State of the Science Oral and Poster Sessions

The AANA Foundation extended an invitation to participate in the State of the Science Oral and Poster Session at the AANA Annual Meeting in Denver, Colorado. This type of forum offers unique opportunities to talk directly to researchers about their research findings. The interaction among colleagues in a less formal setting sets the stage for invigorating discussions and exploration of the research findings.

Each year, Poster Session candidates are selected by the AANA Foundation Board to present their research for the poster presentation. This year, many of the abstracts from the State of the Science Oral and Poster Sessions were submitted for potential publication in the *AANA Journal*, and 61 abstracts were selected. For further detail and reference citations concerning individual abstracts, please contact the authors.

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AANA Foundation Executive Director

A1

Blunting the sympathetic response to laryngoscopy during the induction of anesthesia

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Introduction: It is well known that performing laryngoscopy for the purpose of endotracheal intubation is a very stimulating procedure. The resulting hypertension and tachycardia that typically ensues is the result of the intense sympathetic response to the laryngoscopy. Typically, opioids are given as part of the induction sequence of anesthesia as they are known to blunt the sympathetic response to laryngoscopy. The purpose of this study is to determine if there is a difference in the sympathetic response to laryngoscopy during induction of anesthesia comparing sufentanil with fentanyl.

Method: Following IRB approval, written informed consent was obtained from forty patients. Participants were randomly assigned to one of two groups; group A received fentanyl 1.5-2 mcg/kg together with a standardized induction drug sequence, and group B received sufentanil 0.15-0.2 mcg/kg with the same standardized drug sequence. Laryngoscopy was performed following the administration of the induction drugs. Blood pressures and heart rates were recorded at pre-determined intervals during the induction. Data was analyzed to determine which of the two groups demonstrated increases in heart rate and blood pressure compared to baseline values.

Results: Both groups had similar demographics. Repeated measures analysis of variance did not demonstrate a significant difference in heart rates or blood pressures for either group when comparing baseline values to post laryngoscopy values. The fentanyl group had an average increase in heart rate of 15 beats per minute; the sufentanil groups' heart rate increased on average 13 beats per minute post intubation. Blood pressures were not significantly higher post intubation/laryngoscopy for either group compared to patients' baseline values.

Conclusion: This study concludes that there was no significant difference in the response to laryngoscopy irrespective of type of opioid given, when comparing patient baseline values to post induction values. It should be noted that not all laryngoscopies were done with the same amount of experience as some providers were learners in the anesthesia realm.

A2

The effects of chrysin, a *Passiflora incarnata* extract, and midazolam, on the emergence time from general anesthesia in Sprague-Dawley Rats (*Rattus norvegicus*) after intra-abdominal surgery

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Introduction: Chrysin is commonly taken by individuals for its sedative properties. Because of the physiological and pharmacological effects, the use of chrysin may prolong emergence time from anesthesia particularly when combined with midazolam. The purposes of this study were to determine the effects of chrysin and chrysin plus midazolam on emergence time from isoflurane anesthesia.

Methods: Eighty-four mature male Sprague-Dawley rats weighing 225-250 grams were used for this experiment. Rats were assigned to one of five groups: chrysin (n = 21); chrysin + midazolam (n = 22); midazolam (n = 21); and vehicle (n = 20). Chrysin was

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given at 1 mg/kg; midazolam at 2 mg/kg. All drugs and vehicle were given by intraperitoneal injection 10 minutes prior to surgery. An equal volume of sterile water determined by weight was given to the control group. While under anesthesia, intra-abdominal surgery was performed. Upon completion of the surgery, administration of the anesthetic was stopped, and a stopwatch was used to measure the time for emergence from anesthesia. Emergence time, as measured in seconds, was defined as the time of inhalation anesthetic agent discontinuation to the animal returning to the upright position and taking one step forward (righting reflex).

Results: There was no significant difference between chrysin (mean = 181.24 ± 62.01) and vehicle (mean = 196.60 ± 59.70), p = .86. The chrysin + midazolam (mean = 425.50 ± 221) was significantly higher than the vehicle, p = .009. There was no significant difference between chrysin + midazolam and midazolam group (mean = 456 ± 281.05), p = .71.

Conclusions: Anesthesia providers need to be aware that chrysin when combined with midazolam significantly increases emergence time from anesthesia. In addition, providers need to ask patients about herbal use because 70% of all patients neglected to inform their healthcare provider about the use of herbals.

A3

Quality of work life among Michigan CRNAs in various employment modalities: A comparative study

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Introduction: Certified Registered Nurse Anesthetists (CRNAs) provide a vital and crucial role in the administration of anesthetics and anesthesia related care in the United States. Workplace satisfaction can increase retention of CRNAs and increase performance in the anesthesia department. This project collected data from a census of Michigan CRNAs to determine the attitudes of CRNAs about their level of quality of work life related to their current employment modality.

Methods: A 35-item survey was developed addressing seven key dimensions of workplace satisfaction including autonomy, wages, relationships, teamwork, commitment, job satisfaction, and characteristics of employment. The survey was mailed to all Michigan CRNAs (provided by the AANA). Analysis of the collected data compared responses about workplace satisfaction in terms of Michigan CRNAs' attitudes regarding the dimensions measured on the survey. Descriptive, reliability, and correlation statistics were analyzed for those items defining each of the seven dimensions, and scale scores were computed for the respondents using the items defining each dimension.

Results: Among the 567 respondents, 72% were hospital employed, 10% were anesthesiologist group employed, and 17% were other. Unequal group sizes correlated with the distribution of CRNA employment in the state of Michigan. The means of the three employment modality groups were found to differ significantly for job satisfaction, wages, and workplace demand ($p<0.05$). Respondents classified as "other" had higher mean scores in job satisfaction and wages, while hospital-employed respondents had higher mean scores in workplace demand.

Conclusions: This study showed that Michigan CRNAs working in the "other" mode of employment (agency, locum tenens, and independent practice) had higher quality of work life scores when measured by the seven key dimensions. Aspects of CRNA employment related to this modality could be utilized by hospitals and anesthesiologist groups that employ CRNAs to increase workplace satisfaction and increase employee retention.

Source of Funding: University of Michigan-Flint.

A4

The effect of music and therapeutic suggestion on postoperative pain in the general anesthesia patient

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Introduction: Intra-operative music therapy (M) and therapeutic suggestion (TS) offer two non-pharmacological interventions that have been shown to reduce postoperative pain. This study compared the effects of intraoperative music therapy coupled with therapeutic suggestion (M/TS group) on postoperative opioid requirements as compared to using therapeutic suggestion alone (TS group) or no intervention (control group).

Methods: All adult male and female patients scheduled for urologic, gynecologic, or general surgery abdominal procedures under general anesthesia that meet inclusionary criteria and consented to participate in the study were enrolled in this experimental, single-blind, randomized, prospective investigation. Subjects

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were randomly allocated to one of the three groups and followed postoperatively for 24 hours. Pain scores and nausea and vomiting scores were recorded in the postanesthesia recovery unit, same day surgery, and at home. Patient satisfaction scores were obtained at the conclusion of the 24-hour period.

Results: A total of 74 subjects were included in this interim analysis (20 TS, 26 M/TS, and 27 control). No significant differences in demographic variables or other measured variables between groups were noted except in the time from discharge to the first opioid use at home (p=0.039). The mean time for the control group was 66.3 minutes (+/- 74.4), 81.9 minutes (+/- 116.8) for the TS group, and 218 minutes (+/- 288.8) for the M/TS group.

Conclusion: The interim results of this study suggest that intraoperative music therapy (M) and therapeutic suggestion (TS) do not reduce postoperative pain or postoperative nausea prior to discharge but may delay the first use of opioids once discharged. Subjects did not report significant differences in satisfaction with their anesthetic experience between groups with most subjects reporting complete satisfaction.

Source of Funding: Naval Medical Center Portsmouth, Portsmouth, Virgina.

A5

Postoperative pain by fracture type in patients with orthopedic trauma

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Introduction: Anesthesia providers during surgical procedures administer opioids based on a variety of factors. One of the predictors of pain is the type of surgical procedure. The purpose of this secondary analysis was to describe the verbal pain score and amount of opioid administered by type of fracture in orthopedic trauma patients receiving general anesthesia.

Methods: This explorative descriptive study gathered postoperative data on 46 patients. Patients receiving regional anesthesia were excluded for this analysis. Postoperative pain scores (0-10) were obtained at 15 minutes and 45 minutes after surgery. Amount of opioid was converted to mg of morphine and divided by kilograms. Postoperative pain scores and amount of opioid administered in the operating room and first 45 minutes in the post-anesthesia care unit were compared by type of fracture.

Results: Amount of opioid and verbal pain scores were collected in 46 patients (16 females) receiving general anesthesia for lower extremity fractures. Average pain score at 15 minutes for patients with ankle fractures = 8.1 (SD=2.3, n=9), femur fractures = 6.8 (SD=4.0, n=5), tibial plateau fractures = 6.6 (SD=3.3, n=16), and tibia fibula fractures = 7.3 (SD=3.1, n=15). Average amount of opioid administered in the operating room for patients with ankle fracture = 0.38 mg/kg (SD=0.21), femur fractures = 0.58 mg/kg (SD=0.34), tibial plateau fractures = 0.41 mg/kg (SD=0.23), and tibia fibula fractures = 0.42 mg/kg (SD=0.29). Comparison of verbal pain scores or amount of opioid administered by fracture type indicated no significant difference when compared using parametric and nonparametric statistical analysis.

Conclusions: This pilot study suggests that there are some differences by fracture in terms of post-operative pain scores although they are not statistically different. Many factors such as gender, age, and genotype can impact postoperative pain scores.

Source of Funding: This study was funded the American Association of Nurse Anesthetists Foundation.

A6

Investigation of modulation of the alpha 2 receptor in tetrahydropalmatine (THP) analgesia

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Introduction: Pain is one of the most common complaints of patients seeking medical care, and many have resorted to taking nutraceuticals to treat pain. Tetrahydropalmatine (THP), an extract of the herbal corydalis, is purported to possess analgesic properties. However, whether THP induces analgesia via modulation of alpha 2 receptors has not been investigated. Nor are there studies investigating interactions of THP with anesthetics.

Methods: Fifty-seven Sprague-Dawley rats were assigned to one of five groups and administered the following compounds: (1) vehicle; (2) dexmedotomidine and vehicle; (3) THP and vehicle; (4) THP and the alpha 2 antagonist, yohimbine, to examine modulation of the alpha 2 receptor; and (5) THP and dexmedotomidine to investigate interactions between the two compounds. All rats received two intraperitoneal injections in equivalent volumes. Analgesic efficacy was measured using the Harvard Tail Flick analgesia meter. Because the tail flick test produces

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high variability, three pre-experiment measurements were averaged to determine baseline latency and three post-intervention measurements were averaged to determine post-intervention tail-flick latency.

Results: ANOVA on normalized data suggested there was a significant difference among the groups (F = 6.980; p = 0.00). Post hoc analysis (Bonferroni) suggested that neither dexmedotomidine nor THP provided significantly greater analgesia compared to vehicle (p=1.000). However, THP and dexmedotomidine combined displayed significantly greater analgesia compared to all other compounds or combinations (p = 0.002). Finally, rats administered THP and yohimbine did not display significantly shorter tail-flick latencies compared to the THP only group, suggesting THP does not modulate alpha 2 receptors (p=1.000).

Conclusions: THP and dexmedotomidine provided significantly greater analgesia compared to dexmedotomidine alone suggesting an additive or synergistic effect when THP is combined with the anesthetic agent dexmedotomidine. This possible anesthetic interaction warrants further investigation.

Source of Funding: 59th Medical Wing Clinical Research Squadron, Lackland Air Force Base, San Antonio, Texas.

A7

Patient outcomes of peripheral nerve blocks and general anesthetics performed by CRNAs in a military same day surgery center: A retrospective chart review

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Introduction: Regional anesthetics have been associated with decreases in anesthesia related morbidities and pain. The purpose of this study was to evaluate a Military Same-Day Surgery Unit (SDSU) where all regional and general anesthesia (GA) was delivered by CRNAs to determine if there were differences in outcomes between patients receiving GA versus peripheral nerve blocks (PNB).

Methods: All charts from 2003 to 2006 were reviewed. Patients were included if they underwent a procedure that could be done under either GA or PNB. Data were recorded on emesis (PONV), perioperative times, pain, analgesic use, antiemetic use, and anesthesia-related complications.

Results: Overall 342 patients met inclusion criteria; 161 GA and 181 PNB. Anesthesia time (in minutes) was shorter for GA (109.6 vs. 135.5, p<.001), but recovery times were longer (56.7 vs. 36.4, p<.001) with SDSU nearly identical (71.5 vs. 72.8, p=.706), resulting in a total hospital time that was not significantly different (352.7 vs. 347.5, p=.55). GA patients were given more morphine equivalents (mg/eqv) of narcotic in the OR (22.9 vs. 15.1, p<.001) yet still had higher pain scores postoperatively (1.1 vs. 0.3, p<.001), requiring more mg/eqv of narcotic in both PACU (5.7 vs. 3.4, p=.001), and SDSU (4.4 vs. 1.3, p=.000). GA patients received significantly more antiemetic doses intraoperatively (0.58 vs. 0.04, p<.001), but not in recovery (.08 vs. 04, p=.18) nor in SDSU (.12 vs. 09, p=.54). There were no significant differences in the mean episodes of PONV between the groups in recovery (.07 vs. 04, p=.17), or SDSU (.11 vs. .08, p=.47). There were no anesthesia-related adverse events or readmissions for either group.

Conclusions: PNB patients had less pain and received less analgesia without any increase in PONV, perioperative time, or anesthesia-related complications. PNB administered by CRNAs in a Military Same-Day Surgery Unit resulted in positive patient outcomes.

Source of Funding: Uniformed Services University of the Health Sciences.

A8

The effectiveness of the SurgiVet Enviro-Pure canister when used with the Universal Portable Anesthesia Complete (UPAC) drawover anesthesia system

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Introduction: Military anesthesia providers often deliver anesthesia care in underdeveloped countries with limited resources or in confined spaces with limited access to the outside environment, which is necessary for the proper scavenging of waste anesthetic gases. The Surgivet Pure-Guard is a scavenging system consisting of the Enviro-Pure charcoal canister and base alarm system currently utilized in veterinary anesthesia practice. The objective of this study was to determine the effectiveness of the Surgivet Pure-Guard system at removing waste anesthetic gases

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when utilizing the Universal Portable Anesthesia Complete drawover anesthesia delivery system.

Methods: The Medical Education Technologies Incorporated Human Patient Simulator reproduced human physiological tidal volumes and respiratory rates based on average soldier's weights. Anesthetic gas was measured via a respiratory gas monitor immediately after the Surgivet Pure-Guard scavenging system. The volume percent concentrations of isoflurane were the independent variables and time to exhaustion of the Enviro-Pure scavenger was the dependent variable. Four data collection trials were completed with high (10 L/min) and low (5 L/min) minute ventilations and high (2.3 volume %) and low (1.2 volume %) concentrations of isoflurane.

Results: High minute ventilation and high volume percent concentration led to the earliest canister base alarm (92 minutes) and low minute ventilation and low volume percent extended time to scavenger base exhaustion by more than 500% (507 minutes).

Conclusion: Our results suggest that manipulation of minute ventilation has a greater impact on time to exhaustion of the scavenger than altering the volume percent isoflurane concentration delivered.

A9

Investigation of the anxiolytic effects of luteolin, a lemon balm extract, in the male Sprague-Dawley rat

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Introduction: Surgical anticipation can activate the stress response and may result in poor wound healing. Whereas, decreased surgical anxiety may increase satisfaction and produce shortened recovery times. The administration of anxiolytic drugs preoperatively blunts the stress response. Lemon balm has been used as an herbal remedy for many medical conditions, including anxiety. Luteolin is a major component of the essential oil lemon balm. The purpose of our study was to investigate the anxiolytic effects of luteolin, a lemon balm extract and its potential interaction with the $GABA_A$ receptor in Sprague-Dawley rats.

Methods: Fifty-five rats were divided into 5 equal groups: control, luteolin, midazolam (positive control), flumazenil + luteolin, and midazolam + luteolin. Each rat was placed in an elevated plus-maze (EPM) for evaluation of behavioral responses. Motor response was measured by number of observed movements.

Results: Data analysis of the ratio of the open arm time versus total time spent in the EPM revealed no statistically significant difference between groups. Analysis showed a statistically significant decrease in movement of rats in both the midazolam and midazolam + luteolin groups compared to the control group. The midazolam + luteolin group met significance in both short-duration crossings (p=.011) and total movement (p=.000). The midazolam group demonstrated a significant decrement in total movement (p=.037.)

Conclusions: Our study investigated the anxiolytic effects of luteolin and its possible modulation of the $GABA_A$ receptor in the rodent model. Our data suggests that luteolin does not produce anxiolysis by modulation of the $GABA_A$ receptor; however, luteolin may modulate motor movements and locomotion. Future investigations might explore the motor effects of luteolin using other balance and locomotion instruments such as the rotorod. Additionally, studies are recommended to determine the molecular mechanism of luteolin and its potential interaction with various receptors in the nervous system.

Source of Funding: AANA Foundation grant.

A10

The neuroprotective effects of propofol following hydrogen peroxide treatment are not due to a decrease in apoptosis but rather a decrease in necrosis

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Introduction: Propofol (2,6-diisopropylphenol) is a short-acting sedative-hypnotic that is used for the induction and maintenance of anesthesia. Propofol has been shown to possess neuroprotective benefits, but the mechanism is not yet completely understood. The mechanism of action could be attributed to apoptosis and/or necrosis. Developing a better understanding of the mechanism that provides neuroprotection would be clinically applicable when administering anesthesia to patients who have experienced a stroke or neurological damage.

Method: Studies were performed using cultured PC12 cells. The cells were cultured in RPMI-1640 media containing 10% horse serum, 5% fetal bovine serum, at 37 degrees C, 95% air, 5% CO2 and 80% humidity. Cell injury was induced by hydrogen peroxide (H_2O_2) at a dose of 300 uM. Apoptosis was subsequently determined by measuring caspase 3/7 activity in PC12

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cells in response to H_2O_2 administration. In addition, time–dependent effects of H_2O_2 on caspase 3/7 activity were quantitated at 4, 24, and 72 hours. The PC12 cells were then treated with an induction relevant dose of propofol, then subjected to injury by means of hydrogen peroxide. The dose-dependent effects of propofol on H_2O_2 induced caspase 3/7 activity was then determined. The data were analyzed using ANOVA as well as Tukey's multiple comparison analysis. $P<0.05$ was not statistically significant.

Results: Treatment of PC12 cells with a clinically relevant dose of propofol (300 uM) did not alter H_2O_2 induced caspase activity (CA). Prior to propofol administration (control) CA was 0.061 ± 0.001, 0.060 ± 0.001, and 0.060 ± 0.002 at 4, 24, and 72 hours respectively. After administration of propofol, CA was 0.069 ± 0.001, 0.080 ± 0.002, and 0.084 ± 0.003 for same time periods.

Conclusions: Propofol did not affect CA in response to cell injury. Therefore, propofol's neuroprotective properties are not mediated through preventing apoptosis.

A11

Efficacy of human patient simulator in skills validation for practicing nurse anesthetists

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Introduction: Anesthesia-related catastrophic events are rare in the operating room. The purpose of this study was to evaluate the efficacy of using the high fidelity patient simulator for skills validation in practicing Certified Registered Nurse Anesthetists (CRNA) and included a convenience sample of volunteer CRNAs on staff at William Beaumont Hospital (WBH).

Methods: CRNAs received one of two rare scenarios: malignant hyperthermia (MH) or anaphylactic shock. Malignant hyperthermia and anaphylaxis were replicated using high fidelity, full-body mannequins. Each CRNA also completed an anonymous survey regarding their work history and personal perceptions regarding simulation use for skills validation.

Results: Survey results indicated most CRNAs agreed there is a need for skills, would participate in skills, and found the simulator to be a valuable tool. One hundred percent of CRNAs diagnosed MH correctly, while only 23% diagnosed anaphylaxis. The results of this study showed an inconsistency in the treatment and interventions in both scenarios and indicate a possible need for skills validation for practicing CRNAs.

Conclusion: Although current practitioners are not mandated to participate in competency evaluations, this study proposes a potential need for such evaluations. In addition, the survey emphasized a high degree of acceptance of skills validation using the simulator.

A12

Fentanyl iontophoretic transdermal system versus morphine intravenous patient-controlled analgesia in elderly obese and elderly non-obese postoperative populations: Patients' assessment of mobility

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Introduction: Intravenous (IV) patient-controlled analgesia (PCA) is effectively used to manage postoperative pain following major surgery; however, IV PCA may limit postoperative mobility, since patients are tethered by IV lines and a dosing button connected to a PCA pump. Due to co-morbidities and/or excess body weight, postoperative mobility may be particularly difficult for elderly obese patients compared with elderly non-obese patients. The fentanyl HCl iontophoretic transdermal system (ITS) is a compact, preprogrammed, patient-controlled analgesic modality approved for pain management in hospitalized adults following surgery. This analysis evaluated postoperative mobility with fentanyl ITS versus morphine IV PCA for elderly obese and elderly non-obese subjects using a validated Patient Ease-of-Care (EOC) questionnaire.

Methods: Two studies evaluated safety and efficacy of fentanyl ITS and morphine IV PCA for pain management for adults (≥ 18 years) following hip replacement or abdominal/pelvic surgery. The Patient EOC questionnaire completed during those studies included a subscale that assessed patient mobility; responses from elderly (>65 years) obese (body mass index [BMI] ≥ 30 kg/m^2) and elderly non-obese (BMI <30 kg/m^2) subjects were examined.

Results: Both modalities provided postoperative pain control that was comparable in terms of safety and efficacy. A significantly higher percentage of elderly obese subjects (n=130) who received fentanyl ITS were considered responders (ie, reported 1 of the 3 most positive responses [6-point Likert scale]) for mobility-related items compared with those who received morphine IV PCA (98.6% vs 69.5%, respec-

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tively; $P<0.001$). Elderly non-obese subjects (n=293) reported similar results (fentanyl ITS, 97.9%; morphine IV PCA, 72.2%; $P<0.001$).

Conclusions: Findings suggest that, from the patient's perspective, compared to morphine IV PCA, fentanyl ITS offers better postoperative mobility for elderly obese and elderly non-obese patients. The self-contained, compact design of fentanyl ITS may account for improved ease of postoperative mobility for these patients compared with those who received morphine IV PCA.

Source of Funding: Supported by Ortho-McNeil Janssen Scientific Affairs, LLC, Raritan, New Jersey.

A13

An effective approach to high-fidelity simulation in anesthesia: Integrating curricula

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Introduction: The landscape of healthcare education is changing. To meet this challenge, Baylor College of Medicine School of Allied Health Sciences Graduate Program in Nurse Anesthesia began using high-fidelity simulation as part of its curriculum in 1999. This course evolved from simple student practice into a structured learning model, integrating classroom lecture material into clinical scenarios while also teaching behaviors related to crisis resource management. The overall course objective is to formatively enhance student knowledge, performance, confidence, and critical thinking through standardized simulated scenarios that are integrated with concurrent didactic course work.

Methods: The human anesthesia simulation course consists of five (4-hour) small-group simulator sessions. Standardized clinical scenarios are conducted using demonstrative, interactive, and observational instruction, along with crisis resource management techniques to assess both student performance and integration of knowledge from concurrent didactic courses. Each session builds on previous sessions. Technical aspects of anesthesia equipment and basic principles and pharmacology of anesthesia are integrated into each session based on current classroom topics. Critical or rare high-risk events, such as anaphylaxis and malignant hyperthermia, are also simulated shortly after these topics are presented didactically. A nine-item course evaluation consisting of a 5-point Likert rating scale (1-strongly disagree, 2-disagree, 3-undecided, 4-agree, 5-strongly agree) and open comment areas were completed anonymously by the students at the conclusion of the simulator course over a 5-year period.

Results: Course evaluations over the past five years reveal the students' overwhelming enthusiasm regarding accomplishment of course objectives with exceptionally high ratings (M = 4.43). Students (N = 84) believe learning in a simulated environment possesses usefulness and efficacy in teaching difficult and complex behaviors and techniques (M = 4.89). Other areas evaluated include effective debriefing small group sessions (M = 4.66) and timely integration of didactic work (M = 4.71). It remains difficult to draw conclusions regarding how performance in the simulator setting will predict performance in the clinical arena, but student feedback indicates they perceive an improvement in their performance and transition in to the clinical milieu.

Conclusion: Advantages of high-fidelity simulation in nurse anesthesia curriculum are clear. Valid and reliable instruments to measure these outcomes do not yet exist. This will be the focus of subsequent courses.

A14

Is granisetron 0.1 mg IV effective in preventing PONV and pruritis in groups of cesarean section patients receiving spinal anesthesia and intrathecal opioids?

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Introduction: The intermediate acting 5-HT_3 antagonist ondansetron is often given prophylactically to prevent postoperative nausea and vomiting (PONV) and opioid induced pruritis. The longer acting 5-HT_3 antagonist granisetron has been shown effective in preventing PONV in hysterectomy patients when a dose of 0.1 mg is given; however, no data regarding the efficacy of this dose in preventing PONV and pruritis in groups of cesarean section patients given intrathecal opioids is available. The purpose of this study was to determine if low dose granisetron was effective in preventing PONV and pruritis in subjects receiving spinal anesthetics that included intrathecal narcotics.

Methods: A total of 70 subjects scheduled for elective cesarean section under spinal anesthesia with intrathecal opioids were enrolled in this double blind,

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placebo controlled study. Following cord clamp, subjects received either 0.1 mg of granisetron or placebo intravenously. Demographic data, incidence, severity and treatment for PONV and pruritis for 24 postoperatively, and satisfaction scores were some of the variables analyzed.

Results: Sixty-seven subjects were used for the final analysis. No significant differences in demographics, incidence of PONV and pruritis in the post-anesthesia care unit or satisfaction scores was noted between groups. Significant differences in PONV and pruritis treatment regimens and severity of pruritis were noted between the groups following discharge to the inpatient ward.

Conclusion: Based on the findings of this study we can recommend 0.1 mg granisetron IV to decrease the severity of PONV and to decrease both the severity and treatment requirements for pruritis in groups of cesarean section patients given spinal anesthesia with intrathecal opioids.

Source of Funding: Navy Medical Center Portsmouth, Portsmouth, Virginia

A15

Risk factors for laryngospasm in children during general anesthesia

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Introduction: Adverse anesthetic events are of concern to the anesthesia provider in the pediatric population. This retrospective cohort study analyzed the association between pediatric patients (children < 18 years of age) with perioperative laryngospasm and procedure-related risk factors during general anesthesia.

Methods: Pediatric patients who developed laryngospasm at Mayo Clinic Rochester, over a 10-year period, were studied. A total of 341 patients were identified as having laryngospasm; of those, 147 were between 0 and 18 years of age. Demographic information, type of surgery and anesthesia, history of pre-existing comorbidities, concomitant medication, airway type, premedication, induction/maintenance medications, time of laryngospasm, oxyhemoglobin saturations, treatment and outcomes of laryngospasm were collected and analyzed. Two controls were identified for each index case. The cases were matched with regard to type of: (1) anesthesia, (2) surgery (ICD 9 code), (3) diagnostic vs. therapeutic procedures, (4) age (± 3 months), and (5) year of surgery (± 1 year). The outcome variables were associated comorbidities, type of airway device, induction and maintenance anesthetic, use of muscle relaxant, and outcomes. Providers' clinical experience was examined to determine if outcomes differed based on provider (pediatric anesthesiologist vs. non-pediatric anesthesiologist subgroups).

Results: Descriptive analysis of data was used to identify an increased risk of laryngospasm for the younger patient and those undergoing ENT procedures. Of all identified laryngospasms, 43.1% occurred in children between 0-18 years. Within that group, 44.2% occurred in patients < 2 years of age. Of all pediatric laryngospasms, 44.2% occurred in patients undergoing ENT procedures. Fewer laryngospasm (47.8%) occurred under the supervision of a pediatric anesthesiologist, than under the supervision of non-pediatric anesthesiologists (52.2%).

Conclusion: This study indicates that there is an increased incidence of perioperative laryngospasm in the younger pediatric population, with special emphasis on the risk of laryngospasm for the pediatric patient undergoing ENT procedures.

Source of Funding: Financial support was received from Mayo School of Health Sciences Master of Nurse Anesthesia Program and the Department of Anesthesiology, Mayo Clinic Rochester.

A16

Evaluation of a novel biological marker of oxygen induced lung injury

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Introduction: Oxygen has been described as a necessary but potentially dangerous substance. Medicinal use of 100% oxygen at ambient pressure has long been associated with cough, shortness of breath, decrease in vital capacity, and alveolar-capillary injury. Exposure of healthy individuals to normobaric hyperoxia can result in toxicity. The formation of a group of oxygen-based free radical generated compounds known as isofurans has been found to be extraordinarily sensitive to increasing inspired oxygen concentration. Measurement of these compounds in an animal model suggests that oxygen-based free radical generated lung injury is a very early event that can occur within the time frame patients undergoing anesthesia are exposed to elevated oxygen tensions. In order to more safely exploit the useful properties of oxygen, a better understanding of its toxic effects must be achieved. This study was designed to examine the value of a

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novel biologic marker of inspired oxygen-induced oxidative stress. Availability of such a marker would promote better definition of safe oxygen exposure limits, provide a basis on which to predict the potential health risk associated with oxygen breathing, and suggest mechanisms to prevent potential toxicity.

Methods: Twenty-five volunteers occupationally exposed to 100% oxygen and 25 age, gender and smoking history matched non-oxygen exposed controls were enrolled in the study. Exhaled breath condensate (EBC) was collected before (baseline), immediately after, and at 24 hours post-exposure and analyzed for isofuran levels.

Results: The oxygen exposed group had a significantly higher level of isofurans at baseline compared to the control group. The oxygen exposed group demonstrated a significant within group increase in isofuran levels immediately after and 24 hours post-exposure.

Conclusion: The data suggest that isofuran levels measured in EBC may be a specific indicator of the degree of oxidative stress imposed by inspiring a high concentration of oxygen at ambient pressure.

Source of Funding: Office of Naval Research.

A17

Does human simulation improve student registered nurse anesthetist performance?

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Introduction: Human simulators have been developed to bridge classroom and clinical experiences and can provide learning in an environment with immediate feedback and repetition without patient consequences. Research in multiple disciplines of medicine has observed that experience on human simulators builds technical competence, confidence, and leadership that enhance the transition into clinical practice.

Methods: This study, undertaken in January 2007, was a prospective pre-experimental two group pretest-posttest design approved by the University of Southern California Investigational Review Board. Participants from the first year student body were consented and randomly assigned to either a pretest and posttest group or a posttest only group. Participants were then assigned to groups (2 or 3 students per group) for the simulation exercise. The human simulation training was preformed with a Medical Education Technologies, Incorporated Human simulator at the Keck School of Medicine simulation lab. Simulations were introductory level for the beginning practitioners and involved techniques of induction, airway management, and patient monitoring. Participants were presented with the same scenarios for each simulation. A seven item attitudinal Likert rating scale was administered at the termination of simulation to rate each student's simulation experience.

Results: Evaluation revealed small differences between results from the pre and posttests groups and were shown to be not statistically significant using a t-test for two non-independent sample means. These results may be explained by a combination of factors including but not limited to testing instrument inadequacies and well prepared participants. Each participant completed an evaluation tool on their simulation experiences. Results of this showed 81.25% of the group indicating the simulation experience was helpful in developing introductory clinical skills and found simulation applicable to the clinical setting.

Conclusions: This study did suggest that a simulation exercise is perceived as being important and improved satisfaction in the development of introductory anesthesia skills in 81.25% of the nurse anesthesia first year students. This study failed to support previous study findings of improved psychomotor skill sets and clinical decision making due to simulation.

A18

Hyperglycemia in the surgical trauma patient

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Introduction: While there have been many reports in the surgical literature regarding the negative effects of perioperative hyperglycemia on outcome, the impact of elevated perioperative serum glucose levels in trauma patients has not been studied. Hyperglycemia has consistently been shown to be associated with poor outcomes including increased morbidity and mortality in the cardiac and neurological injury patients. The primary aim of this study was to determine if there was an increased risk of adverse outcomes in surgical trauma patients who had elevated blood glucose levels perioperatively.

Methods: This IRB approved study included 600 patient charts who were admitted through the emergency room (ER), went directly to surgery, and were subsequently admitted into the surgical intensive care

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unit (ICU) or intermediate care area (ICA). If the patient returned to surgery after the original surgical event, blood glucose data was no longer collected. Patients who were pregnant, less than 18 years old, and who had an injury severity score greater than 48 were excluded from the study. Hyperglycemia was defined as a blood glucose level of greater than 150 mg/dL. Factors such as myocardial infarction, infections, stroke, coma, renal failure/impairment, length of ventilation, delirium, and death were measured in relationship to blood glucose levels.

Results: A statistically significant association was found between myocardial infarction, infections, length of ventilation, delirium, and death with any episode of hyperglycemia.

Conclusion: Patients who are exposed to trauma are at an increased risk of having acute hyperglycemic episodes as a result of the normal stress response on the body. The results of this study show that blood glucose values below 150 mg/dL are associated with fewer poor outcomes.

Source of Funding: Department of Anesthesiology Discretionary Research Fund, Mayo School of Health Sciences Master of Nurse Anesthesia Program.

A19

Investigation of modulation of the alpha 2 receptor by the corydalis extract tetrahydropalmatine (THP) in male Sprague-Dawley rats

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Introduction: The increased use of nutraceuticals over the last 20 years makes it essential to know the effects that these may have in conjunction with anesthetics. Studies suggest that tetrahydropalmatine (THP), an extract of the herb corydalis, has analgesic properties; however, the mechanism of action has not been clearly elucidated. Our study proposed that THP modulates alpha 2 receptors and that it may have additive or synergistic effects with dexmedetomidine.

Methods: Fifty-five male Sprague-Dawley rats were divided into five groups: (1), the negative control, administered vehicle; (2) the positive control, administered dexmedetomidine and vehicle; (3), the experimental group, administered THP and vehicle; (4) rats administered THP and the alpha 2 antagonist, yohimbine to examine modulation of the alpha 2 site; and (5) rats administered THP and dexmedetomidine to investigate interactions between the two compounds. All rats received 2 intraperitoneal injections in equivalent volumes. A baseline measurement of hot plate latency, defined as time from placement on the plate to hind paw lick, was recorded, followed by the injection of the appropriate compound(s). Testing occurred at 5, 10, 30 and 60 minutes after injections.

Results: Repeated measures ANOVA suggested a significant difference among groups ($F = 8.09$; $p = 0.00$). Post Hoc Bonferoni suggested that THP significantly prolonged reaction time on the hot plate compared to vehicle ($p = .037$). Rats injected with THP and yohimbine did not have significantly shorter latency times compared to those injected with THP alone ($p = 1.0$) suggesting that THP does not modulate alpha 2 receptors. Finally, rats injected with THP and dexmedetomidine did not demonstrate a significantly increased latency time compared to THP alone, suggesting no additive effect of THP.

Conclusion: Our findings are congruent with other studies suggesting antinociceptive properties of THP, however our findings suggest that THP does not modulate alpha 2 receptors.

Source of Funding: 59th Medical Wing Clinical Research Squadron, Lackland Air Force Base, Texas.

A20

An observational study of correlates of myalgia in electroconvulsive therapy

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Introduction: Electroconvulsive therapy (ECT) is a commonly administered treatment for major depressive disorder. Treatments may be administered thrice weekly for 2-3 weeks. Treatment consists of a general anesthetic with neuromuscular blockade using succinylcholine, followed by the application of an electrical current to induce a generalized seizure. Following a treatment, it has been observed that many patients complain of moderate to severe myalgia, the mechanism of which is yet unknown. It is possible that myalgia results from the motor seizure, or from succinylcholine fasciculation. Another possibility is that myalgia results from a biochemical effect of succinylcholine, but separate from fasciculations. To date, no studies have compared the correlations between succinylcholine doses, fasciculation, motor seizure, and myalgia. The results of this study may help anesthesia providers give optimal succinylcholine dosing during ECT treatment.

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Methods: This study was a prospective, observational study consisting of thirty-six ECT patients. It included observation of the initial ECT treatment through the sixth treatment per patient. Motor seizure length and electroencephalographic seizure length was recorded. The degree of muscle convulsive movement and succinylcholine fasciculation was recorded using a scale developed for this study. Patients were surveyed to rate the degree of myalgia twenty-four hours post-treatment. The patient and all outcome assessors were masked to the succinylcholine dose until all observations have been made.

Results: The dose of succinylcholine shows a statistically significant correlation (P = 0.01) of the degree of myalgia following ECT therapy. This correlation was found to be significant only for the overall dose rather than the mg/kg dosing.

Conclusion: Higher doses of succinylcholine cause an increase in severity of myalgia symptoms. The failure of the mg/kg dosage of succinylcholine to present the same correlation of myalgia symptoms was an unexpected finding. Further study may be needed to identify possible underlying mechanisms for this finding.

Source of Funding: Department of Anesthesiology Discretionary Research Fund, Mayo
School of Health Sciences Master of Nurse Anesthesia Program

A21

Participation in a required bench research component in nurse anesthetist education: A student perspective

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Introduction: The Council on Accreditation of Nurse Anesthesia Educational Programs requires 30 hours of research in its basic curriculum. Most Nurse Anesthesia programs (NAP), ours included, offer formal courses in research, statistics, and primary literature review to fulfill this requirement. As NAP students, we participated in the first program to utilize formal bench biomedical research as a required component. The purpose of the present post-hoc review is to assess the merit of this initial experience as it relates to the practice of Nurse Anesthesia. Survey questionnaires distributed among all student participants were used to generate this data.

Methods: The program utilized overlapping four-week rotational periods during which our eight NAP students worked in a biomedical research laboratory. We examined edema formation and endothelial dysfunction in isolated rat lungs exposed to hypothermia (12°C, 4-6 hours) and rewarming (30 minutes). Lungs were ventilated, flushed, and perfused in situ to avoid warm ischemia, then isolated and suspended in a temperature-controlled bath. Edema was gauged via gain or loss of recirculating perfusate. Ventilation was maintained using low (3 cm H_2O, n = 3 lungs) or high (9 cm, n = 3 lungs) levels of positive end-expiratory pressure, and flow was reduced by 50% during hypothermia. Following 30 minutes of rewarming, pulmonary arteries were dissected out and hung in a standard myograph. Endothelial function was assessed by acetylcholine relaxation of a norepinephrine contraction.

Results: Results of this study were analyzed and submitted in abstract form to a national biomedical research meeting. During our tenure in the lab we developed skills in rodent surgery, experimentation, and data analysis, which reinforced our didactic study of research principles and literature review. In addition, we developed critical thinking skills through ongoing literature findings and bench discoveries that were discussed during weekly clinical presentations and analysis. Additional benefits we derived ranged from an improved appreciation for clinical pressures of colleagues in surgery and the complexity of scientific inquiry and technique synthesis. Difficulties we encountered included rapid training to perform complicated surgery and passing on protocols and techniques without a detailed understanding.

Conclusion: Having completed this initial program year, recommendations for improvement included the addition of one full-time technician trained to perform the more technically demanding aspects of surgery.

Source of Funding: This work was supported, in part, by a grant from the MedCen Foundation of the Medical Center of Central Georgia.

A22

Epidural placement: Standardization program

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Introduction: Magee-Womens Hospital is a tertiary care women's hospital with over 9,000 deliveries per year and an epidural placement rate of more than 90%. As part of an academic institution of the Univer-

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sity of Pittsburgh Medical Center (UPMC), both student Nurse Anesthetists and Anesthesia Residents are taught epidural placement. The incidence of post dural puncture headache (PDPH) following accidental dural puncture at Magee-Womens Hospital has increased from 0.5% to 1.5% within the past year. Dural puncture carries considerable morbidity. If left untreated, PDPH can result in serious complications such as subdural hematoma and seizure, which could be fatal. In an effort to decrease inadvertent dural puncture rate, we have developed the Epidural Placement Standardization Program.

Methods: The Epidural Placement Standardization Program consists of videos and sound narration on the proper epidural technique that will be used by the anesthesia staff for trainee instruction at Magee-Womens Hospital. The structured videos consist of four parts; part 1 – epidural insertion, part 2 – proper patient positioning for epidural placement, part 3 – the epidural kit and proper set-up, and part 4 – epidural pump programming. These videos will be used as an integrated Internet-based training education program.

Results: Prevention of unintentional dural puncture through standardized anesthetic approach modification, demonstration of safe use of epidural equipment, and epidural pump programming will help decrease patient morbidity and mortality. These videos will be incorporated as part of the training curriculum at Magee-Womens Hospital. The incident rate of dural puncture will be prospectively collected over the post implementation period with change in dural puncture rate compared for the pre and post implementation periods.

Conclusions: Given the high rate of dural puncture these educational videos will provide quality improvement and decrease the incidence of PDPH, which is a major patient dissatisfier.

Source of Funding: This project was obtained through UPMC Department of Anesthesia.

A23

Inhibition of hypoxic vasoconstriction by IP_3 receptor antagonists in sea lamprey dorsal aortas and isolated smooth muscle cells

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Introduction: Hypoxia produces a profound vasoconstriction (HV) in post-gill arteries of jawless fishes. In the dorsal aorta (LDA) of sea lamprey (*Petromyzon marinus*) intracellular calcium (Ca^{2+}_i) is used almost exclusively for HV.

Methods: In the first part of this study we showed that inositol 1,4,5-trisphosphate (IP_3) receptors were utilized during HV in isolated LDA, and these results were presented at a national meeting. For these studies LDA were excised and sectioned into vascular rings and hung on stainless wires, which were attached below to hooks suspended in smooth muscle chambers, and above to Grass FTO3 force transducers. Signals processed through physiological amplifiers were then converted to mg of tension and archived to a proprietary software program on a personal computer. Baseline tension was established and each vessel contracted with 80 mM potassium to assess viability before experimentation. The IP3 receptor blocker 2-aminoethoxydiphenyl borate (2-APB) was used to block Ca^{2+} release from the sarcoendoplasmic reticulum and entry through store-operated Ca^{2+} channels.

Results: HV was dose-dependently inhibited in the presence of 2-APB, and it was reduced to 53.6 ± 12.3% (n = 6) of a control HV in the presence of 10^{-4} M 2-APB. However, HV was 121.3 ± 61.3% (n = 4) of control in the presence of norepinephrine (NE, 10^{-5}M) added to 2-APB treated vessels. These results indicated that IP3 receptors are involved in HV signaling in LDA. In the second part of the present study we confirmed that these results reflected a mechanism that was intrinsic to the vascular smooth muscle cells (VSMCs). VSMCs were isolated from LDA using a two-part enzyme digestion and calcium flux was examined using the fluorescent indicator dye Fluo-3 AM.

Conclusion: In these preliminary studies, calcium levels increased during hypoxia, and this response was completely eliminated in the presence of 2-APB, whereas the calcium increase due to exposure to 80 mM potassium was maintained.

Source of Funding: Supported by a MedCen Foundation grant.

A24

Association between opioid μ receptor genotypes and postoperative pain responses in orthopedic trauma patients: A pilot study

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Introduction: Anesthesia providers caring for patients undergoing surgical procedures recognize the inconsistency in response to opioids. Two clinically relevant polymorphisms influence the binding of opioid μ receptors, A118G and C17T. The purpose of this study was to explore the relationship of opioid μ receptor genotypes with postoperative pain responses and the amount of opioid administered in orthopedic trauma patients.
Methods: Forty seven subjects with isolated orthopedic injuries were recruited for this exploratory descriptive study. Patients aged 18 to 70 years received general anesthesia (n=33) or general anesthesia and a regional block (n=13). Saliva samples were collected for DNA extraction. Two variants within the opioid μ receptor, A118G (rs1799971) and C17T (rs1799972), were genotyped. Pain scores, heart rate, respiratory rate, blood pressure, and amount of opioid administered during the perioperative period were collected. Opioids were converted to morphine equivalents. The anesthesia plan (general vs. general and regional) was a covariate for comparison testing.
Results: Of the 47 subjects evaluated for the A118G genotype, 33 were AA (wild type, normal), 13 were AG and 1 was GG. For the C17T genotype 43 were CC (wild type, normal) and 4 were CT. There was a significant difference ($p<0.05$) by the A118G genotype in the amount of opioid received by subjects in the PACU. Average opioid administered was 0.097 mg morphine/kg (SD = 0.098) in subjects without the A118G polymorphism and 0.172 mg morphine/kg (SD = 0.130) in subjects with the A118G polymorphism (AG or GG). Although there was a trend toward a difference in initial heart rate in the PACU, the difference was not significantly different ($p=0.14$); 86.3 beats/minute (SD = 23.9) without the A118G polymorphism and 100.4 beats/minute (SD=21.9) in the A118G polymorphism group.
Conclusion: Identification of these polymorphisms prior to surgical intervention may help in determining safer, more effective opioid requirements for patients.
Source of Funding: This study was funded by a grant from the AANA Foundation.

A25

Efficacy of prophylactic administration of intramuscular promethazine in a parturient population scheduled for cesarean section with intrathecal analgesia

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Introduction: The purpose of this investigation was to determine if the prophylactic administration of 25 mg of intramuscular (IM) promethazine would decrease the incidence of postoperative nausea and pruritis in groups of patients receiving intrathecal morphine and spinal analgesia for a cesarean delivery, as compared to a similar group given a placebo.
Methods: In a double-blind, experimental study, 59 subjects were divided into two groups: (1) the experimental group receiving 25 mg of intramuscular promethazine, and (2) the control group receiving a placebo (normal saline). A subarachnoid block consisting of 0.75% bupivacaine, 20 mcg fentanyl, and 200 mcg preservative-free morphine was placed using sterile technique. After obtaining a T10 block level, the study medication was injected intramuscularly (thigh). The subjects were then followed over the next 24-hour period, and data regarding the incidence and severity of postoperative nausea and pruritis was collected.
Results: Subjects in the promethazine group reported significantly lower pruritus scores on admission to PACU (1.68 vs 3.43) ($p=0.015$) and required less treatment for pruritus (35% vs 43%). While on the inpatient wards, subjects in the promethazine group reported lower mean nausea scores upon admission (0.03 vs 1.04) ($p=0.045$). Additionally, this cohort reported lower mean pruritus scores (2.74 vs 3.18, $p=0.62$) and demonstrated a greater incidence of diphenhydramine and nalbuphine use (53% greater and 64% greater respectively). The control group also had a 7- and 3-fold increase in the use of IV promethazine and metoclopramide respectively for control of nausea. The promethazine group had higher pruritus and nausea control satisfaction scores (5 point Likert scale) as compared to placebo with scores of 3.74 and 2.74 ($p=0.003$) and 4.61 and 3.93 ($p=0.017$), respectively. No side effects were reported in the promethazine group.
Conclusion: These findings demonstrate that the prophylactic administration of IM promethazine following spinal anesthesia placement is a viable and cost-effective option to decrease the incidence of intrathecal opioid pruritus, PONV, and increase anesthesia satisfaction scores in groups of cesarean section patients receiving spinal anesthesia with intrathecal opioids.
Source of Funding: Naval Medical Center, Portsmouth.

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A26

Postoperative pain management with fentanyl iontophoretic transdermal system (ITS) versus morphine intravenous patient-controlled analgesia: Findings from a validated nurse ease-of-care questionnaire

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Introduction: Intravenous patient-controlled analgesia (IV PCA) requires significant nursing time for setup, programming, and monitoring. The fentanyl HCl iontophoretic transdermal system (ITS) is a needle-free, preprogrammed, compact, patient-controlled postoperative pain management modality that addresses many of the limitations of IV PCA. The objective of this analysis was to compare the ease of use of fentanyl ITS and morphine IV PCA using a validated Nurse Ease-of-Care (EOC) questionnaire during 2 phase IIIb trials.

Methods: Two active-comparator, randomized, multicenter trials compared the safety and efficacy of fentanyl ITS and morphine IV PCA for providing postoperative pain relief in hospitalized adult patients. During the trials, nurses completed a validated Nurse EOC questionnaire that assessed the ease of use associated with each modality. In this analysis of pooled data from 2 trials, the percentages of responders (nurses who reported 1 of the 3 most positive responses [6-point Likert scale] for all respective items) for overall EOC and its 2 subscales, time-efficiency and convenience, and responders (nurses who reported 1 of the 2 most positive responses [6-point Likert scale] for both satisfaction items) for the satisfaction subscale were compared.

Results: Nurse EOC questionnaires were completed by nurses who treated patients who received fentanyl ITS (n=611) or morphine IV PCA (n=546). Greater proportions of nurses were considered responders for fentanyl ITS compared to morphine IV PCA (overall EOC: 81.1% vs 55.2%; time-efficiency: 82.4% vs 57.7%; convenience: 86.9% vs 63.6%; satisfaction: 66.9% vs 35.3%; P <0.001 for all).

Conclusions: These data suggest that, from the perspective of the nurse, the needle-free, preprogrammed, compact fentanyl ITS is more time-efficient, convenient, and satisfying to use than morphine IV PCA. The fentanyl ITS may be able to alleviate some of the time and convenience constraints associated with IV PCA and help reduce nurse workloads associated with postoperative patient care.

A27

Effects of kava on natural killer cell activity in Sprague-Dawley male rates undergoing abdominal surgery

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Introduction: The first line of defense in cancer treatment is often surgery, but it is also associated with the risk of metastasis. Pain, stress, and anxiety related to surgery can also act synergistically to make the patient vulnerable to metastasis. Natural killer (NK) cell activity helps in the body's defense against cancer metastasis, but it is suppressed during surgery. Strategies, such as blunting stress responses, must be explored to preserve or enhance NK cell activity during surgery. Benzodiazepines have been shown to antagonize suppression of NK cell activity. Working at GABA receptors similar to the benzodiazepines, kava, an herbal remedy, has been used for anxiolysis for centuries. If kava also inhibits surgical suppression of NK cell activity, it may increase host resistance against metastasis and thus promote patient survivability. Therefore the purpose of this study was to investigate the effects of kava on surgical suppression of NK cell activity.

Methods: Thirty-three male Sprague Dawley rats were divided equally as follows: group 1 – surgery and kava, group 2 – surgery and vehicle, group 3 – no surgery and kava. All animals received equivalent volumes of intraperitoneal injection of either (1) kava 125 mg/kg or (2) placebo (vehicle). One day prior to surgery all animals were anesthetized and had blood drawn via cardiac puncture for NK cell assay; this was repeated one day postoperatively. On experiment day, animals underwent either a standard laparotomy under isoflurane anesthesia or isoflurane anesthesia alone.

Results: A series of electrical outages resulted in loss of viability in several specimens during analysis. Thus, findings from data analysis are suspect. Our concerns were confirmed by a well-published immunologist expert in lytic unit calculation.

Conclusion: Remaining cultures provided promising information on NK cell activity and the herbal kava; therefore, this study should be replicated using the same methods and interventions.

Source of Funding: 59th Medical Wing, Wilford Hall Hospital, 59th Research Squadron Lackland Air Force Base, San Antonio, Texas.

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A28

What is the relationship between mentoring and anxiety?

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Introduction: The purpose of this research was to look at nurse anesthesia students' anxiety at the beginning and end of the first semester of nurse anesthesia school after a mentoring intervention of weekly electronic communication.

Methods: A convenience sample of nurse anesthesia students completed the Spielberger State Trait Anxiety Inventory (STAI) at the beginning and end of the first semester of school. A weekly electronic mentoring communication was sent to each participant during the semester. A post data collection survey, which asked questions about the students' perception of the mentoring and the relationship to their anxiety, was tested using paired sample t-tests and Pearson's correlations.

Results: Twenty-nine participants completed the pre test and twenty-eight completed the post test of the STAI. Paired sample t-tests were performed on the pre/post scores. There was a marginally significant decrease between pre mentoring state scores (M=43.38, SD=12.94) and post mentoring state scores (M=40.24, SD=11.71) t_{28}=1.46, p=.078. There was a significant decrease between the perception of anxiety at the beginning of first semester (M=7.65, SD=2.44) and the perception of anxiety at the end of first semester (M=5.93, SD=2.47) t_{28}=2.78, p=.005. The participants rated the question, "Did receiving electronic mailings of encouragement help decrease your anxiety regarding school?" on a Likert rating scale. Seventy-two percent gave a positive response. The Pearson's correlation between the change in perception of anxiety from the beginning to the end of the study, and agreement of the participants that the mentoring was beneficial, was significant, r=.320, p=.045.

Conclusion: The stronger the agreement that electronic mentoring helped decrease anxiety, the larger the perception of decrease in anxiety, from the start to the end of the study. The mentoring assisted in allaying the participants' anxiety. A larger sample size would be beneficial for further research.

A29

Comparison of fascia iliaca compartment block and the 3 in 1 block in the adult knee arthroscopy and meniscal repair

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Introduction: Knee injuries associated with damage to the meniscus is one of the most common debilitating ailments associated with the active adult population. Post-operative pain can impair movement and impede the rehabilitation process. Two peripheral nerve blocks used by anesthesia providers to facilitate postoperative analgesia are both the 3 in 1 block and the fascia iliaca block (FICB). This study is designed to evaluate the differences in the set-up time, spread, and efficacy of these blocks.

Methods: Thirty adult orthopedic patients scheduled for knee arthroscopy with meniscus repair at Naval Medical Center San Diego were included in this randomized prospective clinical investigation. All subjects received a general anesthesia and were randomized to receive the preoperative placement of either a 3 in 1 block or a FICB using a standardized technique and a solution of 40 mL of 0.5% ropivacaine with 1:200,000 epinephrine and 1 mcg/kg of clonidine. Demographic information, time to place block, incidence of side effects, anesthesia, surgical, PACU and SDSU times, severity of pain, postoperative analgesic requirements for 48 hours following surgery and overall analgesic satisfaction were collected. Severity of pain was assessed using a 0-10 Verbal Numeric rating scale and satisfaction was assessed using a 1-5 Likert scale.

Results: A total of 27 subjects are included in analysis (3 in 1 block -12; FICB -15). Three subjects were dropped secondary to change in anesthetic plan following enrollment. At 30 minutes post-placement it was noted that there was a higher incidence of failure in the FICB (40%) as compared to the 3:1 block (0%). (p=.013), with a similar degree of complete motor block between groups (47% ratio 3 in 1 block; 27% ratio in FICB group; p=.411). Time to place block was similar between groups and postoperative data was similar between the groups indicating the FICB achieved analgesia during the operative procedure.

Conclusion: Based on these findings we can recommend either block to facilitate postoperative analgesia, but if the block is to be used for anesthesia we found that the 3 in 1 block was superior to achieve complete analgesia 30 minutes post-placement as compared to the FICB.

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A30

Doctorate in nursing practice in the field of nurse anesthesia: The opinions of Certified Registered Nurse Anesthetists

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Introduction: A proposal has been made for all advanced practice nursing programs (including anesthesia) to require a Doctorate of Nursing Practice (DNP) as the entry level degree by the year 2015. Several programs currently offer DNP degrees and many others are preparing to employ necessary changes. Debate still remains regarding the value of the degree, compensation, and educational curriculum. The purpose of this study was to evaluate the knowledge and opinions of CRNAs regarding the DNP initiative.

Methods: A mailing list of 1,000 randomly selected CRNAs was provided by the American Association of Nurse Anesthetists (AANA). Surveys were sent as a single mailing via USPS. The survey contained 41 statements to help answer the 5 research questions. Likert scale answers were scored using the following scale: strongly agree=1, agree=2, neutral=3, disagree=4, and strongly disagree=5. A mean score greater than 3 indicates disagreement or a decreased impact to the profession for each research question.

Results: There were 383 surveys returned, which helped us answer our 5 research questions. *Research question 1:* The majority of the respondents, 83.6% of the sample, were aware of the initiative regarding a doctorate in nursing practice. However, many were unaware of the closest program to them offering the DNP degree, 69.3%, and the proposed curriculum requirements, 77.8%. *Research question 2:* The results of this survey indicated that CRNAs felt that patient safety will not improve by advancing the educational requirements to a DNP (p=0.000). Over 75% of respondents answered disagree or strongly disagree to 4 of the 8 safety questions asking if a doctoral-prepared CRNA will improve patient safety. With regard to safety, a CRNA responded, "Having been in the field for 30 plus years, I have not seen any improvement in practice related to increased education"; another experienced CRNA stated, "that no additional education will prepare you any better than on the job training." *Research question 3:* The subjects with certificates in anesthesia were more likely to disagree that improvement would occur by obtaining a DNP (mean 3.68) than subjects with master's (mean 3.40). According to survey results, over 96% of respondents felt that their current degree adequately prepared them to contribute to the anesthesia profession. *Research question 4:* When asked if there would be personal benefit from obtaining a DNP degree, respondents were mixed in their views: 39% of respondents disagreed or strongly disagreed and 32% agreed or strongly agreed. Even though 59% of respondents felt their income should increase with an educational advancement, only 19% felt that it would. The majority, 76%, felt their confidence would not improve by obtaining a DNP. Only 18% of subjects indicated they would be interested in pursuing a DNP degree. *Research question 5:* Survey results indicated that only 29% of respondents felt that their leadership skills would improve by obtaining a DNP. The respondents, 70%, did feel that the advanced degree would allow them to become more involved with academia.

Conclusion: The majority of the CRNA population is aware of the DNP initiative, although they are not familiar with its details. Survey subjects indicated that safety and patient outcomes, improvement to the profession, personal benefit, and leadership would not improve by implementing a DNP degree. With this disagreement to the DNP advancement among surveyed CRNAs, a closer investigation should be conducted as to the potential advantages and disadvantages of this education endeavor.

A31

Evaluation of lipid emulsion for resuscitation of bupivacaine-induced cardiac toxicity in awake swine

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Introduction: Rapid intravascular uptake or inadvertent intravascular injection of bupivacaine may produce irreversible cardiac toxicity resulting in death. There is no definitive treatment for bupivacaine-induced cardiac toxicity in humans. The intravenous administration of lipid emulsion has been demonstrated to improve hemodynamics and survival in dogs with bupivacaine-induced cardiac collapse. The current study evaluated the efficacy of adding intravenous lipid emulsion to Advanced Cardiac Life Support (ACLS) interventions for treating bupivacaine-induced cardiac toxicity in awake, unanesthetized swine.

Methods: Arterial, pulmonary, and venous catheters,

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as well as a tracheostomy, were surgically placed in 24 anesthetized and intubated swine. Following a one-hour anesthesia recovery period, bupivacaine, 5 mg/kg, was intravenously administered over 15 seconds to awake animals. Four minutes later, ACLS resuscitation and closed chest compressions were initiated. Animals were randomized but evenly distributed to receive either intravenous saline or 20% lipid emulsion (4 ml/kg bolus over 2 minutes followed by a 0.5 ml/kg/min for 10 minutes). All participants involved in resuscitation and data collection were blind to the group assignment. Resuscitation continued for 20 minutes or until the animal had return of spontaneous circulation (ROSC), which was defined as an unsupported systolic blood pressure of 60 mmHg or greater for 10 minutes. Electrocardiogram, arterial blood pressure, and mixed venous oxygen saturation were continuously measured.

Results: All study animals had visible bupivacaine-induced central nervous system toxicity within 60 seconds of bupivacaine injection and complete cardiovascular collapse by the initiation of the resuscitation. Four animals in the control group had ROSC (n=12) versus six animals in the lipid emulsion experimental group (n=12) (P>0.05). There was no significant difference in the time to ROSC between the groups (P>0.05).

Conclusions: Data analysis suggests that the addition of lipid emulsion to ACLS interventions does not improve the survival from bupivacaine-induced cardiac toxicity in awake, unanesthetized swine.

Source of Funding: TriService Nursing Research Program.

A32

Mechanism of regulation of IL-8 mRNA stability in cystic fibrosis lung epithelial cells

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Introduction: Cystic fibrosis (CF) is characterized by hypersecretion of the cytokine IL-8. The mechanism by which IL-8 gene expression is dysregulated in CF is not known. However, mRNA degradation is recognized as important in controlling the expression of several chemokines. Instability is conferred by adenine and uridine rich sequence elements (AREs) in the 3' –UTR of the mRNA and is regulated via RNA-binding proteins that specifically recognize the ARE motifs. Deadenylation by poly (A)-specific ribonuclease (PARN) appears to be the rate-limiting step. We have hypothesized that modulation of the post-transcriptional stability of the IL-8 mRNA might contribute to hyperproduction of IL-8 protein in the cystic fibrosis patient.

Methods: IL-8 mRNA stability was assessed in CF, IB3-1, lung epithelial cells and in repaired cells, IB3-1/S9, by measuring IL-8 mRNA levels after addition of actinomycin-D. Data were analyzed by analysis of variance (ANOVA), and differences with P<0.05 were taken to be significant. Protein S100 extracts, prepared from both CF and CF-corrected cell lines were analyzed by western blot. The expression level of the various factors known to participate in ARE-mediated mRNA decay including ARE-binding proteins, PARN and exosome were compared.

Results: We found that the rate of decay of IL-8 mRNA in the CF cells is significantly slower (1.5-fold) than in the CFTR-repaired cells. At 4 hours post-treatment with Actinomycin D, the IL-8 mRNA degrades to 45% of the initial level in the CF cells compared to 20% in the CFTR-repaired controls. Additionally, the expression levels of TTP (ARE-binding protein), PARN (deadenylase) and the exosome (3'-5' exonuclease) proteins were significantly reduced in protein S100 extracts prepared from CF cells compared to those from CFTR-repaired control cells.

Conclusions: We conclude that the high levels of IL-8 protein expression in CF lung epithelial cells can be partly due to enhanced stability of the IL-8 mRNA. The mechanism for the enhanced stability may be related to the much lower levels of specific proteins known to be associated with mRNA degradation including TTP, PARN, and exosome. The role of the ARE-binding proteins, PARN and the exosome in promoting increased stabilization of IL-8 mRNA in CF cells may be important in the pathophysiology of this disease.

Source of Funding: NIH (NO1-HV-28287 [HBP] and RO1-DK-53051 [HBP]) and Cystic Fibrosis Foundation [HBP and RB].

A33

Compliance and infection control of the anesthetic gas machine

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Introduction: The anesthesia machine can possibly cause transmission of microbes from one patient to the next, one patient to provider, or from provider to patient. Many studies have looked at many different items in the operating room including laryngoscopy

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handles, suctioning equipment, stethoscopes, and the anesthesia machine. This paper not only discusses past research on this topic but also verbalizes a research project including 24 anesthesia machines being swabbed in 4 different locations.

Methods: An evidenced based model was used to evaluate the machines. Twenty four gas machines were swabbed in four different locations at three different time intervals. The swabs were then analyzed at the twenty-four and forty-eight hour mark. A survey tool was then released to CRNAs to determine knowledge of protocols. The survey tool had four questions on a five-point scale, with 1 - signifying never, 2 - almost never, 3 - neutral, 4 - almost always, and 5 - always.

Results: A total of 220 swabs were collected. Out of the 220 swabs, only 4 had microbial growth. The microbes include staphylococcus and gram negative bacilli. The results were found to not be statistically significant, but growth did include staphylococcus and bacilli, and these microbes can cause serious disease processes. The survey had a total of 20 respondents. The CRNAs on the average rated the survey items between neutral to agree. The following survey questions were used: cleaning the machines on a daily basis (M=4), does the anesthesia technician have the responsibility of cleaning the machines (M=3.6), is there a protocol for cleaning the machines (M=3.6), and finally is there a designated person responsible for cleaning of the machines (M=3.6).

Conclusion: Although the results were not statistically significant, this does not mean the results are not important clinically. The patient who is immunocompromised could have major complications from these pathogens. As for the survey results, one can see the responses were 3.6-4 showing a neutral average response.

A34

The effects of tetrahydropalmatine, a *Corydalis yanhuso* extract, on natural killer cell activity in Sprague-Dawley rats following intra-abdominal surgery

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Introduction: Surgical excision of tumors and the human stress response can lead to the spread of metastatic tumor cells by suppression of natural killer (NK) cell activity. Moreover, the medications used during the perioperative period (e.g., opioids and anesthetic agents) have been shown to also suppress NK cell activity. There are currently no anesthetic regimens that have been shown to completely reverse surgical stress-induced suppression of NK cell activity. This study examined the effect of tetrahydropalmatine (THP), a *Corydalis yanhuso* alkaloid extract, being used by an increasing number of Americans to reduce anxiety and pain on NK cell activity in male Sprague-Dawley rats undergoing intra-abdominal surgery.

Methods: Thirty-nine rats were assigned to one of three groups: (1) surgical rats administered THP, 40 mg/kg; (2) surgical rats administered dimethyl sulfoxide (vehicle); and (3) anesthesia-only rats administered THP. All compounds were administered by intraperitoneal injection and were given in equivalent volumes. All rats were administered anesthesia. Serial blood sampling occurred 24 hours preoperatively and postoperatively at 24 and 72 hours.

Results: Due to multiple power failures at the laboratory, the NK cell assays were compromised; therefore, all results are suspect and cannot be used for any inferences.

Discussion: Previous research findings have demonstrated that THP produces analgesia by antagonizing dopamine (D1) receptors. A considerable line of research suggests that NK cell activity is suppressed by increases of dopamine in the nucleus acumens and prefrontal cortex. If THP is found to suppress dopamine in these brain areas and provide analgesia, it may be an ideal adjunct for patients undergoing surgical resection of solid tumors. One future study may include immunohistochemistry techniques to elucidate the effect of THP in areas of the brain important to preservation of NK cell activity.

Source of Funding: 59th Clinical Research Division, Wilford Hall Medical Center, Lackland Air Force Base, San Antonio, Texas.

A35

Learning and anxiety in the anesthesia simulator laboratory

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Introduction: Current research is lacking on the use of the human patient simulator laboratory with peer-assisted education in anesthesia training. The purpose of our study is to evaluate whether second year student nurse anesthesia instruction versus CRNA professorial instruction in the simulation laboratory decreases anxiety and produces a greater learning environment for first-year student nurse anesthetists.

Method: After IRB approval, verbal consent was obtained from study participants. First-year anesthesia

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students were randomly assigned to one of two groups. Group I students were instructed and evaluated by second-year nurse anesthesia students in the human patient simulator laboratory. Group 2 students were instructed and evaluated by CRNA academicians. After completion of a standardized simulator laboratory experience, a questionnaire was administered specific to levels of anxiety during the learning experience.

Results: The learners who were evaluated and taught by CRNA faculty felt the anxiety-producing events were the fear of missing something, while the peer instruction group was more task-successful concerned. The average anxiety level of those taught by CRNA faculty was 7.3 based on a scale of 0 through 10, with 0 being a lack of anxiety and 10 being the worst anxiety imaginable. The average anxiety level of those taught by the second-year student instructors, or peers, was 2.7. In terms of what would decrease anxiety, the group that was taught by faculty felt having more clinical experience would be beneficial; the group taught by their peers thought being prepared was the solution. All participants in the study felt that positive reinforcement while performing was most beneficial.

Conclusion: The reduction in anxiety may correlate with improved learning of skills when instructed by peers for those in nurse anesthesia training programs. Incorporating students as teachers into the simulator laboratory experience appears to promote less anxiety while increasing learning.

A36

Integration of high-fidelity patient simulation into CRNA curriculum: Student perception

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Introduction: Using simulation-based education and evaluation, student registered nurse anesthetists (SRNAs) have an opportunity to experience realistic scenarios while faculty have an opportunity to teach, challenge, observe, and correct their students' performance in a safe environment.

Methods: After completing their first year of a front loaded nurse anesthesia curriculum, two classes of SRNAs participated in high-fidelity simulator-based exercises (n = 50 over 2 years). Students prepared by creating anesthesia plans for a variety of patient profiles and reviewing pertinent coursework. The first sessions focused on adult anesthesia. Using a METI® Human Patient Simulator, small groups of 3-4 students rotated through an equal number of different patient scenarios. Each scenario had at least one patient complication and/or or equipment complication to manage. Debriefing occurred in the room after each scenario. Three months later, the same groups of students managed pediatric cases. Scenarios included a variety of ages, patient profiles and complications encountered in pediatric patients. Evaluations were completed by students after both exercises.

Results: Ninety-six percent of the students strongly agreed or agreed that the adult simulated experience improved their anesthesia skills. One hundred percent strongly agreed or agreed that the sessions were applicable to their anesthesia practice. Ninety-six percent favored simulated exercises over reading. Ninety-six percent stated they wanted to read more about the situations they encountered during simulation. Limitations of the METI pediatric simulator made it difficult to mask and required use of cuffed ETTs. Although 96% strongly agreed or agreed that the scenarios were applicable to their anesthesia practice, only 69% strongly agreed or agreed that the simulated experience improved their anesthesia skills. Again, a large number favored simulation over reading about these complications (92%) and interest in reading more about the situations was stimulated (81%).

Conclusion: Integrating simulator training in the education of SRNAs benefits their skills, knowledge, and desire for more information.

A37

Does leukoreduction of red blood cells reduce the incidence of multi-organ failure in adult surgical patients receiving massive transfusions

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Introduction: Multiple organ dysfunction syndrome (MODS), also known as multiple organ failure, may be seen after major surgery and has been associated with acute respiratory distress syndrome (ARDS), septic shock, as well as other major complications. MODS has resulted in prolonged hospital stays and is a major cause of death. With increasing healthcare costs, MODS is becoming more and more expensive for hospitals, insurance providers, and patients. Several conflicting studies have looked at the association between the transfusion of non-leukoreduced red

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blood cells (RBCs) and postoperative complications, primarily infection. The objective of this case cohort study was to determine if there was a reduction in MODS in patients receiving leukocyte-reduced RBC transfusions. Mayo Medical Center (MMC) implemented universal leukoreduction of all RBCs in April 2005 at an increased cost of $8.79 per PRBC. In 2005, MMC transfused approximately 44,000 units of leukoreduced RBCs with an increased cost of over $385,000 for the calendar year of 2005.

Methods: A retrospective chart analysis was conducted of surgical patients requiring massive transfusions, defined as greater than or equal to 4 units, in the time period from surgery until 7 days following the surgical procedure, before (N=575) and after (N=575) MMC instituted universal leukoreduction of red blood cells. The primary analysis used the chi-square test to compare patient groups (leukoreduction vs. no leukoreduction) with respect to the development of MODS.

Results: The incidence of MODS was found to be 16% in patients receiving > or = to 4 units of non-leukoreduced RBCs. A significant detection of a 30% reduction of MODS (MODS rate of 11%) in surgical patients receiving > or = 4 units of leukoreduced RBCs was identified.

Conclusion: A substantial and statistically significant decrease in MODS and postoperative infection occurred coincident with implementation of the transfusion of leukoreduced RBCs.

Source of Funding: Financial support was received from Mayo School of Health Sciences and the Department of Anesthesiology, Mayo Clinic.

A38

Depression in postoperative open heart patients

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Introduction: Depression is an illness seen in many postoperative open heart patients. Longitudinal studies of recovery from cardiac surgery show that psychologically distressed patients have significantly higher rates of rehospitalization and recurrent events such as myocardial infarction, cardiac arrest, and resuscitation. Depressive symptoms are greatest at the time of transfer from the intensive care unit to the second to third postoperative day. Up to 77 percent of patients recovering from bypass surgery have greater levels of depression than community norms six weeks after discharge from the hospital.

Methods: This is a descriptive convenience pilot study that collected data at one point in time. The participants, once meeting the present study's criteria for inclusion postoperatively, were asked to complete a Zung Depression Scale. The data was analyzed using a Shapiro-Wilk Test of Normality to compare the prevalence of depressive symptoms at the studied institution to the prevalence of depression nationwide.

Results: Of the 20 individuals who participated in the study, three or 15 percent demonstrated a positive Zung Depression Score indicating depression ($n \geq 50$). Most people with depression score between 50 and 69, with the highest possible score being 80. The mean of scores was 42.1 with the lowest being 23 and the maximum being 68. Tests of normality showed a Shapiro-Wilk Statistic of 0.97 with 20 degrees of freedom and a significance of 0.693 indicating a normality of distribution. The lower bound 95% Confidence Interval was 37.0 and the upper bound 95% confidence interval was 47.1.

Conclusion: This study shows that the prevalence of depression at the studied institution was lower than that of the national average. The patients who did meet the criteria for symptoms of depression were individuals under 58 years of age who had been diagnosed with chronic disease prior to their open heart surgery.

A39

The effect of a single dose of kava and midazolam on emergence time from general anesthesia following an abdominal surgical procedure in the male Sprague-Dawley rat (*Rattus norvegicus*)

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Introduction: Patients undergoing surgery frequently use herbal medications that may contribute to possible side effects and potential drug interactions with standard pharmaceutical therapies used during general anesthesia. Herbals such as kava, purported to have anxiolytic effects, is currently gaining in wide popularity and use. Having the potential to interact with anesthetic regimens resulting in unpredictable results, kava must be investigated for its potential beneficial or detrimental effect.

Methods: Sixty-six male Sprague-Dawley rats were equally divided into 3 treatment groups as follows: (1) vehicle, (2) kava, and (3) kava and midazolam. All rats received the same total volume and number of intraperitoneal injections preoperatively. Abdominal surgery was then performed while the animals were anesthetized with isoflurane anesthesia. Emergence

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was recorded as the time in seconds from the discontinuation of the anesthetic to the time the righting reflex was observed and the rodent was able to take one purposeful step.

Results: ANOVA revealed that there was a significant difference in mean emergence time from anesthesia across the groups. Post hoc testing determined statistical significance as follows: in the kava plus midazolam group (p<.000) when compared to the vehicle, and the kava group (p< .022) when compared to the vehicle group. Mean emergence times were recorded as follows: (1) the vehicle group, 196.6 seconds with a SD of 59.8; (2) the kava group, 398 seconds with a SD of 197.53 seconds; and (3) the kava + midazolam group, 886 seconds with a SD of 554 seconds.

Conclusion: Midazolam is widely used in anesthesia, and our study demonstrated that there is most likely a synergistic or an additive effect between kava and midazolam, which can lead to a prolonged emergence time from general anesthesia. These results illustrate the need for further research into the potential effects of herbals when combined with commonly used anesthetic agents.

Source of Funding: 59th Medical Wing, Wilford Hall Hospital, 59th Research Squadron, Lackland Air Force Base, San Antonio, Texas.

A40

Myotonic dystrophy and anesthesia: The Mayo Clinic experience

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Introduction: Myotonic dystrophy affects the musculature, such that poor sequestration of calcium following stimulation leads to sustained contraction. Multiple organs systems are affected in people with this disorder. Cardiac, respiratory, and muscular systems are most affected; therefore, this disorder has many implications on peri-operative patient care. Studies have shown complication rates as high as 52% in anesthetics delivered to patients with known myotonic dystrophy; however, these studies were conducted prior to the development of some newer, shorter-acting anesthetic agents and newer techniques of regional anesthesia.

Methods: The study's focus was a retrospective, single center review of 123 anesthetic cases from 52 patient charts between 1999 and 2005. The study reviewed the records of patients with myotonic dystrophy who underwent an anesthetic in order to determine the incidence of morbidity and mortality, as well as characterize the risks and safety of various drugs and techniques in these patients. Demographics, past medical history, peri-operative factors, disposition status from the operating suite and 30-day mortality rates were compared among anesthetics in which an intra-procedural or acute post-procedural complication were noted to those that appeared uneventful. Continuous variables were compared using the 2-tailed t-test, and categorical variables were compared via Pearson's chi-square or the Fisher exact test. A p<0.05 was considered significant.

Results: There were 123 anesthetics (72% general, 1.6% regional, 25% monitored anesthesia care) reviewed in 52 patients (age = 43.7 years ± 21.4, 59% male). An overall complication rate of 17% per anesthetic with one-third of patients experiencing a complication was determined. The summary of the data and results were displayed in poster format and examined the relationship between newer anesthetic medications and techniques in myotonic dystrophy patients.

Conclusion: According to the statistical analysis, more recent anesthetic techniques and newer short-acting drugs improved morbidity and mortality rates among persons with myotonic dystrophy.

Source of Funding: The Mayo Clinic Department of Anesthesiology and the School of Health Sciences supported these endeavors; however, additional funding was not required.

A41

Depth of endotracheal tube placement comparing conventional methods to scientific formulas

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Introduction: Endotracheal intubation is one of the most important procedures performed by anesthetists. Placement of endotracheal tubes (ETT) must allow for proper inflation of the cuff; avoiding endobronchial intubation or the risk of vocal cord damage and/or spontaneous extubation. ETT position is often determined by utilizing ETT at 21 cm for females and 23 cm for males, by listening for bilateral breath sounds, and direct visualization of depth during laryngoscopy. Two formulas have been described that consider the patient's height as a more accurate way of determining proper tube placement.

Methods: We performed a multicenter study with a convenience sample of ASA I, II and III adult patients

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receiving a general anesthetic with an oral ETT and surgery in the supine position. The practitioner performed endotracheal intubation and adjusted the depth of the ETT using their preferred technique. The investigators calculated the depth of the ETT using two formulas and compared these to the actual depth and the distance from the carina as determined by direct visualization with a fiberoptic bronchoscope. Scaled variables were evaluated using the chi-square test. The group means were compared using a one-way analysis of variance.

Results: Fifty-one patients were enrolled in this study (24 males, 27 females). The mean age was 45 and the average BMI was 29.6. This research found 11.8% (N=6) of the endotracheal tubes were malpositioned. The documented depth of the tube and the located depth were not significantly different. The malpositioned tubes were positioned < 2 cm from the carina; none of these tubes were endobronchial. Patients with higher BMIs had a greater incidence of malpositioned tubes. The mean located depth of the malpositioned tubes was 22 cm. The Chula calculation would have placed these tubes at 20.4 cm and the formula at 19.8 cm. Had either of these calculations been used, the tubes would have been positioned correctly.

Conclusion: In this study, placement of the endotracheal tube based on the patient's height would have avoided a malpositioned tube and the potential for endobronchial intubation.

A42

Meclizine for prevention of postoperative nausea and vomiting in a high risk population

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Introduction: Recent studies have found that the prophylactic administration of 25 mg meclizine given in the immediate preoperative period coupled with perioperative intravenous (IV) ondansetron is effective in preventing PONV in groups of high-risk patients following discharge to home but is less effective in the immediate postoperative period. The purpose of this study was to determine if the prophylactic administration of 25 mg given the night before and the day of surgery would be more effective in preventing PONV throughout the entire postoperative period using a similar study design as that reported earlier.

Methods: A total of 62 patients identified as high risk for PONV were enrolled in this double-blind, placebo controlled trial. All subjects received a standardized general anesthesia regimen and prophylactic IV ondansetron. Variables of interest include frequency and severity of PONV and sedation, antiemetic requirements, overall anesthesia satisfaction levels and demographic variables. PONV severity was assessed using a 0-10 verbal numeric rating scale, sedation was assessed using a 3-point ordinal sedation scale, and satisfaction was assessed using a 5-point Likert scale.

Results: No differences in demographic variables, preoperative and perioperative medications, level of sedation, or surgical times was noted between groups. Noted lower incidence of PONV and verbal numeric rating scale scores for nausea in all assessment settings, achieving statistical significance following discharge to home (.045). In comparing the meclizine group to the placebo group, noted longer time to first antiemetic requirement (14 hours versus 6 hours) (p=.04) and those administered meclizine were discharged from the hospital to home 83 minutes sooner than the placebo group. A 24-hour follow-up call following discharge to those administered meclizine reported higher overall satisfaction scores (5.0) as compared to the placebo group (3.5) (p=.002).

Conclusions: Based on the results of this study we can recommend the prophylactic administration of meclizine 25 mg the night before and the day of surgery to groups of patients identified as high risk for PONV to prevent PONV and increase patient overall satisfaction with anesthesia.

A43

The Icarus effect: The influence of diluent warming on dantrolene sodium mixing time

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Introduction: Intravenous (IV) dantrolene sodium (DS) is a primary determinant of successful treatment of malignant hyperthermia (MH). DS has a long reconstitution time with respect to its use in treating an MH crisis. The mythical tale of Icarus illustrates the relationship between temperature and the corresponding state of matter. We postulated warming the diluent would hasten development of clear and particulate-free DS suitable for IV injection. We evaluated an alternate technique for hastening the reconstitution of DS.

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Methods: Simulating real-world conditions, we conducted a randomized, controlled, single blind study dividing 16 DS vials into 2 groups, warmed (41ºC) and ambient temperature (22ºC) diluents. Employing an IV fluid warmer, primed using a 1-L bag of preservative-free sterile water attached to a 60 mL syringe via a 3-way stopcock, we aspirated and injected the diluent directly into each DS vial. After injecting 60 mL of randomly chosen diluent, standardized vigorous agitation of the mixture was performed until complete dissolution was obtained. The observer inspected the vials at 10-second intervals to determine when the solution became particle-free and suitable for injection.
Results: Warmed diluent (41ºC) versus ambient temperature (22ºC), hastened the time to solubilize DS. The mean time to particulate-free DS suitable for IV injection with the warm diluent was 58.88 seconds versus 93.87 seconds for the ambient temperature ($p < .001$). Levene's test indicated the variance between groups was equal. Cohen's d statistic ($d = 4.73$) revealed a large effect size, thus imparting practical significance to our findings. SPSS 13.0 software was used for statistical analysis. Limitations to our study included the use of DS 6 months expired and a single manual agitator.
Conclusions: The Icarus effect was demonstrated; a practical method using reliable, safe and accessible warming devices speeds the time to administration of DS, which may reduce morbidity and mortality associated with MH.

A44

Incidence of awareness in a high risk population: The cesarean section under general anesthesia

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Introduction: Anesthesia awareness is a devastating complication that can result in long-term psychological consequences. Although newer medications, technological advancements, and vigilance by the anesthesia providers have decreased its occurrence, it is an issue that continues to be a challenge. The obstetrical client is considered high risk for anesthesia awareness; however, there is no current literature that supports this documentation. The purpose for this study is to assess the incidence of awareness in the cesarean section patient requiring general anesthesia.
Methods: Ludwig Von Bertalanaffy's "General System Theory" was the theoretical framework applied to this research. A convenience sample was obtained at a facility in West Virginia. Patients who required general anesthesia for their cesarean delivery between January 2005 and December 2006 were chosen to participate. Telephone numbers of this population were obtained by a retrospective chart audit. A structured interview was utilized to assess awareness. Results were evaluated using an "Awareness Categorization" used in prior research to identify awareness cases.
Results: Data from 35 patients are presented (37% response). Two possible events were identified that could be implicit or explicit recall. Conclusive findings would require additional follow-up with the two potential awareness cases.
Conclusion: Literature identifies the prevalence of anesthesia awareness to be consistently 1 to 2 cases per 1,000 patients; this can be up to 40,000 cases per year. This major anesthetic complication needs to be considered by every provider to prevent the psychological consequences that may result.

A45

Managing iatrogenic ventricular tachycardia secondary to epinephrine infiltration

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Introduction: In 1999, the Institute of Medicine released their landmark report *To Err Is Human* detailing the prevalence of United States' medical errors. This report initiated the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Patient Safety Goals. In 2003, Patient Safety Goal #3 described efforts to "Improve the safety of high-alert medications", with a 2006 revision to include "Label all medications, medication containers (e.g., syringes, medicine cups, basins), or other solutions on and off the sterile surgical field in perioperative and other procedural settings." Despite these efforts, potentially fatal medication errors continue to occur daily. Tang et al found the etiologies of these errors were multifactorial with the most prevalent causes focusing on personal neglect coupled with a heavy workload. The most common error was administration of a wrong dosage.
Methods: A 53-year-old male presented for a wide local excision of a malignant melanoma from the left cheek with sentinel node biopsy. His medical history included reflux, chronic sinusitis, and several psychiatric conditions all well controlled with numerous psychotropic medications. Following anesthetic induction, 5 ml of an epinephrine solution was injected into the left cheek to reduce surgical bleed-

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ing. Within 3 minutes the patient went into a 140 beats/minute ventricular tachycardia generating a blood pressure of 256/146. One hundred percent oxygen was administered. A valsalva maneuver was attempted without success. Then esmolol 50 mg IV was administered twice within 5 minutes resulting in a return to normal sinus rhythm at 86 beats/minute with a blood pressure of 141/108. A 12-lead ECG showed nonspecific lateral ST-T abnormalities. In retrospect, it was determined that the injected epinephrine solution was a 1:1000 concentration.

Conclusion: Despite the multiple possible etiologies of this error, it is evident that further work is needed to improve patient safety surrounding the administration of medications with potentially fatal side effects.

A46

Anestheticrisks.com: An online resource for current information on probability of anesthetic complications

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Introduction: Greater than 20 million anesthetics are delivered yearly in the United States. Some cases include unintended adverse anesthetic outcomes. As a provider of anesthetic services, could you scrupulously answer a patient's question on the probability of an anesthetic complication? We have reviewed current literature to accumulate recent data on anesthetic risks to best inform anesthesia providers of the relative possibility of anesthetic complication.

Method: Using the Consent for Anesthesia document from a large regional medical center we selected eleven of the complications of anesthesia identified therein. These anesthetic complications included dental damage, eye injury, airway trauma, nerve injury, postoperative nausea and vomiting, awareness under anesthesia, allergic reaction, aspiration pneumonia, heart attack, stroke, and death. A literature review for each topic was initiated using the PubMed/MEDLINE database; preference was given to publications addressing anesthetic complication in the United States and published in the last ten years. The articles were then reviewed to identify author, study period, data source, and relevant statistical evaluation of anesthetic complications.

Results: We accumulated information from the articles for each of the previously identified anesthetic risks regarding incidence, common cause, risk factors, and highest risk patients.

Conclusions: We have created a website that provides easy access to a review of current literature in a concise format that addresses the probability of anesthetic complications.

A47

The general well being of the graduate nurse anesthesia student: A comparison of health patterns during the anesthesia education experience

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Introduction: Stress has been defined as the body's ability to adapt to a perceived threat or change and has been linked to both minor and major physiologic illnesses. The inability to cope with stress can inhibit learning. The purpose of this study is to identify how nurse anesthesia education experiences affect students in terms of their stress and well-being. We are attempting to determine if differences exist in perceived stress related to the level within the academic program. Results may assist academicians to incorporate stress management techniques and healthy adaptive processes into curriculum for nurse anesthesia students.

Methods: After IRB approval, a questionnaire was sent to nurse anesthesia students enrolled in Michigan CRNA academic programs. Return of questionnaire implied consent. All responses were confidential and respondents remained anonymous. The questionnaire was used to identify differences in health patterns before and during graduate school.

Results: One hundred (N = 100) students completed and returned the survey; 74% are in their first year of study. Seventy-seven percent (77%) are females, and 32% are between the ages of 25 and 30. Sixty-nine percent (69%) claim to use alcohol since beginning their anesthesia training; however, it is not known if this is an increase in existing patterns, and 60% claim to have a negative change in exercise patterns. Weight gain, general malaise, anxiety/depression, and insomnia occurred most frequently since beginning the nurse anesthesia education process, and fear of academic failure as well as clinical evaluations of performance created the most stress.

Conclusion: The results of this study indicate that a large percentage of the sample felt their general well-being was negatively affected and changed since beginning graduate school. It appears that there may be a need for programs to incorporate stress management techniques and well-being education as part of the first-year nurse anesthesia curriculum.

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A48

The effect of preoperative anxiety assessment on anxiolytic dosing regimens

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Introduction: Increased preoperative anxiety has been implicated in increased perioperative and postoperative analgesic requirements and delayed discharge from the hospital. Traditionally, anesthesia providers prophylactically treat anxiety with midazolam, but it has been noted that anesthesia providers overestimate anxiety levels and frequently medicate patients not in need of anxiolysis. Recently at Naval Medical Center San Diego a preoperative a 0-100 mm VAS scale for anxiety was implemented as part of its routine preoperative assessment. This study was undertaken to determine what impact this assessment had on preoperative and postoperative patient outcomes.

Methods: One hundred anesthesia records were randomly selected for review from a period of time before implementation of the preoperative anxiety assessment, and 100 anesthesia records were selected from a time period following implementation. Variables of analysis included total anxiolytic and analgesic requirements and total time required in the PACU and in the hospital. Descriptive and inferential statistics were used to analyze the data. A p-value of <.05 was considered significant.

Results: Following implementation of the preoperative VAS score for anxiety, an increase in PACU time requirements (55 ± 50 minutes versus 71 ± 130 minutes) (p=0.092) and the total time required in the hospital (281 ± 195 minutes versus 421 ± 440 minutes) (p=.004) was noted as compared to a time prior to implementation of the preoperative assessment. When correlational statistics was used, a positive correlation was noted between an increased VAS score and PACU and total hospital time requirements (p<.05) but not in overall anxiolytic and analgesic requirements. (p>.05).

Conclusions: Implementation of 0-100 mm VAS score for anxiety did not result in a change in medication requirements but did note correlation in increased VAS and increased PACU and total hospital time requirements.

A49

Promoting an alternative technique for positioning the morbidly obese patient for laryngoscopy

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Introduction: Previous studies have evaluated the positioning of the morbidly obese patient; comparing the "sniff" versus the "ramp" position, both of which have shown to place added strain on the anesthesia providers. We propose that a modified 'ramped" position, without using the rolls and blankets, but with use of the bed controls that places the patient in reverse Trendelenburg, will allow for adequate laryngeal exposure without trauma or strain to the anesthesia provider's back.

Methods: Following IRB approval, the researchers enrolled 30 participants in this descriptive study. The patients' demographic information was reviewed to ensure that all inclusion criteria were met. An information sheet was given to the participating anesthesia provider and verbal consent was obtained. The patient was positioned prior to laryngoscopy using the "modified ramp" approach. Following intubation, vocal cord visualization was graded using the Cormack-Lehane classification, and the anesthesia provider completed a survey regarding their experience with this technique.

Results: The sample consisted of data based on 30 patients (3 males and 27 females) with a mean BMI of 43. The practitioners enrolled in the study were: CRNA 53% (N=16), MDA 10% (N=3), Residents 30% (N=9), and RNAS 7% (N=2). The mean years of anesthesia experience was 7.7 years with a minimum of 1 year. In 97% (N=29) of the cases the patient was successfully intubated using this positioning method. The mean number of intubation attempts was 1.2. Seventy percent (N=21) of the participants noted a difference in back strain when using this method. Eighty percent of the participants (N=24) planned on using this technique in the future.

Conclusion: Based on the data from this sample, the modified ramp technique was found to be easier to perform by the majority of the participants. It should be considered as a safe and effective alternative for positioning obese patients and minimizing the back strain of the participant.

A50

Crisis simulation: Managing anaphylactic shock

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Introduction: A single algorithm cannot adequately address the complexity and severity of anaphylaxis. Anaphylaxis is usually a sudden, unanticipated severe allergic reaction that can result in death. It has become a growing problem within the anesthesia community because it is difficult to recognize the early signs and symptoms since patients are mostly unconscious and/or sedated during a surgical procedure. Prevention is key. The purpose of this project is to develop an anaphylaxis simulation scenario. This tool can be used to evaluate the competence and teach novice anesthesia providers in the management of anaphylaxis in the clinical setting.

Method: The simulation will consist of a PowerPoint presentation overview on anaphylaxis. Nurse Anesthesia students from Duke University will then have the opportunity to run through an anaphylactic simulation using an adult Human Patient Simulator at the Duke University Human Simulation Center. The students will be videotaped, and their performance will be evaluated and debriefed after the simulation. Students will complete a survey at the end of the simulation.

Results: Results are pending. Once the simulation is developed, the students who utilize this teaching tool will show an increase in competence and understanding in the management of anaphylaxis.

Conclusion: The simulation will be used as a future tool to evaluate core competencies. Students will exhibit confidence in their practice and improve their skill and knowledge. Based on the surveys, the simulation will be used as an adjunct exercise to lecture.

A51

Nurse anesthesia manpower issues in West Virginia

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Introduction: The purpose of this study was to identify the projected retirement and relocation of CRNAs during the 2007-2011 time frame, within the state of West Virginia. The goals of this study were to determine if there were changes in the work commitment of CRNAs in West Virginia within the next five years and how many West Virginia CRNAs plan to retire or relocate within the next five years.

Methods: This study was a quantitative, descriptive, non-experimental study that surveyed all (n=379) CRNAs within the state of West Virginia who are registered with the American Association of Nurse Anesthetists and practice within the state. The collection tool was a thirteen question survey, which had previously been used in Nebraska, Missouri, Arkansas, Illinois, and Indiana. The survey asked demographical questions such as age, county of residence, work hour/week, average anesthetics/year, and number of facilities worked/week. The surveys were sent out in early December 2006 with data collection completed by early January 2007.

Results: Out of the 379 CRNAs surveyed, 202 were returned yielding a response rate of 53%. Out of the 202 returned surveys, 177 administered anesthesia in 2006, which lead to an 88% usage rate. When surveyed about a decrease in work commitment, 31% (n=54) of the CRNAs answered yes. When surveyed about relocating out of West Virginia within the next five years, 13% (n=23) of the CRNAs answered yes. When surveyed about retiring from delivering anesthesia within the next five years, 15% (n=27) of the CRNAs answered yes.

Conclusions: The decrease in nurse anesthesia workforce supply within the time frame of 2007-2011 is projected to be 59% in total. There will need to be future research conducted to assess the amount of CRNAs entering the West Virginia nurse anesthesia arena.

A52

The impact of facility design on efficiency and implied patient satisfaction

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Introduction: Long waiting times are a significant source of patient dissatisfaction. Increased wait times also increase the patient's feeling of anxiety, discomfort, pain, hunger, and loneliness. The physical design, either being a freestanding facility dedicated to ambulatory procedures or a hospital-based ambulatory unit can greatly alter the efficiency of the center. Consolidation of outpatient surgery cases to one physical area will allow for a decrease in preadmission process times for patients. This consolidation allows for fewer delays related to the patient's arrival to the operating room from different areas of the hospital allowing for quicker and more efficient turnover between cases.

Methods: A case cohort study was performed on 834 outpatients who had cataract surgery done by the same surgeon. Between January 1, 2002 and December 31, 2002, 392 outpatients had cataract surgery in

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the traditional hospital setting and between the dates of January 1, 2005 and December 31, 2005, 442 outpatients had cataract surgery in a hospital-based separate ambulatory surgery center. This study compared preoperative, intraoperative, and postoperative times between the two groups.

Results: The results of this study showed a reduction in perioperative time intervals between cataract surgeries performed at a freestanding facility dedicated to ambulatory procedures in 2005 versus a hospital-based ambulatory surgery unit in 2002. Differences in preoperative, intraoperative, and postoperative times are summarized in poster format.

Conclusion: The future of medicine is leading toward increasing numbers of outpatient surgeries. According to the analysis, a dedicated freestanding ambulatory surgery center leads to decreased perioperative time intervals compared to a hospital-based outpatient surgery unit. Patient satisfaction with the experience is of the utmost importance to the anesthesia provider. Previous research has shown that long waiting times are a significant source of patient dissatisfaction. Facility design directly impacts perioperative time and thus patient satisfaction. Results of this study show that a dedicated freestanding ambulatory surgery center increases efficiency.

A53

The effects of kava on alanine aminotransferase in the male Sprague-Dawley rat

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Introduction: Nutraceutical use has greatly increased throughout the United States not only in the civilian population but within the military as well. Approximately 60% of enlisted military soldiers use herbals at least once a week. Kava is one of the best selling herbal supplements with a reported sales growth of 437%. Kava is taken to alleviate insomnia, pain, and for sedation. Kava came under the scrutiny of the United States Food and Drug Administration (FDA) after a number of European reports that it potentially causes damage to the liver including hepatitis, cirrhosis, and liver failure. Therefore, the increase in consumption of kava may increase morbidity and mortality associated with liver damage. The serum alanine transaminase (ALT) is liver specific in the rat, and elevated levels reflect potential liver damage and acute liver failure. The purpose of this study was to determine the effects of kava on ALT in the male Sprague-Dawley rat.

Methods: The study was a prospective pilot experimental design with a vehicle-only control group. Eight male Sprague-Dawley rats weighing between 225 and 320 grams were used. The rats were assigned to one of two groups (1) a one-time dose of intraperitoneal injection of aqueous kava 125 mg/kg, or (2) the control group (intraperitoneal injection, equal volume of sterile water used as vehicle). One day after injection, a blood specimen was collected.

Results: The mean of ALT in the kava group was 234 IU/l (SD ± 178.92) compared to the control group that had a mean of 73 IU/l (SD ± 20.9). The normal range for a rat is 52-224 IU/l.

Conclusions: The data suggest that kava may cause some liver impairment in the male Sprague-Dawley rat. Future studies should be conducted that are prospective randomized studies in which a baseline ALT is acquired and multiple doses of kava are given over time. Approximately 60% of military personnel ingest herbs at least once a week. Anesthesia providers need to know that patients who have ingested kava may have some liver impairment. This study suggests that one dose of kava increases the liver enzyme, alanine transaminase.

A54

Awareness during general anesthesia: A review of case reports

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Introduction: Awareness is an uncommon phenomenon, occurring in about 0.1% to 0.2% in recent years. Prospective studies of awareness, because of the low incidence, do not have enough power to identify the risks, causal factors, and sequelae. The purpose of this study is to identify those factors, which are important for development of effective preventive measures.

Methods: The National Library of Medicine's PubMed database was searched for the time period between 1950 through August 2005. PubMed was searched for case reports on awareness and anesthesia. A manual search of references cited in published reports, studies and reviews was also performed. We ended with 271 cases. For each report we extracted the following data: patient characteristics, drugs administered, time of awareness, monitors used, type of surgery, and sequelae of awareness. Means and frequency distributions were tabulated and data were analyzed with chi-square and negative binomial regression tests.

Results: Sixty-three percent of patients were females,

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85% received muscle relaxants, and 74% of incidents occurred during the maintenance stage. The feelings of helplessness and paralysis during awareness were positively associated with postoperative psychiatric sequelae. The frequency of case reports has increased significantly during 1990 to 2005 compared to earlier times. (p=.05-.0001).

Conclusions: The number of cases reviewed is the largest collection to date. Specific characteristics were identified in each case. Significant associations of awareness complaints vs. sequela were established. Development of preventive measurements may be enhanced by further studies in the future.

A55

The effect of education on perceptions of chemical dependency in anesthesia

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Introduction: Anesthesia practitioners have a particularly high risk for chemical dependency. The purpose of this study was to determine whether education given to student registered nurse anesthetists regarding addiction and patterns of addictive behavior would alter their perceptions of impairment.

Methods: Approval was obtained from the Institutional Review Board at Florida International University. A pretest-intervention-posttest model was used, with an educational presentation as the independent variable. A sample of 54 student registered nurse anesthetists was used. Descriptive statistics revealed the sample included 24 males and 29 females ranging in age from 24 to 53. In the classroom setting, perceptions toward impairment in nurse colleagues were measured using the Perceptions of Nursing Impairment Inventory (PNII). This 30-item survey instrument was developed in 1987 at the University of Kentucky College of Nursing. Each item was scored from strongly agree to strongly disagree. After initial completion of the survey, an educational program was provided. A series of videos, "Wearing Masks: The Potential for Drug Addiction in Anesthesia," was viewed. This program was provided to the researchers by the AANA. The PNII was again administered to examine the effect of the intervention.

Results: Dependent *t*-tests were used to compare pretest and posttest overall mean scores and each item individually. A significant difference was found in overall mean scores after education. A high significance in five individual items was found. These items included perceptions that impairment is an illness, that it is a widespread problem, that it can happen to any nurse, and that there is a responsibility to help an impaired colleague receive assistance.

Conclusion: Given the importance of these key concepts of the disease of addiction and the changes in attitudes after an educational intervention, it becomes very apparent that education regarding addiction is vital and should be a mandated component in anesthesia education.

A56

A historical study of nurse anesthesia education in Nebraska

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Introduction: The purpose of the study was to document the history of the education of nurse anesthetists in Nebraska from the nineteenth century to 2006. Evidence of: apprenticeship training, anesthesia training during the basic nursing school curriculum, organized post-graduate training programs prior to the implementation of accreditation, post-graduate hospital-based programs that were accredited beginning in 1952, and academic degree programs at the baccalaureate and master's level was sought and analyzed.

Methods: Historical method guided the analysis of primary and secondary documentary evidence. Additionally, eighteen oral history interviews were collected following the guidelines recommended by the American Historical Association.

Results: Unpublished documentary evidence found described early apprenticeship training. Surgeons trained Sister Marie Anderson to administer ether and chloroform between 1898 and 1900. Later she traveled to Minnesota to be trained in the use of the anesthesia machine and to observe anesthetic techniques in Chicago. Nursing school curricula revealed it was common for Nebraska nursing students to receive anesthesia training during their basic education between approximately 1915 and 1930. Prior to the establishment of the first Nebraska nurse anesthesia program in 1947, hospital records documented that many RNs traveled out of Nebraska in order to attend a post-graduate anesthesia training program. Several small hospital-based certificate nurse anesthesia programs were established in Nebraska following World War II, as was typical in the United States. A large number of programs, especially those associated with teaching medical centers, were closed during the 1980s, similar to the Nebraska experience when the

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University of Nebraska Medical Center and Creighton University programs were closed. A single nurse anesthesia program remains in the state. The Nebraska programs were early to establish baccalaureate degree programs. By 1980, the three existing Nebraska nurse anesthesia programs awarded a BS while less than 25%, or 32 of 143, accredited nurse anesthesia programs nationally were awarding an academic degree.

Conclusion: The long history of nurse anesthesia practice and the professionalization of the education of nurse anesthetists is the foundation of current practice. The study documents and expands the understanding of the process by which nurse anesthetists became established as the first advanced practice nurses.

Source of Funding: The study was supported by grants from the American Association of Nurse Anesthetists Foundation and from the American Association for the History of Nursing.

A57

Management of perioperative antiplatelet therapy: Pulling the plug on thrombotic events

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Introduction: Currently, 80% of stents deployed in percutaneous coronary intervention (PCI) are drug-eluting stents (DES). Whereas bare-metal stent implantation is complicated by restenosis and reintervention, stents coated with paclitaxel or sirolimus inhibit endothelialization and restenosis. However, intravascular exposure of stent struts triggers platelet aggregation. Former guidelines recommended an antiplatelet regimen of clopidogrel and aspirin for three to six months. Follow-up on the original DES trials, however, indicates that stent thrombosis occurs at a rate of 1.3%, resulting in death in nearly half those subjects, prompting FDA officials to recommend a twelve-month antiplatelet regimen until further notice. Despite a direct correlation between stent thrombosis and cessation of clopidogrel, standard surgical protocol dictates that antiplatelet drugs be discontinued. Meanwhile, anesthetists are faced with the uncertainty surrounding antiplatelet therapy and the challenge of balancing patient risk factors for bleeding with thrombosis.

Methods: A literature review revealed that, in addition to individual and angiographic risk factors, perioperative risk factors for stent thrombosis include cessation of antiplatelet therapy and recent PCI. Pooled recommendations for the management of perioperative antiplatelet therapy are:

1. DES is contraindicated in patients undergoing PCI in preparation for surgery within twelve months.
2. Procedures should be postponed for twelve months after DES implantation.
3. Aspirin should continue throughout the perioperative period.
4. Cardiology should be consulted prior to cessation of clopidogrel.
5. Clopidogrel should not be discontinued for more than five days, even in cardiac surgery.
6. In many procedures (ophthalmologic, dermatologic), clopidogrel should be maintained perioperatively.
7. If discontinued, clopidogrel should be started within six hours postoperatively.

Conclusions: Careful consideration of risk factors for thrombosis balanced with implications of bleeding is necessary to prevent perioperative complications. Current recommendations challenge accepted wisdom surrounding antiplatelet therapy and in conjunction with communication with surgeon and cardiologist, serve as a guide to individualize care for each patient.

A58

Evaluation of patient ease-of-care associated with the fentanyl iontophoretic transdermal system versus morphine intravenous patient-controlled analgesia for postoperative pain management

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Introduction: Although intravenous patient-controlled analgesia (IV PCA) is routinely used in the postoperative setting, drawbacks may include invasive procedure and the potential for programming errors. This analysis of pooled data compared the ease-of-care (EOC) associated with postoperative pain control provided by the compact, needle-free, preprogrammed fentanyl HCl iontophoretic transdermal system (ITS) versus morphine IV PCA.

Methods: Data were taken from 2 randomized, active-controlled trials that evaluated the efficacy and safety of fentanyl ITS versus morphine IV PCA for postoperative pain management. Following study completion, patients completed a validated Patient EOC questionnaire that assessed the ease-of-use of each modality. Overall EOC was based on the following subscales:

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movement, confidence with device, comfort with device, dosing confidence, pain control, and knowledge/understanding. Responders for overall EOC and each subscale were defined as those who reported 1 of the top 3 positive responses (on a 6-point Likert scale) for all subscale items; responders for the satisfaction subscale reported 1 of the top 2 positive responses for both items.

Results: Patients (N=1,305) received fentanyl ITS (n=647) or morphine IV PCA (n=658) following surgery. Significantly higher proportions of patients receiving fentanyl ITS versus morphine IV PCA were responders for overall EOC (42.3% vs 27.9%; *P*<0.001), Movement (97.1% vs 72.5%; *P*<0.001), confidence with device (90.2% vs 82.6%; *P*<0.001), comfort with device (79.0% vs 73.4%; *P*=0.021), dosing confidence (92.4% vs 88.7%; *P*=0.027), knowledge/understanding (74.3% vs 66.4%; *P*=0.002), and satisfaction (74.9% vs 67.9%; *P*=0.006). A numerically higher proportion of patients receiving fentanyl ITS versus morphine IV PCA were responders for pain control (72.3% vs 67.2%; *P*=0.056).

Conclusions: Findings indicate that the compact, needle-free, preprogrammed fentanyl ITS was associated with a more positive patient assessment of ease-of-use compared with morphine IV PCA. Technological advances in postoperative analgesia delivery methods may improve the quality of patient care and increase patient satisfaction.

A59

Mechanism of analgesic effect, efficacy and anesthesia interactions of kava in the male Sprague-Dawley rat

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United States Army Graduate Program in Anesthesia Nursing

Introduction: It is estimated that approximately one in three Americans use unconventional therapies such as herbal supplements to relieve pain. Eight herbal supplements have been identified that could pose the greatest potential risks in surgical patients. Among these is kava, which is used for a wide spectrum of therapeutic properties including sedative, anxiolytic, analgesic, and neuroprotective effects. Although there are studies examining the anxiolytic effects of kava, there is very little information regarding analgesic properties of this herbal. Therefore the purpose of this investigation was to examine how kava may modulate pain pathways and how it may interact with the commonly used analgesic, morphine, using the hot plate analgesia technique. Measurements of antinociception via the hotplate apparatus are measures of unorganized learned behavior which involves the cerebral cortex.

Methods: Sixty male Sprague-Dawley rats, were equally divided into 5 treatment groups as follows: (1) vehicle only, (2) herbal kava 125 mg/kg, (3) morphine 10 mg/kg, (4) kava 125 mg/kg + morphine 10 mg/kg, and (5) kava + antagonist naloxone 1.5 mg/kg. All medications were given via two intraperitoneal injections of equal volume. Animals were tested at four consecutive time points of five, ten, thirty, and sixty minutes on the standard hot plate analgesia apparatus. Three blinded observers monitored the rodent for hind paw lick, a well documented pain response behavior in the rat. Responses were recorded in time in seconds.

Results: Fifty-nine rats completed the study. Analysis of variance repeated measures revealed no statistical difference across groups. However, means at specific time points, measured in seconds, across the groups did vary with longer times recorded for the kava and the kava plus morphine groups.

Conclusions: While the results did not show a statistical significance, the difference in mean times across groups warrants further investigation with either higher doses in treatment groups or a different time schedule for testing.

Source of Funding: 59th Medical Wing, Wilford Hall Hospital, 59th Research Squadron, Lackland Air Force Base, San Antonio, Texas.

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Evidence based anesthesia: Fever of unknown origin in the parturient and neuraxial anesthesia

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Navy Nurse Corps Anesthesia Program

Introduction: Whether it is safe to proceed with neuraxial analgesia in a febrile patient is an area of controversy for anesthesia providers. Some local clinical practice guidelines are present, but none offer a clear guideline for the febrile patient and neuraxial analgesia. Based on this, we performed an evidenced-based project in an effort to establish a guideline for our active obstetrical clinical practice.

Methods: Neuraxial anesthesia is generally safe for the parturient and complications are exceedingly rare; however, serious adverse outcomes can result. Due to the devastating nature of the morbidity, however rare,

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the decision to proceed with a neuraxial anesthetic in the face of infection may be contentious. This project reviews the available literature to determine the relative risk and benefit of neuraxial anesthesia.

Results: Fever and sepsis are considered to be relative contraindications to regional anesthesia. However, epidural anesthesia is a superior method of management of pain during labor. One must also consider that 30-40% of patients with chorioamnionitis require cesarean section delivery. Due to the increased morbidity and mortality of general anesthesia in this population, it may be reasonable to proceed with regional anesthesia.

Conclusion: Based on this review of the literature, the overwhelming opinion is that the risk of seeding the epidural space is considerably less than the risk of general anesthesia in this population, so the practice of withholding an epidural is not substantiated. However, it may be prudent to administer antibiotics prior to the regional anesthetic and to provide post-operative monitoring for the development of symptoms of complications.

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Does premixing propofol with lidocaine affect time to induction?

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Introduction: To reduce pain on injection, practitioners often combine 1% propofol and 1% lidocaine as a 9:1 admixture. Since this process of premixing the agents is known to reduce the concentration of propofol in vitro, the purpose of this study was to determine if a difference exists between groups of patients administered a lidocaine-propofol admixture prepared immediately before induction (control group) as compared to one prepared 60-180 minutes prior to induction (experimental group).

Methods: This prospective, randomized investigation enrolled 125 patients scheduled to undergo a procedure requiring general anesthesia and randomized them into either the immediate or delayed admixture group. All subjects underwent induction of general anesthesia with a 2 mg/kg propofol and 0.2 mg/kg lidocaine admixture. Time to induction was measured from the time of bolus injection to the time subjects dropped a syringe held between their thumb and forefinger during administration of the admixture.

Results: A total of 116 subjects were included in the final analysis (65 controls, 51 experimental). No significant differences in demographic variables or other measured variables between groups except in time to syringe drop. Time to syringe drop was noted as 29.65 ± 11.9 seconds in the control group and 43.8 ± 22.1 seconds in the experimental group ($p<.001$).

Conclusion: The results of this study demonstrate that premixing propofol and lidocaine in a 10:1 ratio does affect induction time. Admixtures premixed more than 60 minutes before induction increases the mean time to induction of general anesthesia by 14 seconds when compared to admixtures mixed and administered within 30 minutes. Additionally, the results suggest that in situations requiring rapid securing of the airway, such as in high acuity patients who do not tolerate periods of apnea or patients with full stomachs, lidocaine-propofol admixtures should be administered soon after mixing to avoid an unnecessary prolongation of induction.

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