use of CP. It provides an objective assessment of anatomical variation and esophageal closure via pressure applied by the ultrasound probe. It is suggested that USG-PTP is less affected by

external laryngeal manipulation, prevents more instances of gastric insufflation, and may be safely used in scenarios where CP is contraindicated. Limitations of the interventions recommended by this project include a lack of randomized control trials and limited control over sample size.

Evidence Based Practice/Quality Improvement

Abstract #69

Use of Inhaled Tranexamic Acid to Treat Airway Bleeding in Anesthesia Emergencies

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Introduction: Hemoptysis and airway hemorrhage can lead to airway-related deaths in the anesthesia setting. Blood in the airway can obscure direct and video laryngoscopy as well as fiberoptic equipment, and it can impair ventilation and oxygenation. The current standard treatment includes limiting bleeding, oxygenating the patient, resuscitating volume, correcting coagulopathies, and securing the airway, but there is no definitive way to limit or stop airway bleeding. There is a growing body of evidence to suggest that tranexamic acid (TXA) can be administered via aerosolization or nebulization to treat airway bleeding. The purpose of this integrative review is to examine the effectiveness of inhaled TXA to reduce or stop hemoptysis and airway hemorrhage in the anesthesia setting.

Methods: The PICOT question was as follows: In patients experiencing acute hemoptysis and/or airway hemorrhage, does the administration of aerosolized TXA, compared with traditional treatments produce hemostasis and resolution of hemoptysis immediately and over the course of several days? PubMed, Embase, MEDLINE Ultimate, CINAHL Ultimate, and Cochrane Library were systematically searched for relevant literature using the key phrases aerosolized tranexamic acid/TXA, inhaled tranexamic acid/TXA, nebulized tranexamic acid/TXA, hemoptysis, and/or airway hemorrhage. Additional limits were applied including a date range of 2014-2024 and articles in English. Pediatric and adult studies were considered. This integrative review was exempt from institutional review board approval. The findings will be disseminated at an educational event and the effectiveness of the presentation will be evaluated with a pre-/post-test design.

Results: To be determined.

Discussion: Given the emergent and life-threatening nature of airway hemorrhage and the strength of the data currently available, anesthesia providers should consider including inhaled TXA in their plan of care for patients who are experiencing acute hemoptysis or airway hemorrhage in the anesthesia setting. There is limited research available, the sample sizes of the randomized controlled trials are relatively small, and no systematic reviews exist currently. Clinical judgment should be utilized to determine the appropriateness of this course of action based on the patient's presentation, availability of supplies, and the provider's confidence in administering aerosolized TXA. The current literature supports a dose of TXA 500-1000 mg in adult patients and 250-500 mg in pediatric patients, and there is inconclusive data to support diluting the TXA prior to administration. Patients receiving inhaled TXA should be monitored for

bronchoconstriction as well as other possible TXA side effects including seizures, altered renal function, and vascular occlusive events.

Case Study/Innovation

Abstract #70

A Model for Sustainable Anesthesia Care in a Resource-scarce Setting: Lao Friends Hospital for Children in Luang Prabang, Lao PDR

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Introduction: Lao Friends Hospital for Children (LFHC) opened in February 2015 on the grounds of the Luang Prabang Provincial Hospital in Lao People's Democratic Republic (LPDR). LFHC provides free surgical and anesthesia care for patients. A baseline study was conducted in 2015 at the time LFHC opened. The mortality rate for the three districts surveyed in Luang Prabang province showed an under age 5 mortality rate of 88/1,000, which was well above the national rate (72/1,000) at that time. Although there are surgical services in the Provincial Hospital, Hmong and Khmu patients are not likely to seek care in the Lao government hospitals due to cultural differences. LFHC has become known as the "Hmong Hospital" due to the many Hmong patients seeking care there. Three of the four nurse anesthetists at LFHC are Hmong. Their ability to understand the cultural differences of the Lao, Hmong and Khmu people provide them with the ability to give culturally appropriate anesthesia care at LFHC.

Presentation: A workforce study of anesthesia providers was conducted in PDR in 2021. There were 244 anesthesia providers in the country, including 64 anesthesiologists and 26 nurse anesthetists. Other anesthesia providers were either medical assistants or physicians with some training in anesthesia. When LFHC opened in 2015, Health Volunteers Overseas (HVO) started a nurse anesthetist training program. Three nurse anesthetists have graduated from the program, and one is currently in training. The program is three years in duration and has been recognized by the International Federation of Nurse Anesthetists. The LFHC HVO Nurse Anesthesia Program uses clinical rotation opportunities that have included Luang Prabang Provincial Hospital; Mahosot Hospital in Vientiane, Lao PDR; Siriraj Hospital in Bangkok, Thailand; and Angkor Hospital for Children in Siem Reap, Cambodia. The number of surgical cases performed in the operating theatre at LFHC increased from 266 in 2016 to 1,160 in 2019, and totaled 989 cases in 2023. The most frequent procedures in 2023 were dressing changes (27%) followed by orthopedic procedures (23%). The cornerstone of anesthesia provided by the LFHC nurse anesthetists is ultrasound guided regional anesthesia. Although regional anesthesia is often used, nurse anesthetists utilize multimodal analgesia and have developed a postop pain quality improvement project. Additional goals of the program are to develop the teaching skills of the nurse anesthetists at LFHC to enable them to teach other healthcare providers.

Discussion: Volunteers from HVO provide instruction using clinical, didactic and simulation

teaching methods. Program coordinators develop the curriculum and guide volunteers in the teaching that is required at the sites. Clinical rotations for trainees have included Mahosot Hospital, the Department of Anesthesiology at Siriraj Hospital, and Angkor Hospital for Children. During the pandemic, HVO developed virtual synchronous and asynchronous anesthesia education that was provided to anesthesia staff at LFHC, Angkor Hospital for Children, and Sonja Kil Memorial Hospital in Kampot, Cambodia. Currently, instruction is provided for the anesthesia providers at the hospitals in Lao PDR and Cambodia by HVO volunteers.

Case Study/Innovation

Abstract #71

A Model for Sustainable Anesthesia Care in a Resource-scarce Setting: Angkor Hospital for Children in Siem Reap, Cambodia

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Health Volunteers Overseas

Introduction: From 1975-1979, approximately 1.5 million Cambodians died after the Khmer Rouge came to power. The regime especially targeted the educated classes, including nurses and doctors, creating a shortage of healthcare providers. During the 1990s, more than a decade after the Khmer Rouge reign of terror had ended, the Ministry of Health (MoH) sought to rebuild the nursing and physician workforce. More recently the focus has been on improving the quality of patient care in Cambodia. The Angkor Hospital for Children (AHC) in Siem Reap was founded in 1999 and provides compassionate care to children throughout Cambodia. AHC is a teaching hospital that works closely with the MoH and provides clinical rotations for nursing students, medical students, physician residents, and other healthcare providers in Cambodia. Since 2004, anesthesia care at AHC has been provided by nurse anesthetists supported by Health Volunteers Overseas (HVO). At the outset, HVO volunteers educated the nurse anesthetists on how to improve their clinical abilities, but starting in 2006 the focus shifted to developing the ability of AHC nurse anesthetists to teach.

Presentation: This project aimed to develop a model of sustainable, high-quality, cost-effective anesthesia care in a resource-scarce setting. The nurse anesthetists at AHC deliver anesthesia in an ophthalmology operating theatre, minor procedure room, and main operating theatre. In 2018, 8,870 minor procedures were performed, most requiring anesthesia. These cases included dressing changes for burns, foreign body removal, minor orthopedic procedures, laceration repair, and a variety of other procedures. Anesthetics in the minor procedure room were often performed with a laryngeal mask airway or mask ventilation and included regional blocks. In 2023, 631 cases were done in the ophthalmology operating theatre. Types of cases in the ophthalmology theatre included cataract removal, corneal lacerations, enucleation for retinoblastoma, strabismus, and other procedures. Anesthesia for children in the ophthalmology theatre included general anesthesia with the use of retrobulbar and peribulbar blocks. In 2023, 854 cases were done in the main operating theatre. Surgeries included orthopedic fracture repair, burn debridement, contracture repair, hernia repair, imperforate anus repair, exploratory laparotomy, and urologic and ENT procedures. Anesthesia provided in the main operating theatre included mask induction with regional anesthesia. Airway management was mostly laryngeal mask airways or intubation for more extensive procedures.

Discussion: The mission of HVO is professional development of existing healthcare providers to

improve their abilities to advance the quality of care in resource-scarce settings. The HVO nurse anesthesia program at AHC initially focused on decreasing the anxiety of children and their families prior to surgical procedures and during the perioperative timeframe. The nurse anesthetists at AHC also improved pain management by increasing the use of regional blocks. As the quality of anesthesia care advanced, in 2012 the HVO program implemented a curriculum for AHC nurses who wanted to become nurse anesthetists. Eventually, three nurses and two physicians progressed through the program. Methods of teaching anesthetists at AHC included clinical instruction, lectures, and simulation education. Anesthesia providers in the program participated in clinical rotations at the National Pediatric Hospital in Phnom Penh, Cambodia, and Siriraj Hospital in Bangkok, Thailand. As the AHC nurse anesthetists gained clinical experience, the program focused on improving their teaching abilities. Now, the nurse anesthetists at AHC are teaching other anesthesia providers in Cambodia, have participated as volunteers with Operation Smile, and have served as HVO volunteers at Lao Friends Hospital for Children in Laos.

Case Study/Innovation

Abstract #72

Airway Emergency Following Pulmonary Cryoablation in the Nonoperating Room Anesthesia Setting

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Introduction: Pulmonary cryoablation has been gaining traction in the remote anesthesia setting for patients with nonoperable lung lesions. It is a minimally invasive procedure in which a cryoprobe is percutaneously inserted into lesions under computed tomography guidance and destroys cancer cells through rapid freeze-induced cell injury. It is a low-risk procedure; however, severe complications such as hemopneumothorax have been reported. In remote settings, these procedures are performed under challenging conditions with limited access to resources and a patient population that is older with multiple comorbidities. Anesthesia providers must be knowledgeable about these procedures, including their risks and complications, to optimize patient care in the remote anesthesia setting.

Presentation: A 73-year-old female, diagnosed with metastatic uterine cancer, presented to interventional radiology for cryoablation of five lesions in her left lung. She previously had a cryoablation in her right lung that was complicated by a pneumothorax. Her physical exam findings included orthopnea as well as dyspnea on exertion. A standard general anesthesia was induced, and the airway was secured with a 7 mm endotracheal tube (ETT). Inhalational gas and muscle paralysis were maintained while cryoprobes were advanced under computed tomography (CT) guidance. At the end of the procedure, neuromuscular blockade was reversed and spontaneous ventilation was initiated. Ventilation abruptly halted without the presence of end-tidal carbon dioxide (ETCO2) tracing. Manual ventilation was employed with no improvement and high airway pressures. A CT scan showed an occlusive clot at the carina artery, distal to the tip of the ETT. Anesthetic management was converted to total intravenous anesthesia with propofol. A large intravenous line and an arterial line were placed for invasive monitoring. The ETT was exchanged for an 8 mm ETT for bronchoscopy. An interventional pulmonologist was consulted to evacuate the endotracheal clot using an endobronchial cryoprobe. The cryoprobe was activated at the surface of the clot, triggering cryoadhesion of the clot to the probe. The clot was incrementally evacuated, and adequate tidal volumes with positive ETCO2 resumed. The patient's hemodynamics and oxygen saturation were stable throughout the procedure. The patient was transferred to the ICU sedated and intubated. The patient was extubated the next day and discharged on postoperative day four.

Discussion: Minimally invasive lung cryoablation is gaining traction in remote anesthesia locations due to precise guidance under CT. However, there is limited data on the safety and

efficacy of cryoablation on lung lesions. While it can reduce tumor growth, it has serious complications considering the challenges of the remote setting and patient comorbidities. Pneumothorax is the most common complication in 38% of cases and hemoptysis in 17% of cases with 4% requiring bronchoscopy. This patient's multiple lung lesions, comorbidities, and previous history of cryoablations placed her at higher risk for bleeding and clot formation. Anesthesia providers must be knowledgeable of this novel procedure and its anesthesia implications. They must perform risk stratification and careful patient selection for this procedure. In the remote setting, adequate preparation is crucial to address airway complications with additional ETT sizes, double lumen tubes, and bronchial blockers to isolate the lungs from blood contamination. Invasive monitoring and cross-matched blood products should be readily available for bleeding emergencies. With better understanding of procedural implications, anesthesia providers can effectively coordinate an interdisciplinary team approach to address adverse events and improve patient care.

Case Study/Innovation

Abstract #73

Anesthetic Implications of Moyamoya Disease: A Case Study

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Introduction: This case study educates anesthesia providers about Moyamoya disease (MMD) and contributes to the limited evidence that exists to guide anesthesia providers in caring for this patient population. It highlights the perioperative management of a patient with MMD undergoing mastoidectomy and ear tube placement. Moyamoya disease is a rare cerebrovascular condition classified by progressive narrowing of the bilateral internal carotids and branches. In response to this chronic stenosis, the body forms frail collateral vessels. The prevalence of MMD is 0.35/100,000 people. Researchers still do not fully understand the etiology of MMD, but may have found genetic links, especially in the East Asian population where MMD is more common. Anesthesia providers need to consider the many anesthetic implications while providing general anesthesia for this patient population. This case study informs readers and provides recommendations for perioperative care.

Presentation: The 34-year-old female, 157 cm, 73 kg, ASA physical status 3, presented for mastoidectomy and ear tube placement. Pertinent medical and surgical history included stroke related to MMD in her early 20s. Preinduction vital signs were BP 104/52 mmHg, HR 76/min, RR 15/min, SpO2 100%, temperature 97.6°C, and numeric pain rating scale (NPRS) score 0/10. Prior to induction, the anesthesia team placed an arterial line and initiated cerebral oximetry monitoring. As induction began, the team initiated a phenylephrine infusion. The team performed a standard induction with fentanyl, propofol, lidocaine, and succinylcholine. Maintenance of anesthesia was with sevoflurane. The arterial line was leveled and maintained at the tragus to coincide with pressures in the circle of Willis. The patient's blood pressure was stable and maintained within 15-20% of baseline during procedure. Cerebral oximetry monitoring readings ranged between 66-71 on the left and 76-80 on the right. End-tidal CO2 ranged between 35-40 during the case. The patient received hydromorphone boluses totaling 0.6 mg for pain control. The team gave a total of 1,300 mL of lactated ringers during the 1 hr case. At the request of the surgeon, the team extubated the patient deep and she was transported to the postanesthesia care unit. Postoperative vital signs were BP 118/57, HR 78/min, RR 12/min, SpO2 100%, temperature 97.2°C, and NPRS score 0/10. Her postoperative neurologic exam remained unchanged from her baseline. Case studies are exempt from institutional review board (IRB) approval.

Discussion: The outcomes of this case provide more evidence of safe anesthetic care of MMD patients. However, limitations exist in these recommendations due to limited evidence in the

literature and lack of patient follow-up. The patient's postoperative neurologic exam remained unchanged from baseline, her vital signs were stable, and she was discharged from the hospital the same day. A systematic review of two databases yielded four relevant pieces of evidence to support management recommendations. However, the evidence was low-level and included retrospective studies, reviews, and surveys. Anesthetic technique, blood pressure management, ventilation strategy, temperature management, fluid management, and cerebral oximetry are all anesthetic considerations in this disease process. The literature suggests no one superior anesthetic type over another. Evidence shows blood pressure should be maintained within 15% of baseline; however, this patient had a few blood pressures outside this range, and she had positive immediate postoperative outcomes. Evidence also suggests pediatric patients undergoing revascularization surgery have a greater chance of postoperative transient ischemic attack (TIA) if starting with a higher baseline blood pressure. Anesthetists should insert an arterial line and level it at the tragus. Best blood pressure augmentation needs more research to recommend best practice. Ventilation strategy goals should be to maintain normocarbia. Anesthetists should vigilantly monitor temperature and maintain normothermia to mild hypothermia. The surgical procedure should drive fluid management strategies. If available, the anesthetist should use cerebral oximetry to help assess hemodynamics, but no evidence shows superior outcomes if used.

Case Study/Innovation

Abstract #74

Anesthetic Management in Fibrodysplasia Ossificans Progressiva: A Case Study

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Introduction: Fibrodysplasia ossificans progressiva (FOP) is a rare, autosomal dominant, genetic condition affecting one in two million individuals globally. The condition is characterized by progressive heterotopic ossification of skeletal muscle, fascia, tendons, and ligaments. This abnormal development of bone can be spontaneous in nature, termed a "flare-up," or can be the result of minor trauma, such as soft tissue injury, intramuscular injections, biopsies, or viral illnesses. Individuals are typically wheelchair bound by the age of 30 years with a median life expectancy of 40 years. Death occurs most commonly from thoracic insufficiency syndrome or pneumonia. An individual with FOP poses many anesthetic challenges. Sensitivity to oral trauma, temporomandibular joint fusion, cervical spine immobility, and restrictive chest wall disease all lead to airway management difficulties and complexities of management. The focus of this case study is to describe anesthetic management of a patient with FOP and discuss current anesthetic recommendations.

Presentation: A 53-year-old male, ASA physical status 3, was scheduled for a robotic bilateral inguinal herniorrhaphy. His medical history included FOP, asthma, and hypertension. Significant physical assessment findings were a fused cervical spine, temporomandibular joint immobility that limited mouth opening to approximately 1 cm, and minimal thoracic expansion with deep inhalation. Preoperative medications given were intranasal oxymetazoline, midazolam 1 mg, dexmedetomidine 4 mcg, and glycopyrrolate 0.2 mg IV. An oxygen 6 L/face mask was initiated enroute to the operating room (OR). Great care was taken in positioning the patient on the OR table, with the patient confirming that he was comfortable. The airway was secured by an awake nasal fiberoptic intubation with an otolaryngologist at the bedside in the OR in case a surgical airway was required. Steroids were started intraoperatively and continued for four days. Regional analgesia techniques were purposely avoided. Surgery was complicated by the patient's stiff, noncompliant abdomen resulting in inadequate visualization upon insufflation that necessitated conversion to an open procedure. Multiple adhesions complicated the hernia reduction resulting in a 1-foot resection of the small bowel. Sugammadex 200 mg was given for neuromuscular blockade reversal. Upon emergence from anesthesia, the patient was extubated, oxygen 3 L/min nasal cannula was administered, and he was transferred to the intensive care unit. His postoperative course was significant for atelectasis that delayed discharge for eight days and required home oxygen. Case studies are exempt from institutional review board (IRB) approval.

Discussion: The patient in this case study developed atelectasis postoperatively and was discharged home on oxygen. Atelectasis may have been an unavoidable complication due to his restrictive thoracic cavity expansion. Individuals with FOP are rare and pose many anesthetic challenges. The International Clinical Council on Fibrodysplasia Ossificans Progressiva proposes recommendations to follow when providing anesthesia care. Surgical interventions should only be undertaken in a major medical center equipped with practitioners and equipment capable of caring for patients with complex disorders. Due to the challenging nature of airway management in these patients, general anesthesia is recommended. An awake nasal fiberoptic intubation is recommended to secure the airway. An otolaryngologist should be present and prepared to place an emergent surgical airway. Steroid administration is recommended to be started preoperatively and continued until postoperative day four. Great care should be taken in positioning the patient to minimize soft tissue injury. Peripheral IVs are acceptable, but tourniquet time should be minimized. Acetaminophen and nonsteroidal anti-inflammatory medications are recommended to minimize opioid administration and subsequent respiratory depression. Recommendations regarding ultrasound (US) guided regional techniques are lacking. Mandibular blocks are known to cause temporomandibular joint fusion and should be avoided. Intracutaneous and subcutaneous injections are tolerated. Thus, US guided regional techniques maintaining a strict intracutaneous or subcutaneous infiltration may be a viable option. Future research on the utility of specific US guided blocks is needed.

Case Study/Innovation

Abstract #75

Argatroban Use During a Carotid Endarterectomy in a Patient with a History of Heparin-induced Thrombocytopenia: A Case Study

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Introduction: Heparin is the anticoagulant of choice in cardiovascular procedures due to cost, availability, and reversibility. Complications from heparin administration may occur when heparin creates a heparin-platelet factor 4 complex and antibodies are created which lead to the activation and destruction of platelets. Heparin-induced thrombocytopenia (HIT) is suspected when thrombocytopenia and thrombus formation occur, leading to devastating consequences for the patient. HIT occurs in 0.1-5% of patients who receive a therapeutic course of heparin. Patients with a history of HIT present unique challenges for anesthesia providers who must determine the best anticoagulant to give such patients when undergoing cardiovascular procedures. Although heparin administration may be considered in specific patients due to the unique pathophysiology of HIT, alternative anticoagulation methods should be reviewed. This case study documents the successful use of argatroban during a carotid endarterectomy (CEA) in a patient with remote HIT.

Presentation: A 60-year-old female with 70% right proximal internal carotid artery stenosis presented to the hospital after a syncopal episode. The patient was scheduled to undergo a CEA and had multiple comorbidities including hypertension, type 2 diabetes, chronic obstructive pulmonary disease, coronary artery disease, peripheral vascular disease, fatty liver, chronic kidney disease stage III, seizures, and a pacemaker. Listed allergies included heparin and warfarin due to a history of HIT diagnosed a year earlier. Routine lab work demonstrated decreased hemoglobin and hematocrit of 8.5 g/dL and 29.5%. A preoperative echocardiogram revealed normal cardiac function with an ejection fraction of 55%. The anesthetic plan included a general anesthetic with an endotracheal tube and intraoperative blood pressure monitoring using an arterial line. Standard monitors were applied to the patient and an uneventful induction and intubation occurred. Sedation was maintained using sevoflurane and blood pressure was controlled at 140-160 mmHg during cross-clamp using a phenylephrine infusion. Administration of 6 mg argatroban was completed intravenously before the cross-clamp was applied. The procedure was performed with no complications. The patient was extubated in the operating room and transferred to the intensive care unit neurologically intact. No complications or deficits were reported during the following 24-48 hours post-procedure and the patient was successfully discharged six days following the procedure to a skilled nursing facility. Case studies are exempt from institutional review board (IRB) approval.

Discussion: Patients with a history of HIT represent a special population in which heparin may be contraindicated depending on the timing of initial diagnosis. Studies show the heparin-platelet factor 4 (PF4/H) antibody, which is responsible for HIT, is cleared from circulation an average of 85 days after the last heparin exposure. Patients are considered to have remote HIT when there are no longer anti-PF4/H antibodies detectable. HIT recurrence in patients with a history of HIT is similar to the general population after intraoperative heparin re-exposure. The American Society of Hematology supports the use of heparin in the intraoperative period for patients who have a remote history of HIT and are undergoing a cardiovascular procedure. A nonheparin anticoagulant is recommended for pre- and postoperative periods due to the risk of HIT recurring with use over four days. According to current literature and recommendations, heparin administration should have been considered in this case due to the patient's remote HIT status. In patients with recent HIT or who have anti-PF4/H antibodies, an alternative anticoagulant should be chosen during the intraoperative period. Alternative anticoagulants include direct thrombin inhibitors (DTIs) and are selected based on patient characteristics, cost, and drug availability. Evidence shows there is no difference in mortality or hemorrhage when heparin is compared with DTIs in patients with a history of HIT undergoing cardiovascular surgery. Argatroban has proven to be a successful alternative to heparin in patients with remote HIT undergoing a CEA. Heparin administration during the intraoperative period should be considered depending on remote HIT status due to the low risk of HIT recurrence.

Case Study/Innovation

Abstract #76

Gastric POCUS as a Routine Upper Endoscopy Preanesthetic Assessment for Aspiration Prevention in Patients taking GLP-1 Agonist Medications: A Case Study

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Introduction: The focus of this case study is to highlight how gastric point-of-care ultrasound (POCUS) is a necessary preanesthetic assessment tool prior to upper endoscopy procedures, especially for patients on GLP-1 agonists. GLP-1 agonist-induced gastroparesis (GP) is still under investigation and not well described. Despite following fasting guidelines, patients show up to procedures with unsafe gastric residual levels, which puts them at significant risk for pulmonary aspiration. This case study describes a patient on a GLP-1 agonist who fasted for 18 hours and had solid food in the stomach. Estimating appropriate fasting times can be difficult in patients who have GLP-1 agonist-induced GP. Using a reliable assessment tool to show gastric content levels on the day of procedure, even in fasted patients, could be life-saving in endoscopic procedures where pulmonary aspiration risk is high. Gastric antrum POCUS as a routine preanesthetic assessment is accurate, can reduce risk, and is shown to have little impact on the endoscopy schedule.

Presentation: The patient was a 49-year-old female, 5’9” and 198 lb, body mass index (BMI) 29, with a past medical history of anxiety, type 2 diabetes mellitus, hypertension, mild intermittent asthma, allergies, lumbar spinal stenosis, and gastroesophageal reflux. The patient endorsed a feeling of fullness and reported belching on the car ride. The preprocedural physical exam did not include using gastric antrum POCUS to assess stomach contents. Per patient report, she had fasted for 18 hours from solid foods and had been on clear liquids only up until 10 hours preprocedure. The patient was prescribed Trulicity (dulaglutide) 1.5 mg which she injected once weekly and was last taken six days preprocedure. After the physical exam by the CRNA and resident registered nurse anesthesiologist (RRNA), the anesthetic plan was changed from general intravenous anesthesia with propofol and a nasal cannula to rapid sequence induction and general anesthesia for airway protection. General anesthesia was maintained with sevoflurane and there were no adverse events during the procedure. The endoscopist noted a large amount of solid food at the gastric antrum when the endoscope was fully inserted. At the conclusion of the procedure, the patient was safely extubated once she met criteria and returned to the endoscopy recovery area on a simple O2 mask with oxygen at six liters per minute. She was awake and able to answer questions, and denied having pain. After she met criteria for discharge, the patient was taken home by a family member. Case studies are exempt from institutional review board (IRB) approval.

Discussion: This case study is a near-miss incident. This ideal candidate for gastric POCUS did not have gastric antrum scanning and had a full stomach that could easily have been missed. The CRNA and RRNA were informed of the few case reports at the time that described full stomachs in patients on GLP-1 agonists despite adequate or increased fasting times. This patient was on the sixth day of a seven-day medication dosing interval, which could seem sufficient. If the patient had been scheduled in a room unsuited for mechanical ventilation, or the providers had not heard about GLP-1 agonist-induced GP, they could have elected for sedation. This patient was safely intubated and underwent the procedure with maximum airway precautions. The case could have been postponed and better fasting and medication instructions given had POCUS identified the full stomach prior to procedure. Upper endoscopy procedures incur the highest anesthetic risk for pulmonary aspiration. Alakkad et al. 2015 showed that not all changes to airway management after POCUS increase intervention or time spent; the researchers also did not find an overall increase in procedural delay. Gastric POCUS is a reasonable, accurate way to assess gastric residuals, and is an indispensable tool in one of the highest risk procedural areas for pulmonary aspiration. Anesthesia departments should prioritize training providers in the use of gastric POCUS as a preanesthetic assessment tool, especially prior to upper endoscopy procedures where there is not a protected airway.

Case Study/Innovation

Abstract #77

The Impact of Chronic Cannabis Use on Gastric Motility and Aspiration Risk: A Case Study

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Introduction: The focus of this report is the gastrointestinal effect of chronic cannabis ingestion in an otherwise healthy young male patient presenting for scheduled surgery. The proposed physiologic mechanisms of cannabis-related development of gastroparesis (GP) will be outlined, with an emphasis on associated aspiration risk and best practice for anesthetic management of these patients. As more states legalize cannabis, the proportion of the population that routinely uses high-potency cannabis will surge. When coupled with the continuously large volume of surgical procedures conducted annually, the likelihood of a Certified Registered Nurse Anesthetist (CRNA) encountering a cannabis-using patient with the potential for adverse anesthetic outcomes will continue to rise. The importance of thorough preoperative assessment for the presence and degree of cannabis use to establish aspiration risk and safely develop an anesthetic plan cannot be overstated.

Presentation: The patient in this case report is a 19-year-old male patient presenting for an ankle open reduction internal fixation (ORIF) following a car accident three weeks prior. History and physical identified mild systemic disease, notably asthma and controlled gastroesophageal reflux disease, and a normal anesthesia-specific assessment with greater than eight hours of nil per os (NPO) time. The patient endorsed chronic cannabis use for five years, with last use occurring the night prior. A laryngeal mask airway (LMA) was chosen for airway management due to short surgical duration and what was believed to be a low aspiration risk. Induction of general anesthesia (GA) was uneventful, but shortly thereafter the patient began to regurgitate gastric contents. The LMA was removed, and rapid sequence intubation was performed. The patient was unable to maintain adequate tidal volumes or be safely weaned from ventilatory support at the end of the case. He was admitted to the intensive care unit, where he underwent chest x-ray and bronchoscopy. He was extubated overnight and discharged home on postoperative day one. Upon consideration of the patient's cannabis use history coupled with the adequate NPO time, cannabis-induced GP was considered as a potential cause of the events that took place during the case.

Discussion: Available literature on cannabis-induced GP is limited and consists primarily of a low level of evidence research. As cannabis is a Schedule 1 substance and federally illegal, practical and ethical difficulties impede high-quality research on this topic. One randomized controlled trial was identified, noting an increase in gastric emptying time of an average of 90 minutes when cannabis was consumed compared to placebo. A retrospective comparative study

examined group health characteristics and inpatient outcomes for patients with a diagnosis of GP and cannabis use. Of the sample identified, nearly 10% of patients hospitalized with GP were active cannabis users. Two case studies were reviewed that identifed a correlation between chronic cannabis use and GP. One of the studies outlined the anesthetic course of a chronic cannabis-using patient undergoing an ankle ORIF with an LMA who aspirated following induction of GA, a clinical vignette markedly similar to the case described in this report. Based on this body of evidence, CRNAs should take care to ascertain presence and degree of cannabis use during preoperative assessment. At present, there are no official guidelines for pre- and intraoperative management of these patients to reduce aspiration risk, although preoperative abstinence from cannabis is supported. Until higher quality research can be conducted and official guidelines provided, conservative management of these patients is recommended. Proposed practice changes include assumption of a full stomach or, where available, preoperative use of point-of-care ultrasound to identify gastric contents for patients endorsing cannabis use. Finally, careful preoperative assessment and anesthesic plan development by the CRNA continues to be essential.

Case Study/Innovation

Abstract #78

The Safety of Liposomal Bupivacaine Versus Standard Bupivacaine for Interscalene Block: A Case Report

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Introduction: As the provision of regional anesthesia procedures continues to grow, so do the indications of liposomal bupivacaine (LB). LB is a sustained-release formulation for standard bupivacaine created to prolong peripheral, regional, single-shot anesthesia. However, since LB's inception in 2011, there has been controversial debate about its benefit profile. Much of the literature on the clinical efficacy of LB has been funded or performed by Pacira Pharmaceuticals, the manufacturer of Exparel, he brand name for LB. The purpose of this case report is to compare the risk of prolonged phrenic nerve blockade resulting in hemidiaphragm and ventilatory compromise against the benefit of prolonged analgesia with the use of LB versus standard bupivacaine in interscalene brachial plexus blocks (ISB).

Presentation: The patient was a 36-year-old male with a history of chronic pain and ASA physical status 2. The patient underwent a right tenodesis biceps repair with debridement. Prior to the procedure, the patient received an ISB with 10 mL LB combined with 10 mL 0.5% standard bupivacaine. After the procedure, it was noted that the patient had severe right hemidiaphragm paralysis which required the use of bilevel positive airway pressue and an overnight hospital admission. This case created questions such as: Are there differences in respiratory compromise and/or phrenic nerve palsy when using LB versus standard bupivacaine in ISBs? Additionally, if adverse events are noted with LB in ISBs, are those adverse events prolonged?

Discussion: Although some literature favors LB compared to standard bupivacaine alone for prolonged analgesic benefit, there is limited benefit of LB to outweigh the increased reductions seen in diaphragmatic excursion with LB. Also, most research studies that evaluate different medications in ISBs for shoulder surgeries consist of multimodal analgesic regimens. The current research for evaluating LB versus standard bupivacaine alone in ISBs shows that there is a need for more consistent, unbiased research without potential confounding variables.