

STATE OF THE SCIENCE ORAL AND POSTER SESSIONS: PART 1

The AANA Foundation extended an invitation to participate in the State of the Science Oral and Poster Sessions at the AANA Annual Meeting in Seattle. 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 set 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 57 abstracts were elected. Approximately half of the abstracts are published in this issue and the remainder are scheduled for publication in the December 2004 *AANA Journal*.

For further detail and reference citations concerning individual abstracts, please contact the authors.

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AANA Director of Research and AANA Foundation

A1

The prevalence of carpal tunnel syndrome amongst anesthesia providers

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Introduction: Carpal tunnel syndrome (CTS) is defined as a complex of symptoms resulting from compression of the median nerve at the carpal tunnel. Symptoms include pain, numbness and tingling on the anterior surface of the index, middle or radial half of the ring finger. Anesthesia providers of both genders are at risk to sustain work related musculoskeletal disorders due to job related repetitive tasks. The mechanical strains that nurse anesthetists perform, such as rigid laryngoscopy with repetitive left wrist deviations, place anesthesia providers at a fivefold increase risk of CTS. The purpose of this study is to correlate demographic data and associated work and social factors with the incidence of symptomatology consistent with CTS.

Methods: After obtaining IRB approval, a questionnaire was developed and administered to approximately 250 practicing anesthetists in the greater Detroit metropolitan area. The tool contained questions that elicited data regarding demographic information and technical hand/motor skills used in a typical day (both at work and socially). It questioned whether or not symptoms typical of CTS were present.

Results: The results of the study are based upon 155 respondents. Using the Spearman rank order test, a positive correlation was found between pain while providing anesthesia and pain during the workday; numbness and loss of sensation, weakness in the hand

or wrist; and difficulty grasping small objects. Males spent more time on the computer, 1.02 hours, compared with females 0.58 hour. Twenty-three of 98 females complained of weakness in the hand or wrist compared to 9% of males (n = 54).

Conclusion: The results of this research demonstrated that 18.7% of the respondents had hand or wrist pain at night, 22.4% had pain during the day at work and 36% had numbness or loss of sensation. There was no correlation between years in anesthesia or the number of mask cases or the number of intubations and any of the symptomatology. The study was not able to conclude a link between carpal tunnel syndrome and anesthesia practice.

A2

Does the use of real time tele-video conferencing affect the academic achievements of student registered nurse anesthetists?

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Introduction: The purpose of this research was to determine the effect of Tele-Video Conferencing (TVC) on the academic performance of student registered nurse anesthetists (SRNAs). The study compares scores local students who view lectures in person to their distant counterparts who view lectures via TVC. The examination of results produced by local and distant site students may provide a reasonable comparison to support the validity of TVC as a viable method of education.

Methods: All values in this study were compared and

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contrasted using the T-test P. The group of 36 students was comprised of 26 local site students and 10 distant site students. Students' entry level statistics consisted of: Years Experience, Undergraduate Grade Point Average (GPA), and Graduate Record Exam (GRE). There were no statistically significant difference in these values. The Self Evaluation Exam (SEE) total score was used to quantify the SRNAs' academic achievement.

Results: The analysis showed no statistical difference in any of the parameters compared. The students' entry level statistics were comparable with P values as follows: Years experience $p=0.78$, GPA $p=0.44$, and GRE $p=0.54$. The SEE results comparison also revealed no differences. The local group mean was 392, while the distant group mean was 401 ($p=0.52$).

Conclusions: Based on the results of this study, the use of TVC is an effective education model that yields positive results for the students that take part in it. When compared to accepted modes of teaching, such as the live lecture model, distance site students are as successful as their local site peers.

A3

Certified Registered Nurse Anesthetist performance and perceptions: Use of a handheld, computerized, decision making aid during critical events in a high-fidelity human simulation environment

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Introduction: With the increasing focus on patient safety and human error, understanding how practitioners make decisions during critical incidents is important. Despite the move toward evidence-based practice, research shows that much decision making is based on intuition and heuristics ("rules of thumb"). The purpose of this study was to examine and evaluate the methodologic feasibility of a strategy for comparing traditional cognition versus the use of algorithms programmed on a personal digital assistant (PDA) in the management of unanticipated critical events by Certified Registered Nurse Anesthetists (CRNAs).

Methods: A combined qualitative-quantitative methodology was utilized. The quantitative element consists of a pilot study using a crossover trial methodology. Two case scenarios were carried out in a full-scale, high fidelity, simulated anesthesia care delivery environment. Each participant was instructed to routinely provide care using his or her own knowledge, intuition, and experience in one scenario and utilize a PDA con-

taining a catalog of approximately 40 events with diagnostic and treatment related information in second scenario. Audio-videotaping of the scenarios allowed for definitive descriptive analysis of items of interest, including time to correct diagnosis and definitive intervention. The qualitative approach consisted of a phenomenological investigation of problem solving and perceptions of PDA use and the simulation experience by the participants using "think aloud" and retrospective verbal reports, semi-structured group interviews, and written evaluations.

Results: Qualitative results of the study indicate that participants found the PDA algorithms useful despite some minor technical difficulties. Overall, participants found the simulated environment and case scenarios realistic but also described feelings of expectation, anxiety, and pressure. Problem solving occurred in a hypothetico-deductive manner. The methodologic investigation revealed several areas for improvement including more precise control of case scenario occurrences and more detailed data collection. All participants agreed with the value of using high fidelity simulation for research and education, particularly for problem solving of critical events.

Conclusion: Results of this study support the proposed methodology and provide information for more effective utilization of high fidelity simulation in education and research.

A4

Comparison of the incidence and severity of post-operative sore throat pain following endotracheal intubation with air versus four percent lidocaine in the endotracheal tube cuff

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Introduction: Postoperative sore throat pain is a common complaint following general endotracheal anesthesia. Elimination or minimization of sore throat pain that causes patient discomfort can have profound effects on the patient's overall perception of their surgical experience. Previous research studies have suggested that this complication can be minimized by inflating the endotracheal tube cuff with lidocaine instead of air.

Methods: The sample contained 60 patients who were undergoing a surgical procedure requiring general anesthesia. The participants were randomly placed into the air or four percent lidocaine group. In the post-anesthesia care unit (PACU), the blind PACU

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nurse evaluated the presence of sore throat pain. Also, within 48 hours of extubation, a blind researcher once again evaluated the participant for sore throat pain.

Results: There was no significant decrease in sore throat pain reported by participants who received lidocaine in the endotracheal tube cuff as compared to the participants who received air, $p < .05$. Other findings included a significance between the use of oral airways and the incidence of sore throat pain, $p < .05$. The study also showed significance in the severity of sore throat pain in the 20-48 hour postoperative period for those subjects intubated with a Miller 3 blade, $p < .05$.

Conclusion: This study failed to identify the use of lidocaine in the endotracheal tube cuff as a preventative measure against postoperative sore throat pain. Awareness that the Miller 3 blade and oral airways have the ability to increase postoperative sore throat pain is valuable information to consider during an anesthetic.

A5

Meclizine in combination with ondansetron for the prevention of postoperative nausea and vomiting in a high risk population

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Introduction: Postoperative nausea and vomiting (PONV) are common complaints following general anesthesia. This is especially true when certain risk factors such as female gender, non-smoker, history of motion sickness and history of previous PONV are present. Often anesthesia providers will prophylactically treat these "high risk" patients with an antiemetic agent such as ondansetron in an effort to decrease the incidence of PONV. However, even with ondansetron administration the incidence of PONV in "high risk" patients remains significantly higher than the general population. Some investigations indicate that using a combination of antiemetic agents may be more effective in preventing PONV in these high-risk patients, but often results in side effects and an increase in both institutional and patient cost.

Recent evidence has shown that administration of the inexpensive, low side effect profile drug meclizine will decrease the incidence of PONV in the general population and can be safely given when used in combination with other antiemetic agents. However, no study to date has examined what effect the combination of meclizine and ondansetron would have on the

incidence and severity of PONV in a group of patients identified as high risk for the occurrence of PONV. Therefore, the purpose of this study was to determine if the prophylactic administration of ondansetron and meclizine would be more effective than ondansetron alone in decreasing the incidence of PONV in groups of patients identified as "high risk," without increasing the incidence of side effects.

Methods: In this prospective, randomized, double blind study, a convenience sample of 84 subjects scheduled to undergo general anesthesia and identified as having 3 of the 4 known risk factors for PONV were randomly assigned to receive either 50 mg of oral meclizine or placebo approximately 30 minutes prior to induction of anesthesia. In addition, all subjects were given 4 mg ondansetron intravenously approximately 20 minutes before conclusion of the surgical procedure. Demographic information, incidence and severity of PONV, surgical and anesthesia times, satisfaction scores and postoperative antiemetic requirements were some of the measured variables. PONV severity was measured using a 0-10 verbal numeric rating scale done preoperatively, on entry into the PACU and SDSU and every 15 minutes after complaints of PONV. Descriptive and inferential statistics were used to analyze data. A p -value of < 0.05 was considered significant.

Results: A total of 84 subjects were enrolled, but 7 subjects were excluded secondary to breeches in protocol and/or cancellation of surgery, leaving 77 (39 meclizine and 38 placebo) for analysis. No significant differences in demographic variables, surgical times, anesthesia times, or analgesic requirements were noted between groups. Incidence of nausea was noted to be similar between groups in the PACU and SDSU but was significantly lower in the meclizine group (10%) as compared to the placebo group (29%) following discharge to home ($p=0.038$). When VNRS scores were analyzed in those subjects requiring treatment in the PACU, it was noted that subjects given meclizine had significantly lower scores at 15 minutes ($p=0.013$) and 45 minutes ($p=0.006$) following treatment as compared to the placebo group. No differences in side effects were noted between groups. Satisfaction scores were higher in the meclizine group (median =5) as compared to the placebo group (median=3.0) ($p=0.002$).

Conclusions: In this study the administration of prophylactic meclizine to patients at high risk for PONV resulted in lower incidence and severity of PONV in the hospital and following discharge to home thereby making it an attractive prophylactic treatment option for patients at high risk for PONV.

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A6**The use of ultrasound in placement of intravenous catheters**

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Introduction: This prospective, randomized study evaluated the use of the BARD Site-Rite 3 Ultrasound System versus the traditional (visual/palpation) method during peripheral intravenous (IV) access on patients with known or potential difficult peripheral access.

Methods: Thirty-five adult patients needing peripheral IV access were recruited and randomly assigned to either the ultrasound group or to the traditional group. Of the 35 patients, 19 were assigned to the ultrasound group and 16 to the traditional group. The time taken for successful venous cannulation, number of attempts, and catheters used were recorded for each patient. Patient demographics including age and body mass index (BMI) were also obtained.

Results: IV cannulation on the first attempt was successful in 13 of 16 patients (81%) in the ultrasound group versus 14 of 19 patients (74%) in the traditional group ($p = 0.70$). Using ultrasound, there were a total of 26 attempts at IV insertion, versus 22 in the traditional group. Mean number of attempts for the former being 1.4 ± 0.7 and 1.3 ± 0.9 attempts for the latter ($p = 0.98$). The mean overall time per patient for catheter insertion was 303.7 ± 294.6 seconds in the ultrasound group versus 172.1 ± 222.1 seconds in the traditional group ($p = 0.14$). Times to insertion on the first attempt were 187.3 ± 228.3 seconds for ultrasound versus 78.0 ± 33.1 seconds for the traditional group ($p = 0.59$). Total number of catheters used was 1.4 ± 0.7 for the ultrasound group versus 1.3 ± 0.9 for the traditional group. BMI was 29.4 ± 10.2 for ultrasound versus 27.9 ± 7.3 for the traditional group ($p = 0.025$).

Conclusion: No significant differences were noted between the groups in relation to time to successful cannulation, number of attempts, or number of catheters used.

Although no significance was found, the portable ultrasound device did aid in cannulating 100% of those patients assigned to the ultrasound group. Ultrasound is a proven technique that can be easily learned by providers and used as an adjunct when difficulties arise in IV placement.

A7**The effect of caffeine on alertness after sedation**

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Introduction: Adenosine has been implicated in both sleep and anesthesia. Caffeine, an adenosine receptor antagonist, is well known to decrease sleepiness. We hypothesize that caffeine, which can help decrease sleepiness from sleep loss, will also decrease sleepiness after midazolam/fentanyl sedation and facilitate recovery.

Methods: On four separate occasions, subjects ($n = 12$) received an injection of midazolam 0.07 mg/kg and fentanyl 2 mcg/kg. Thirty minutes after sedation, subjects drank a cup of decaffeinated coffee that contained either placebo or caffeine 3 mg/kg. The primary dependent measure was the multiple sleep latency test (MSLT). Secondary dependent measures included the Epworth sleepiness scale (ESS), digit symbol substitution test (DSST), divided attention test, and auditory and visual reaction time (ART and VRT). These tests were performed at 2, 4, 6, and 8 hours after drug injection. Analysis of the results was performed using repeated measures analysis of variance. Measurements were repeated during the day (within-subject factor 2, 4, 6, and 8 hours after drug injection) with caffeine as the between-subjects factor.

Results: There was a significant time-of-day effect, independent of treatment, for ESS ($P < 0.001$), MSLT ($P < 0.001$), and VRT ($P < 0.001$). Overall, independent of time-of-day, subjects performed better on the DSST ($P = 0.035$) after receiving caffeine.

Conclusions: The data confirms our hypothesis that caffeine can decrease sleepiness, thereby facilitating recovery, after midazolam/fentanyl sedation.

A8**Effects of ketorolac tromethamine on platelet aggregation in porcine platelet rich plasma under simulated surgical stress**

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Introduction: Ketorolac tromethamine (KT) is a non-steroidal anti-inflammatory drug that acts as a potent, reversible, non-selective cyclo-oxygenase inhibitor. Many anesthesia providers and surgeons avoid the use

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of ketorolac due to perceived increased risk of bleeding due to its platelet inhibitory properties. This study was designed to assess the direct effects of ketorolac on platelet aggregation under simulated surgical stress in porcine platelet rich plasma (PRP).

Methods: Studies were performed using blood from healthy pigs under isoflurane anesthesia. Blood samples were drawn into 4.5 cc 3.2% buffered sodium citrate tubes. PRP was obtained by centrifuging blood samples at $100 \times g$ for 15 minutes at room temperature. Platelet count was determined using a haemocytometer. Platelet aggregation was measured in response to collagen, KT and stress hormone cocktail (norepinephrine, epinephrine and cortisol) alone or in combination, using a Chrono-log 490 dual chamber aggregometer. Data were analyzed using ANOVA, followed by Tukey's Multiple Comparisons Analysis. $P < 0.05$ was statistically significant.

Results: Treatment of PRP with collagen (1, 2, 4, 8 and 10 μg) dose-dependently (DD) increased aggregation. Pretreatment of PRP with KT (.031, .310, 3.10, 6.20 and 12.40 μM) DD decreased collagen induced aggregation. Collagen induced platelet aggregation (CIPA) with 2 μg ($99.47 \pm 7.39\%$) was not affected by stress hormone cocktail ($101.2 \pm 9.59\%$). However, CIPA was decreased by KT ($52.95 \pm 20.97\%$). Stress hormones had no effect on KT induced reduction in CIPA ($53.00 \pm 12.89\%$).

Conclusion: KT inhibited CIPA dose-dependently. The effects of KT were not altered by the presence of stress hormones in this model of simulated surgical stress. These results indicate that the use of KT in the presence of surgical stress would not increase risk to bleeding over KT alone. Similar studies are planned using human platelet rich plasma.

A9

Massage effects in female nurse anesthesia students

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Introduction: Nurse Anesthesia programs are stressful even for the most robust and hardy nurses. The experience of stress can lead to symptoms of fatigue, pain, anxiety, and depression. This study describes a pilot research project investigating the stress relieving effects of massage in female nurse anesthesia students. There is no research published that describes the effects of massage in female nurse anesthesia students. The research question and variables are: what are the effects of massage on mood, physiologic stress, symptom distress, and quality of life in female nurse anesthesia students?

Methods: In order to test the efficacy of the short massage session for intervention research, a pilot project was planned using a convenience sample of volunteer female senior nurse anesthesia students. After obtaining Institutional Review Board approval, the study was explained to the students in class by the investigator, who is also a peer. Out of 10 eligible subjects, 6 volunteered to receive the 15-minute back rub. The dependent variables are physiologic stress, measured by blood pressure and pulse, and self-report tools for the following symptoms: anxiety and depression (Hospital Anxiety and Depression Scale); mood, (the Mood Rating Scale); symptom distress, (visual analogue scales, Rotterdam symptom checklist), and quality of life (Functional Living Index-Cancer). The researcher gave the pre-tests, massage intervention, and post-tests during the lunch hour in the school skills lab.

Results: Demographics revealed the 6 Caucasian females ranged in age from 29 to 35, mean age 33.3. All had experienced at least one previous massage. The massage produced a lower systolic blood pressure for 5 subjects (83%), as well as improved quality of life scores. All 6 (100%) subjects had decreased scores for "very tense" after the massage and had improved mood scores.

Conclusions: A 15-minute back rub in a massage chair is effective in providing relaxation, decreased stress, and improved mood for female nurse anesthesia students. The findings from this pilot can be applied to other nursing intervention research studies applying massage as a relaxation method. Nurse anesthetists and students should try massage as a means of reducing personal stress, for themselves and their patients.

A10

Teaching technical writing skills

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Introduction: How do you reduce the angst in graduate students when technical writing is required? An opportunity to teach a graduate level research course in a new format was recently presented. Most research courses in graduate school have placed an emphasis on theory, style, and format. Using the technique of Action Research, which is applied research, the authors chose to structure a course of study to see if anxiety levels could be reduced when nurse anesthesia students are confronted with the requirement to write technical proposals and research reports.

Methods: Thirty-five graduate students were provided

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Likert-style self-assessment questionnaires to complete at the beginning and end of the Research Methodology course. Within the course specific training and education modules for technical writing were provided, including power-point presentations and written exercises. Emphasis was placed on writing techniques and journalistic practices. Twelve on-line exercises comprised of 365 questions and answers were completed. Written deliverables included a research question written in paragraph form and a five-page summary of a complete research proposal.

Results: Analysis of pre-course assessments showed considerable anxiety pertaining to technical writing. Most respondents indicated a comfort level of "neutral" to "uncomfortable." The post-course assessments indicated that individuals changed their feelings about technical writing from "dread" and "boredom" to "opportunity" and "excitement." Eighty-six percent of the individuals indicated that the writing modules and power-point presentations improved their writing abilities.

Conclusion: This data supports the incorporation of basic writing techniques into a research course. Teaching basic creative writing skills in a graduate level research course can significantly reduce the distress and perturbations that students frequently encounter when written projects are required.

A11

Fiberoptic assessment of laryngeal mask airway (LMA) placement: Blind insertion versus direct visual epiglottoscopy

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Introduction: Traditional blind (BLD) LMA insertion is assessed using surrogate signs to determine proper seating. Epiglottoscopy (EPG) employs a laryngoscope aiding LMA entry. The aims were to fiberoptically assess LMA position placed BLD vs with EPG, and compare resultant hemodynamics.

Methods: 132 ASA I/II patients (89 males) aged 41 ± 9 years undergoing general anesthesia for maxillofacial surgery consented to participate. LMAs #5 (n=117) or #4 were used. After sufficient intravenous propofol and fentanyl, a lubricated LMA was inserted BLD in 38 consecutive subjects then with EPG in 94. With EPG a #3 Macintosh blade was used, and the LMA was inserted until its proximal rim was all that was seen. After cuff inflation, sevoflurane, 3.0 to 5.0%, was administered in a 3/3-liter flow of N₂O/O₂ and breathing assisted to maintain etCO₂ <50 torr. A

side-arm port allowed Olympus™ fiberoptic endoscopy introduced to the LMA outlet. A Canon™ digital camera recorded images. Anatomical views were rated using a standard tool and statistics (chi-square, t-test, Mann Whitney U where appropriate) computed.

Results: Group demographics and hemodynamics were similar ($p > 0.05$). With BLD insertion, 22 (58%) were found to have the epiglottis in view, 9 (24%) experiencing >50% coverage of the glottis (LMA was repositioned). With EPG 8 (8.5%) were found to have the epiglottis in view, only 2 (2.1%) had >50% coverage of the glottis (LMA was repositioned). Statistically ($p < 0.01$) and clinically significant differences favored EPG in terms of optimal anatomical seating. Only one patient (BLD group) had clinical signs of poor placement.

Conclusion: LMAs should be optimally placed to maximize function and safety. EPG was brief, not associated with adverse hemodynamics, and was superior to BLD in achieving optimal anatomical seating. Clinical signs of incorrect seating were unreliable. The value of endoscopic assessment of LMA anatomical seating was demonstrated.

A12

BIS monitoring effects in unihemispheric dolphins

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Introduction: The use of processed EEG as a method of measuring the state of wakefulness during surgery has recently been simplified with the introduction of the Bispectral (BIS) monitor (Aspect Medical Systems) into anesthetic practice. The robust design of this new monitoring device encouraged us to use it as a monitor of the unihemispheric sleep previously reported to occur in dolphins. We proposed this unusual use of the BIS monitor in support of an ongoing research program at the Navy SPAWAR Systems Center Marine Mammal Program studying the prolonged vigilance capabilities of Atlantic bottlenose dolphins, *Tursiops truncatus*.

Methods: The monitor's leads were initially placed on a dolphin trained to "beach" itself onto a mat adjacent to its ocean holding pen. To detect differences between the two hemispheres, two BIS monitors were used simultaneously. The lead strips were placed on each side of the dolphin's skull, oriented vertically, with the end lead (#3) positioned just above and

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behind the eye. It is expected that this montage should position the leads in the closest proximity to cerebral matter and places the BIS leads near locations where previously reported EEGs had been obtained on dolphins. The experiments were conducted on multiple occasions at the marine mammal veterinary clinic at SPAWARSCEN in San Diego.

Results: This research effort is ongoing, but to date dolphins have been studied on 15 different occasions. During 4 of the 15 experiments both hemispheres simultaneously displayed BIS values that remain in the high 90s throughout the several hour observation periods, with or without diazepam pre-medication. Distinctly different unihemispheric BIS readings were seen on 8 of the 15 days observed, with low-side values of 30s-40s simultaneously with high-side values in the 80s-90s. Propofol has been used to induce general anesthesia in the monitored dolphins, and showed bilateral BIS values in the 30s. Of the many observational studies we have made in which marked asymmetry in BIS values was seen, the left side BIS was more often seen to be lower than the right side BIS.

Conclusions: Whether the observations made are a reflection of asymmetrical cardiac artifact, or simply due to some new, unsuspected, right-left hemispheric specialization, is unknown at this time. The notion that we are seeing an EEG manifestation of unihemispheric sleep remains plausible. Our demonstration of a possible basis for the prolonged vigilance capabilities of dolphins has encouraged ongoing studies of the dolphin's cerebral functioning. In addition, our demonstration of the ability to do unihemispheric monitoring with bispectral analysis may prove useful in common surgical procedures such as carotid endarterectomy.

A13

Ronald F. Caulk: Pioneer of quality international nurse anesthesia care

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Introduction: Ronald F. Caulk, CRNA, FAAN, has contributed to the profession of nurse anesthesia for many years as a clinical anesthetist, past AANA president and as the Executive Director of the International Federation of Nurse Anesthetists (IFNA). The IFNA is an international organization dedicated to the promotion of continual high quality patient care and the advancement of the art and science of anesthesiology.

The purpose of this research was to present an historical record, perspective and analysis of Ronald Caulk's professional life and his contributions to the improvement of worldwide anesthesia care. The researchers felt that making Mr. Caulk's achievements known would stimulate and encourage future generations to follow suit.

Methods: Questionnaires were developed and distributed to AANA colleagues, IFNA representatives and Mayo Foundation School of Nurse Anesthesia classmates via electronic and US mail. Interviews were conducted. Published works of Mr. Caulk and colleagues, as well as information from AANA and Mayo Archives, were utilized.

Results: Fifty-nine questionnaires were sent out. Of the fifty-nine questionnaires nine were undeliverable, six recipients declined to participate, twenty-two did not respond, and sixteen questionnaires and six oral interviews were completed.

Conclusions: Ronald Caulk departed from his family's custom of working for the telephone company to pursue a career in nurse anesthesia. He received his anesthesia education at the Mayo Clinic in 1962. Results of the questionnaires and interviews indicated Ron was perceived as a dynamic leader with strong convictions. He was viewed as a CRNA whose goal was to make the worldwide practice of anesthesia better for all patients. His IFNA involvement demonstrated his ability to reach out to people from all parts of the world to accomplish that common goal. His remarkable contributions to the Nurse Anesthesia profession in the US were recognized by many of the responders as well. He was viewed as an excellent role model for future generations.

A14

A review of current management of hyperglycemia during open heart surgery

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Introduction: Patients undergoing coronary artery bypass grafting procedures are at risk for developing stress-induced hyperglycemia. Stress-induced hyperglycemia can occur in both diabetic and non-diabetic patients. The deleterious effects of hyperglycemia include increased risk of infection, polyneuropathy, congestive heart failure, cardiogenic shock, multiple organ failure, and death. Recent studies have shown beneficial effects of decreased morbidity and mortality by maintaining normoglycemia, which can be defined as 80 to 110 mg/dl. The purpose of this study was to

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retrospectively evaluate the current management of blood sugar levels during coronary artery bypass grafting and/or valvular procedures. Current management protocols were compared to actual practice. The effect of glucose containing solutions administered such as antibiotics was also evaluated. This could have important ramifications for future anesthetic protocols for continuous insulin infusions.

Methods: A random sample of 100 patients who underwent coronary artery bypass grafting and/or valvular procedures from February 2002 to February 2004 were selected for a retrospective chart review. Data collected included: patient history of diabetes, current treatment of diabetes, blood sugar levels during various points of surgery, and management of increased blood sugar levels. Glucose containing solutions that the patient receives were also recorded. Blood glucose levels were given a score. A positive score was given for blood glucose levels less than 80 mg/dl and greater than 110 mg/dl (i.e., blood glucose of 120 mg/dl would receive a score of +10, blood glucose level of 50 mg/dl received a score of +30).

Results: Demographic data among all patients were similar. Mean glucose values at all points measured were greater than 110 mg/dl. There was a predictable increase in blood glucose values after the administration of dextrose containing solutions. The majority of these increased blood glucose levels were not treated with insulin.

Conclusion: Current blood sugar management protocols at this institution do not appear to be adhered to. Future evaluations of providers' beliefs and attitudes toward the treatment of hyperglycemia may prove beneficial.

A15

The pattern of antibiotic use in trauma patients and the associated risk of nosocomial pneumonia

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Introduction: Nosocomial pneumonia (NP) is the second most frequent nosocomial infection and the leading cause of death from hospital acquired infections. Purposes of this research were to: 1) identify categories of trauma patients receiving antibiotics; 2) identify patterns of antibiotic treatment; and 3) determine existence of a relationship between antibiotics and the development of early-onset pneumonia (EOP) vs. late-onset pneumonia (LOP).

Methods: A secondary analysis from a parent, prospec-

tive cohort study evaluated patterns of antibiotic treatment in 576 trauma patients. Antibiotics were coded into 26 different classifications. Duration of antibiotic use was coded as none, one dose, 24 hours, or greater than 24 hours. Bacteriology of EOP and LOP was identified. Descriptive statistics described the pattern of antibiotic use and pathogens involved. Logistic regression identified whether duration or class of antibiotic use was a significant predictors of EOP or LOP.

Results: The incidence of EOP and LOP was 14.3% and 12.3%, respectively; 81% of patients received antibiotics with 62% receiving antibiotics for greater than 24 hours. Orthopedic surgeries had the highest incidence of receiving antibiotics. Patients receiving beta-lactams ($B=5.2$, $p<0.0009$), or any antibiotic for only 24 hours ($B=2.1$, $p=0.036$) were more likely to develop EOP. Patients receiving cephalosporins ($B=0.42$, $p=0.013$) were less likely to have EOP. Beta-lactams ($B=6.1$, $p=0.005$), beta-lactam and cephalosporins ($B=7.8$, $p<0.0009$), combination of 2 antibiotics other ($B=7.1$, $p=0.004$), or receiving more than 2 antibiotics ($B=3.82$, $p=0.012$) increased the risk of LOP. Receiving any antibiotic for more than 24 hours ($B=2.9$, $p=0.01$) increased the risk of LOP.

Conclusions: Antibiotics for 24 hours increased the risk of EOP, while antibiotic use for greater than 24 hours increased LOP. The most frequently prescribed antibiotics were cephalosporins, which decreased risk of EOP but increased the risk of LOP when in combination with beta-lactams.

A16

Does parental perception of importance of NPO guidelines improve compliance?

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Introduction: Patient compliance with preoperative instructions such as NPO guidelines is an essential component in avoiding intraoperative-postoperative morbidity and mortality and surgery cancellation. Researchers have examined the relationship between preoperative education, comprehension, and compliance with NPO guidelines in the adult patient. Studies exist addressing the relationship between parental understanding and compliance with types of postoperative instructions. However, research addressing the relationship between parental understanding of and compliance with NPO guidelines is lacking. The purpose of this study was to determine if the perceived importance of NPO guidelines improved parental compliance.

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Methods: Following a post-test only design, parents of children scheduled for surgery between the ages of 2-12 years were given detailed, scripted NPO guidelines via phone by preadmission nurses. The guidelines included the importance of NPO compliance. Parents were given a questionnaire the day of surgery. Completed questionnaires were placed anonymously in locked containers. Sixty-four surveys were collected, 20 were eliminated because the child was outside the age range.

Results: Although reported compliance with NPO guidelines was greater than 99%, results of regression analysis did not indicate that perceived importance of NPO guidelines was a factor in compliance with NPO guidelines. Examination of Pearson's coefficients revealed correlations between three pairs of individual variables that were statistically significant; however, the strength of the associations was mild.

Conclusion: The small sample size may have resulted from a lack of compliance from support departments critical to the study. Interestingly, despite the scripted NPO guidelines containing updated NPO instructions, many parents reported receiving "NPO after midnight" instructions. Whether this was a result of incorrect delivery or incorrect perception is not known. Correlations between three of the variables—type of instructions received, type of educator, and clarity of instructions—warrant further investigation in order to determine methods of improving NPO guideline delivery to parents.

A17

Performance of portable anesthesia machine ventilators across worsening lung conditions

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Introduction: Critically wounded casualties may develop worsening airway resistance (R) and/or decreased lung compliance (C). Sophisticated anesthesia ventilators or critical care ventilators are not available in austere settings. This study compared delivered (del) tidal volumes (VT) of 3 field anesthesia ventilators: Uni-Vent 754M with Universal Portable Anesthesia Complete (754), Magellan (MAG), and Narkomed M (NM) across lung conditions.

Methods: A lung simulator was used at normal R and C (Cond1), high R and low C (Cond2), and very high R and very low C (Cond3). Set VTs were 480, 640, and 880 ml; 0 and 5 cm water PEEP. Differences in del and

set VT were compared during Cond1 using paired Student's t-test ($p < \text{or} = 0.05$). Differences in delivered VT during Cond1 and delivered VT during Cond2 and during Cond3 were compared using ANOVA ($p < \text{or} = 0.05$).

Results: Differences in del and set VTs during Cond1 were statistically but not clinically significant. There were statistically and clinically significant differences in del VT between Cond1 and Cond2 and between Cond1 and Cond3 that exceeded the compressible volume of the circuit. Example: VT = 880 ml and PEEP = 0 cm water, difference between del VT during Cond1 and Cond3 for 754, MAG, and NM were 30, 385, and 191 ml, respectively.

Conclusion: Del VT with MAG and NM dropped when lung conditions worsened due to a decrease in inspiratory flow. Adequacy of ventilation must always be monitored and manufacturers should use these findings in designing future devices.

A18

Determination of microbial contamination on the laryngoscope handle at the start and end of the day

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Introduction: The laryngoscope is a commonly utilized instrument in anesthesia practice, which aids the anesthesia provider during laryngoscopy. Laryngoscopy may be the most commonly used invasive procedure performed by the anesthesia provider. During laryngoscopy the laryngoscope comes in contact with mucous membranes, saliva, and sometimes blood. The laryngoscope blade may be contaminated when it touches the handle when in the closed position. This study focused on the incidence of microbial contamination on the laryngoscope handle at the beginning and end of the workday.

Methods: A total of 102 laryngoscope handles were cultured for gram-positive and gram-negative organisms. Handles were chosen from operating rooms in which general anesthesia, requiring endotracheal intubation was administered. The selected handles were discretely marked and swabbed at the beginning and end of the workday. After the handles had been swabbed, gram-positive (phenylethyl alcohol, PEA) and gram-negative (MacConkey agar, MC) selective media were streaked with the swab. Culture plates were then incubated for 24 hrs at 35°C. After incuba-

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tion, colonies were counted and recorded. Statistical analysis was performed using the Wilcoxon signed rank test.

Results: Statistical analysis revealed no significant difference in the number of colonies between beginning and end of the workday. No gram-negative organisms were detected. However, 60% of the handles tested were contaminated with gram-positive microorganisms.

Conclusion: These findings identify the laryngoscope handle as a potential source of cross contamination.

A19

Desflurane vs sevoflurane recovery times in laparoscopic gastric bypass patients

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Introduction: With the increase demand to provide safe, cost-effective anesthesia with rapid wake-up times, using less soluble volatile agents in the morbidly obese has been advocated. In recent studies, the use of desflurane instead of sevoflurane was associated with faster immediate recovery. Desflurane has also been reported to cause less postoperative sedation and improve patient mobility in the morbidly obese. The purpose of this study was to calculate and compare the difference between surgical and anesthetic end times of desflurane and sevoflurane in laparoscopic gastric bypass patients.

Methods: After local IRB approval and informed consent, patients undergoing laparoscopic gastric bypass were randomly assigned to receive desflurane or sevoflurane. Surgical and anesthetic end times were recorded and compared.

Results: There were a total of 35 bariatric surgical patients. Sixteen received desflurane and 19 received sevoflurane. The difference between surgical and anesthetic end times ranged from 9 to 33 minutes with a mean of 18.25 minutes for the desflurane group. Patients receiving sevoflurane had a range of 11 to 66 minutes for a mean of 23.32 minutes. This demonstrates, on average, a quicker recovery of 4.32 minutes with desflurane. The p value between these two groups was 0.216.

Conclusion: In this small patient population, desflurane may be the volatile anesthetic of choice with a faster recovery time. Operating room and anesthesia charges are based on time. A cost savings could be passed on to the hospital, insurer, and patient. Further evaluation of desflurane and sevoflurane in bariatric surgical patients is needed.

A20

Effects of tobacco smoking on measures of cold-induced pain

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Introduction: Nicotine's effect on human pain perception is uncertain. This study's purpose was to determine whether pain thresholds, pain tolerances, or ratings of pain intensity differ among smokers (S), non-smokers (NS), and abstaining smokers (AS).

Methods: A total of 29 male and female smoking and non-smoking subjects participated. Smokers were randomly assigned to either smoke 1 cigarette 15 minutes prior to testing (S group) or abstain from smoking for 10 hours prior to testing (AS group). Pain was induced by employing the cold pressor test. Pain threshold, pain tolerance, and a rating of pain intensity were measured and compared among groups. Pain threshold was the time from the beginning of the cold pressor test to the subject's report of pain. Pain tolerance was measured from the pain threshold to the subject's voluntary removal of the extremity from the cold pressor test apparatus. Pain intensity was measured using a visual analog scale.

Results: Pain tolerance and ratings of pain intensity did not differ among the three groups. The S group had a significantly higher pain threshold ($\bar{x} = 35.51 \pm 19.76$ s) than the NS group ($\bar{x} = 16.32 \pm 8.96$ s) ($p = 0.013$; $\alpha = 0.05$).

Conclusions: Nicotine may attenuate the sensation of pain in humans, suggesting that pain management may need to be adjusted for abstaining smokers. Further research is warranted.

A21

The incidence of postoperative myalgias following an induction dose of succinylcholine: Self taming with succinylcholine versus pre-treatment with vecuronium

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Introduction: One of the most frequent side effects of succinylcholine is post-operative myalgia. Many methods have been employed to reduce the fasciculations that occur with succinylcholine, and may theoretically reduce the subsequent post-operative myalgias. This study will compare how a self taming dose

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of succinylcholine and a pre-treating dose of vecuronium affect the incidence of fasciculations and post-operative myalgias.

Methods: A convenience sample of forty outpatients and inpatients, ASA I-III, were randomly selected. After random assignment, the participants received either 1 mg of vecuronium 2.5 minutes prior to receiving 100 mg of succinylcholine or a self taming 10 mg dose of succinylcholine 45 seconds prior to receiving 100 mg of succinylcholine. The fasciculations were rated from 0-3, using a tool developed by Hochhalter. The patients were contacted within 24 hours after surgery via telephone and asked to rate their muscle discomfort unrelated to surgical incision site using a VAS scale of 0-10.

Results: There were eighteen patients in the group receiving the vecuronium pre-treatment and twenty-two patients that received the self taming dose of succinylcholine. Thirty-eight were female and two were males. Severity of fasciculations and post-operative myalgia were significantly higher among the group receiving the self taming dose of succinylcholine as compared to the pre-treatment with vecuronium. However, there was no correlation between the severity of fasciculations and the severity of post-operative myalgias.

Conclusions: There was no evidence that fasciculations correlated with post-operative myalgias. However, the vecuronium group experienced fewer fasciculations and post-operative myalgias. When succinylcholine is indicated for induction of anesthesia, perhaps pre-treatment with vecuronium can be helpful in promoting patient comfort.

A22

Anesthesia manpower survey for Michigan counties with populations less than 250,000

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Introduction: The purpose of this study was to examine the current and future nurse anesthesia manpower need for Michigan counties with populations < 250,000. In a 1990 AANA study, it was estimated that 35,000 CRNAs would be needed by the year 2010. With the growth rate projected at 1% annually, and CRNAs providing 65% of anesthetics nationwide, a CRNA shortage in Michigan is predicted that will increase in the next three to five years.

Methods: IRB exemption was received. The population of each of the 83 Michigan counties was obtained from

the US Census Bureau. A hospital list from the Michigan Hospital Association was obtained, and all hospitals in counties with a population < 250,000 were included. Surveys were mailed to 109 chief CRNAs of hospitals in the 76 counties that met the population requirement. The survey asked each chief CRNA of his or her respective hospital's current, one year, and three to five year FTE projections for CRNAs.

Results: Data showed there is currently a greater demand than supply of CRNAs in 45 of 109 Michigan hospitals surveyed (response rate = 41.2%). At present there is an average of 0.77 FTE positions open with a predicted one year need of 0.87 FTE. The three to five year projected average is 1.3 open FTE positions per hospital.

Conclusion: After examining the data, it appears there is a projected increase in CRNA demand of nearly 41% over the next three to five years at Michigan hospitals located in counties with populations < 250,000. Extrapolating the data to 109 hospitals results in predicting each hospital needing at least 1 additional full-time CRNA working 52 hours a week. This would translate into nearly 200 CRNAs needed in the next three to five years for Michigan counties with < 250,000 population.

A23

Readiness estimate and deployability index for Air Force nurse anesthetists

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Introduction: Air Force Certified Registered Nurse Anesthetists (CRNAs) play an irreplaceable role in deployed surgical capabilities. The aim of this descriptive study is to provide Air Force leadership with an assessment of CRNA readiness for deployment. Variables are organized into six components which include: (1) clinical competencies, (2) operational competencies, (3) soldier survival skills, (4) personal/psychosocial/ physical readiness, (5) leadership and administrative support, and (6) group integration and identification.

Methods: Readiness Skills Verifications for Air Force CRNAs were utilized to develop clinical competency questions. Two deployment experts reviewed the survey to determine content validity. All 105 stateside Air Force CRNAs were surveyed using the Readiness Estimate and Deployability Index Revised for Air Force Nurse Anesthetists (READI-AFNA) with a 63% return rate.

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Results: Descriptive statistics described the following mean scores on a five-point scale for the six components of medical readiness: (1) clinical competencies 4.38, (2) operational competencies 3.73, (3) soldier survival skills 3.93, (4) personal/psychosocial/ physical readiness 4.62, (5) leadership and administrative support 3.78, and (6) group integration and identification 4.01.

Conclusion: Overall, participants rated themselves a readiness score of 4.094. This suggests that Air Force CRNAs perceive themselves ready to deploy when called upon.

A24

Does pneumoperitoneum affect cardiopulmonary parameters during laparoscopic nephrectomy?

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Introduction: Surgical position and CO₂ pneumoperitoneum (PNP) can have cardiopulmonary effects. Typical monitoring includes end-tidal (ET) CO₂. We investigated whether ET CO₂ accurately reflects arterial CO₂ during laparoscopic nephrectomy in the lateral decubitus (LD) position and whether there were significant cardiopulmonary changes.

Methods: After institutional approval and informed consent, seven patients scheduled for laparoscopic nephrectomy were enrolled. After general anesthesia induction, patients received a tidal volume of 10 cc/kg at a rate of 10 breaths/min. Data was obtained before pneumoperitoneum of 15 mm Hg in supine and lateral decubitus positions and supine after deflation. Data was obtained 30 minutes after pneumoperitoneum and then hourly pneumoperitoneum deflation. The following parameters were measured: SBP, DBP, MABP, HR, SpO₂, ET CO₂, ABG, and peak inspiratory and plateau pressures.

Results: Pearson correlation revealed that ET CO₂ and arterial CO₂ did correlate. Compared to baseline supine, there was a significant change in ET and arterial CO₂, MABP, pH, and peak inspiratory pressure.

Conclusion: Pneumoperitoneum was associated with significant changes in cardiopulmonary variables. Although the ET and arterial CO₂ did correlate, there was noted to be an increased gradient with longer durations of pneumoperitoneum. This trend would require additional study to see if this correlation would continue during laparoscopy involving longer pneumoperitoneum.

A25

Preadmission airway assessment using the upper lip bite test and thyromental distance to predict the difficult airway

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Introduction: Difficult endotracheal intubation is a major source of morbidity and mortality in anesthesia practice. Early detection through use of a simple airway assessment is the best prevention. Identifying a difficult airway in the preadmission testing clinic allows for preemptive planning for the necessary equipment and time to ensure the safety of the patient. We hypothesized the upper lip bite test (ULBT) and thyromental distance measurement airway assessments to be predictive of the difficult airway when performed by the nurses in the preadmission testing clinic (PAT) and the anesthesia providers preoperatively.

Methods: The ULBT and thyromental distance measurement airway assessments were performed on 112 patients by the nurses in PAT and the day of surgery by the anesthesia providers. Laryngeal grade, number of attempts and alternative methods of intubation were recorded and used to determine the difficulty of the airway. Predictability was determined by way of statistical analysis using correlation and linear regression.

Results: We can reject the hypothesis that there is no relationship between the anesthesia providers' ULBT assessment and the difficult airway. And, the correlation between the ULBT assessment by the nurses and the anesthesia provider indicates strong support for the relationship between the nurses' ULBT assessment and the difficult airway. We cannot reject the hypothesis that there is no relationship between the thyromental distance measurement by the nurses nor the anesthesia providers.

Conclusions: Nurses in PAT and anesthesia providers can use the ULBT to predict the difficult airway. Thyromental distance measurement can be complicated to measure accurately on many patients and is not a good predictor of the difficult airway even when used with the upper lip bite test.

A26

The effect of intraoperative ketorolac on the postcesarean section analgesic requirements in groups of parturients given a morphine-fentanyl-bupivacaine spinal anesthetic

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Introduction: Intrathecal opioids are often part of the anesthesia plan for cesarean section patients. The subarachnoid administration of morphine, fentanyl and the local anesthetic bupivacaine is particularly effective at providing intraoperative and postoperative anesthesia and analgesia in this patient population. Many providers however, choose to supplement this regimen with administration of intravenous (IV) ketorolac tromethamine, a potent non-steroidal anti-inflammatory drug (NSAID), during the intraoperative period and cite improved outcomes and reduced postoperative opioid analgesic requirement as their rationale. This practice limits the number of postoperative ketorolac doses available for treatment of pain experienced subsequent to the intrathecal opioid effect. The purpose of this prospective, randomized, double blind, placebo-controlled study is to evaluate whether the intraoperative administration of IV ketorolac tromethamine impacts the total postoperative analgesic requirements in a group of cesarean section patients who have received a morphine/fentanyl/bupivacaine spinal anesthetic.

Methods: A convenience sample of 66 subjects undergoing elective cesarean section were randomized to receive either 30 milligrams (mg) of IV ketorolac tromethamine or normal saline placebo 15 to 30 minutes prior to skin closure. Data collected included 0-10 verbal numerical rating scale scores for pain, total postoperative opioid consumption, demographic variables and overall satisfaction with postoperative analgesia. The data was analyzed using descriptive and inferential statistics including t-test, chi-square and the Mann-Whitney U test. A p-value of < 0.05 was considered significant.

Results: To date, 48 subjects have completed the study protocol. Preliminary analysis reveals no significant difference between groups specific to demographic information, postoperative VNRS scores ($p = 0.325$), total postoperative morphine equivalents ($p = 0.092$), or satisfaction scores ($p = 0.490$).

Conclusions: Based on the preliminary analysis there is no apparent basis for administering intraoperative doses of ketorolac in this population. This practice would then allow additional doses to be available for analgesia in the timeframe where the effects of the intrathecal opioid has diminished or disappeared.

A27

A correlation study of three different airway assessment techniques and successful intubations

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Introduction: Failure to establish a patent airway following induction of general anesthesia is one of the most frequent causes of anesthesia related morbidity and mortality. The Mallampati scoring system has been the gold standard for airway assessment; however, this tool alone fails to take into consideration factors that make intubation difficult. Recent research has demonstrated the predictive power of neck circumference and the Upper Lip Bite Test. The purpose of this research was to evaluate these three assessment tools and correlate them with the view obtained on laryngoscopy and the ease of intubation.

Methods: Following informed consent, a convenience sample of 100 ASA I-III patients, aged 18-80 undergoing general endotracheal anesthesia were enrolled. Demographic data and an airway assessment were completed in the pre-operative holding area utilizing the three different techniques. Induction of general anesthesia was performed by the anesthesia provider and upon completion of intubation, the provider recorded information regarding visualization of vocal cords, number of attempts required as well as data about their anesthesia experience, and other demographic data on the patient.

Results: Of the three assessment tools evaluated only the neck circumference correlated with the view on laryngoscopy. The greater the neck circumference the less likely the entire laryngeal inlet would be visualized. An analysis of the demographic variables demonstrated a positive correlation between weight and the number of attempts required for successful intubation.

Conclusion: This research demonstrated that body weight and neck circumference were the variables that correlated with factors associated with difficult intubations. The Mallampati scoring system and the Upper Lip Bite Test failed to predict the view that would be obtained on laryngoscopy. This study found that the higher the patient's weight and neck circumference the more likely the intubation would be difficult.

A28

Is the use of Hespan beneficial during bariatric surgery?

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Introduction: Obesity is an increasingly common metabolic disease affecting over 33% of the population in the United States. According to the literature, patients undergoing gastric bypass surgery are at greater risk for hypovolemia than the rest of the surgical population. Hypovolemia can result in postoperative complications such as tachycardia, hypotension and decreased urine output. The purpose of this study is to demonstrate the impact colloid therapy has on postoperative well being such as vital signs, urine output, laboratory values and fluid boluses.

Introduction: This was a convenience sample involving 64 patients having bariatric surgery involving Roux-en-Y gastric bypass surgery. Written informed patient consent and IRB approval was obtained. Inclusion criteria consisted of patients between 18-65 years of age, ASA II or III, having bariatric surgery. Patients with evidence of clinically significant cardiovascular, pulmonary, gastrointestinal, hepatic, renal, endocrine, neurological, metabolic, or psychiatric disease were excluded.

Methods: Study patients were placed into two groups by a non-randomized method. Control group subjects received a minimum of 20 ml/kg crystalloid intraoperatively, while the experimental subjects received a minimum of 500 cc colloid preoperatively, 5 cc/kg colloid intraoperatively, and 15 ml/kg crystalloid intraoperatively. Data regarding postoperative patient vital signs, urine output, laboratory values, and extra fluid boluses were collected.

Results: The results of postoperative data demonstrated there were no significant differences between groups in regard to vital signs, urine output, laboratory values or extra fluid boluses required.

Conclusion: There were no clear differences in patient vital signs, urine output, laboratory values or extra fluid boluses with the use of colloids in the bariatric population. This study is in agreement with current literature and further study is recommended..

A29

A history of nurse anesthesia in the Air Force

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Introduction: Current military and civilian CRNA his-

tory papers do not have a United States Air Force focus. This study will expand on the history of roles, relationships and techniques of the CRNA profession. The purpose of this qualitative study will be to historically describe the roles, professional relationships and techniques among nurse anesthetists in the Air Force since 1951.

Methods: CRNAs who have served on active duty in the United States Air Force were included in the sample. These interviews gathered information regarding the history of nurse anesthesia in the Air Force. Descriptive information from these interviews described the changing roles, techniques and relationships of the target population. The structured interview technique, with focused questions and probes, was utilized as the instrument for data collection. Reliability and validity concerns were met using the accepted qualitative standards of confirmability, transferability, consistency, and truth-value. The data was analyzed by chronology and topic in order to describe the progression of roles, relationships and techniques.

Results: The 11 telephone interviews were completed from CRNAs who served on active duty in the Air Force. Taped recordings were made of these interviews and transcribed. Both researchers looked for common themes, progression of roles, relationships, and techniques in all interviews.

Conclusion: Results demonstrated that commonality of experience was in evidence from those CRNAs interviewed. These commonalities included autonomy of practice, lack of understanding of the roles and responsibilities of the CRNA from other health care professionals, and advances in technologies in patient monitoring and anesthetic delivery over time.

A30

Effect of chronic angiotensin converting enzyme inhibition and angiotensin receptor blockade on blood pressure during general anesthesia. Should ACEI therapy be stopped before elective surgery?

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Introduction: Angiotensin converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARB) are increasingly being used in the management of hypertension and congestive heart failure. Several authors have reported refractory intraoperative hypotension in patients chronically treated with ACE

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inhibitors. The objective of this study is to delineate the effects of chronic ACE inhibition on intraoperative blood pressure, fluid and vasopressor requirements.

Methods: We prospectively investigated the effects of perioperative continuation versus withdrawal of chronic ACE inhibition in 269 surgical patients undergoing non-cardiac surgery at our institution. Patients either continued ACEI and ARB until the day of surgery or stopped the day prior to surgery. Data was abstracted from the computerized anesthetic record, preoperative evaluation record and medical record. Parameters analyzed included intraoperative blood pressure, type and dose of anesthetics utilized, total amount of intravenous fluids administered, vasopressor requirements and co-morbidities.

Results: There was a significant difference ($p=0.02$) between two groups (ACEI/ARB taken ≥ 10 hours prior to surgery and <10 hours prior to surgery) in regard to moderate hypotension.

Conclusions: The majority of clinical opinions and individual practices within anesthesia regarding intraoperative hemodynamic instability associated with the use of ACEI and ARB are based on isolated case reports. There is currently no consensus on the appropriate perioperative use of ACEI and ARB. Furthermore, no definitive evidence has demonstrated that intraoperative hemodynamic instability is directly associated with the perioperative use of ACEI and ARB; in addition, no clinically significant impact of such changes on overall patient outcome has been demonstrated. Our final results indicated an increased incidence of moderate hypotension if ACEI/ARB was taken <10 hours prior to induction. Hypotensive episodes can be reduced if timing of last ACEI/ARB dose is >10 hours.

A31

The effects of anesthetic technique on adverse outcomes following carotid endarterectomy

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Introduction: CEA surgery can be performed successfully utilizing both regional or general anesthesia; controversy remains as to which one, if either, affects postoperative physiologic outcomes. The purpose of this research was to determine if there was a difference between regional or general anesthesia in complications and length of hospitalization.

Methods: After IRB approval was obtained, a retrospective chart review was performed ($n=44$) on a convenience sample of those who had CEA surgery between the dates of 2002 and 2004 in a large urban hospital in northern Ohio. Demographic data and data specific to clinical outcomes was gathered, as well as anesthesia technique used. This information was recorded on a self-designed instrument.

Results: There was a statistically significant difference in the mean ages of the two groups; regional anesthesia group 71 years versus the general anesthesia group 64 years ($p < 0.05$). The length of surgical time and time spent in the post-anesthesia recovery unit were similar between both groups. There was no statistically significant difference seen in mortality and morbidity between the groups. A statistically significant difference was observed, however, regarding length of stay in the hospital: 6.5 days for the general group and 2.7 for the regional group ($p < 0.05$). The regional group was also noted to have significantly higher intraoperative mean arterial blood pressures compared to the general anesthesia group ($p < 0.05$).

Conclusions: This study found that older patients were selected for a regional technique more often than their younger counterparts. The regional groups' mean length of hospitalization was 3.8 days less than patients who received general anesthesia. The complication rate was comparable in the two groups. Future research may evaluate the factors that prolonged the length of stay in the patients receiving general anesthesia. The benefit of higher intraoperative blood pressures may be an area of further investigation. The hospital savings associated with a decreased length of stay in this population is an area of suggested inquiry.