## RESEARCH ORAL POSTER PRESENTATION AWARD WINNERS

### RS1 Self-described Nursing Responses Experienced During Care of Dying Patients: A Qualitative Study

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**Purpose:** To understand the lived experiences and feelings encountered by critical care nurses while providing care for dying patients and their families. This research fills gaps in our understanding of these lived experiences, feelings, and their respective consequences encountered by bedside clinicians during provision of end-of-life care for the patient and family unit. **Background/Significance:** Critical care nurses frequently, and at times on short notice, care for dying patients and their families. Nurses providing end-of-life care encounter multiple feelings and stressors along a spectrum of intensity, which can be surprising and occur outside a contextual framework for the clinician to interpret and internalize. Little is known about nurses' responses to end-of-life care and how their response affects them as they care for dying patients and their families and in other areas of their lives. **Method:** A descriptive phenomenological study was conducted and a purposive sampling strategy used to recruit 19 critical care nurses with experience caring for dying patients and their families. Individual, private interviews were conducted that were audio-recorded and transcribed verbatim. Each nurse was asked open-ended questions about their experiences, feelings, and responses encountered while caring for dying patients and their families. Coliazzi's method of data analysis was applied to inductively determine themes, clusters, and categories of responses. Data saturation was achieved when no new themes or responses were identified as sample size increased. Methodological rigor was then established. **Result:** Five main categories were identified: stress, frustration, sadness, relief, and personalizing the experience. Nurses often experienced stress and frustration when providing end-of-life care and felt sadness and relief after the patient's death. Nurses described personalizing end-of-life experiences when care triggered past feelings and evoked strong emotions from prior experiences, making emotions more intense and difficult to resolve. Patients' age shaped emotional responses in that older patients' dying often elicited relief. Younger patients dying often caused frustration and sadness. Role-modeling coping, self-care, and teaching as well as mentoring novices were important to participants. **Conclusion:** Study results have important implications for practice, education, and research. Critical care nurses may be unready for deep emotional and personal responses faced when caring for dying patients and their families. Teaching and preparation in nursing education and critical care orientation for these feelings and responses faced during end-of-life care is crucial. Future research should focus on optimal mentoring and preparation for end-of-life care for nurses to best assimilate their responses.

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### RS2 Patients' Experiences of Adult Extracorporeal Membrane Oxygenation

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**Purpose:** This investigation was part of a larger qualitative study to understand the experience of extracorporeal membrane oxygenation (ECMO) from the perspectives of adult patients and family members. The purpose of the present study was to describe the experiences of adults treated with ECMO by exploring (1) onset of symptoms through recovery and survivorship; (2) impact on physical, psychological, cognitive, functional, and social well-being; and (3) interactions with health care providers (HCPs). **Background/Significance:** ECMO is a complex rescue treatment for patients with severe but potentially reversible heart and/or lung failure and is associated with high rates of morbidity and mortality. Long-term sequelae (physical, psychological, functional, and social) for ECMO survivors are common. This highly technical therapy presents unique challenges to patients. Their experiences during and after treatment with ECMO are not well understood. **Method:** This study was guided by the qualitative method of interpretive description. In-depth, semistructured interviews of 16 adult survivors of ECMO who were treated at 1 of 2 regional ECMO centers in the northeastern United States were conducted. Additional data were collected from demographic questionnaires, field notes, memos, and medical record review. Qualitative data were analyzed using thematic analysis techniques; data saturation was reached. Two investigators inductively coded transcripts and reached consensus by discussion during all data analysis and interpretation decisions. Member checking was completed with 50% of the sample. **Result:** Most participants were male (75%); ages were from 23 to 65 years. Mean duration from hospital discharge to interviews was 54 (SD 28)

months. Survivors progressed through 3 stages: critical illness, recovery, and survivorship. Participants described short- and long-term impacts of the ECMO experience on aspects of their physical (eg, profound weakness, neurovascular injuries), psychological (eg, anxiety, depression, posttraumatic stress), cognitive (eg, impaired memory), functional (eg, limitations in driving), and social (eg, social isolation) well-being. All were deeply influenced by their own specific situations, family support, and interactions with HCPs. **Conclusion:** The ECMO experience was life altering, shattering, intense, and traumatic. Recoveries were bolstered by the support and advocacy of family, friends, and HCPs. Survivors would most likely benefit from predischarge screening to identify mental and/or physical health problems, opportunities for peer support, and comprehensive health services provided in a post–intensive care unit follow-up clinic. Despite the difficult and complex nature of this experience, most survivors can go on to recover and live full lives.

## RESEARCH POSTERS

### RS3 A Retrospective Study of Postoperative Pain Control in Patients With History of Marijuana Use Who Have Undergone Cardiac Surgery

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**Purpose:** To determine if patients who report using marijuana before surgery require more opiates to achieve adequate pain control in the postoperative period than patients who deny using marijuana and undergo the same surgery. This nurse-led study was done to evaluate opiate use of these 2 contrasting populations after open heart surgery. **Background/Significance:** This research occurred in a state that was among the first to legalize recreational marijuana. Since state legislation legalized marijuana use, health care workers have noticed an anecdotal increase in the number of patients who disclose marijuana use and in the amount of narcotic medication required to alleviate pain for that group of patients. Little has been published on the effects of withholding marijuana from patients experiencing acute pain. **Method:** In this study, data were collected on 200 patients who underwent thoracic surgery with sternotomy during the 4 years beginning in 2015 and ending in 2018. A list of patients who affirmed using marijuana during screening before their surgical procedure was provided by the Society of Thoracic Surgery Abstractor for the hospital, as was a list of patients who denied marijuana use. The latter were used as a control group. The principal investigator reviewed the opiate use of each patient for 4 days postoperatively and converted the doses and medications used to oral morphine equivalents. The investigator then compared opiate use in each group, examining daily and 4-day totals. **Result:** Patients reporting marijuana use received more than 200% of the amount of opiates that the nonuser group did. This difference was seen in daily and 4-day totals of opiates used. Daily totals showed that the comparison group (users) consistently required at least 4 times more intravenous dilaudid than did the control group. This contrast was seen not only in the immediate postoperative period: on consecutive days, the totals used by the user group remained more than twice what the control group used. These results were validated as clinically statistically significant ($P < .001$ at a 95% confidence level). **Conclusion:** According to these study findings, patients who use marijuana can be expected to need more opiates than their counterparts when they are hospitalized. Additional research should examine the efficacy of pain medication and nonpharmacological comfort measures in this patient group. Furthermore, the results illustrate that patients and care providers need to have open and honest discussions about marijuana use. Such discussions will provide more informed care and promote additional research on this topic.

### RS4 Chlorhexidine Oral Care for Patients Receiving Ventilatory Support: Does It Make a Difference in Outcomes?

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**Purpose:** On the basis of results of randomized clinical trials and meta-analyses, chlorhexidine gluconate (CHX) is considered a standard of oral care to prevent ventilator-associated pneumonia (VAP) in patients receiving mechanical ventilatory (MV) support. However, recent evidence has led some researchers to question its effectiveness. The purpose of this study was to compare outcomes of CHX on ventilator-associated events, VAP, duration of MV support, intensive care unit (ICU) length of stay (LOS), deaths, and antibiotic use. **Background/Significance:** CHX is routinely used as part of the ventilator bundle to prevent VAP in patients receiving MV support. Although some trials have shown reduction in VAP with routine CHX, recent meta-analyses and a Canadian-led critical appraisal showed benefits only for patients who had undergone cardiothoracic surgery; no differences in VAP, ventilator hours, ICU LOS, or antibiotic use were found in other populations. Opportunities exist to explore CHX outcomes when standard oral care is provided. **Method:** This study is an exploratory analysis of secondary data collected for a trial in which an oral suction intervention on aspiration was evaluated. All patients received oral cleansing every 4 hours, toothbrushing every 12 hours, and CHX 0.12% every 12 hours only if ordered. Patients (N = 513)

were recruited from 5 ICUs within 24 hours of intubation; 410 were enrolled from at least 36 hours (end point) up to 14 days. Outcome variables were as follows: (1) ventilator-associated events (ie, ventilator-associated conditions [VACs], infection-related VACs [IVACs], and probable VAP [pVAP]) per the US Centers for Disease Control and Prevention algorithm; (2) number of ventilator hours; (3) ICU LOS; (4) antibiotic use; and (5) death. Data were analyzed using $\chi^2$, Mann-Whitney *U*, and logistic regression statistics. **Result:** Patients were categorized as having received CHX rinse on at least 50% of days (n = 297) or as receiving CHX rinse on less than 50% of days (n = 113). More than half (59%) were male, 74% were white, 19% were Hispanic, and the mean age was 59 years. Demographics did not differ significantly between groups ($P > .05$) except the CHX group had a lower Acute Physiology and Chronic Health Evaluation II (APACHE II) score ($P < .001$). Per the $\chi^2$ test, there were no differences between groups for VAC ($P = .68$), IVAC ($P = .40$), or pVAP ($P = .32$); the CHX group had fewer deaths ($P = .006$). Per results of Mann-Whitney *U* testing, no significant differences were found in percent antibiotic use ($P = .42$) or number of ventilator hours ($P = .21$); the CHX group had a longer ICU LOS ($P = .03$). Backward logistic regression using 6 predictors for death identified 4 variables that accounted for 14% of the variance: VAC (odds ratio [OR], 2.6), APACHE II score (OR, 1.07), age (OR, 1.02), and percent CHX days (OR, 0.99). **Conclusion:** Application of CHX rinse resulted in no differences in clinical outcomes of VAC, IVAC, pVAP, or percent antibiotic days. Use of CHX was associated with a 1-day longer ICU LOS and a small reduction in the number of deaths. The benefits of CHX should be evaluated further in a multisite, double-blinded, randomized clinical trial to answer the questions regarding CHX benefits. A team approach that ensures that standardized oral care is provided around the clock may be adequate in preventing complications in intubated patients receiving ventilatory support.
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**RS5 Comparison of Nasal and Forehead Oximetry Accuracy and Pressure Injury in Patients With a Ventricular Assist Device or Receiving Extracorporeal Membrane Oxygenation**

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**Purpose:** To determine the accuracy of values obtained from nasal alar and forehead sensors in comparison to oxyhemoglobin saturation measurements, per arterial sampling, in patients with a ventricular assist device (VAD) and/or an extracorporeal membrane oxygenation (ECMO) device; and to compare the incidence of device-related pressure injuries with each sensor. **Background/Significance:** Pulse oximetry requires a clear pulsatile signal. Obtaining a strong signal in patients with a VAD and/or who are receiving ECMO therapy can be challenging. Centrally placed oxygen saturation devices like nasal alar or forehead sensors are used for critically ill patients who experience decreased perfusion. However, owing to decreased perfusion and their critically ill state, these patients are at increased risk for a device-related pressure injury. **Method:** Patients (N = 24) with a VAD and/or receiving ECMO therapy in the cardiothoracic intensive care unit had a forehead sensor and nasal alar sensor applied per manufacturer's recommendations. Arterial saturation measurements were obtained at 0, 24, and 120 hours. Sensor measurements were recorded at the same time as blood samples were collected for laboratory tests. Skin was assessed every 8 hours for the first 20 patients and every 4 hours for patients 21 through 24, with relocation of the sensor to the opposite nare or forehead side for up to 5 days. Sensors were immediately removed when a skin injury was observed. Bland-Altman analysis was conducted, and clinical accuracy was defined as sensor measurement within 3% of laboratory oxygen saturation measurement in blood samples. **Result:** Most of the patients were receiving ECMO and were receiving an epinephrine infusion at each time period. The mean Acute Physiology and Chronic Health Evaluation IV score was 89 (SD 37.4), and the mean age of patients was 44.2 (SD 11.3) years. Laboratory oxygen saturation measurements in blood samples were from 84% to 98%. Five measurements with the nasal sensor and 9 measurements with the forehead sensor had no signal. More measurements were within 3% of laboratory oxygen saturation values for the nasal ala (73.5%) than for the forehead (44.9%; $P = .004$). Bland-Altman analysis on 51 comparisons demonstrated a bias of -1 for the nasal sensor with laboratory measurement and 2.1 for the forehead sensor with laboratory measurement. One stage 2 pressure injury developed at 28 hours in the nasal ala of 1 patient, and a stage 1 injury developed at 24 hours on the forehead of another patient. **Conclusion:** In this group of patients with decreased perfusion due to VAD and/or ECMO cardiac support, nasal alar sensors had better accuracy and fewer measurement failures. However, some patients still provided challenges with obtaining an accurate signal. The nasal alar sensor and forehead sensor had the same occurrence of pressure injury.

**RS6 Critical Care Nurses' Work Environment, Compassion Satisfaction, and Compassion Fatigue**

*Tara Sacco, Nancy Sharts-Hopko, Helene Moriarty; St John Fisher College, Rochester, NY*

**Purpose:** Guided by the Compassion Satisfaction-Compassion Fatigue Model and American Association of Critical-Care Nurses (AACN) healthy work environment (HWE) standards, the purpose of this study was to examine the relationship of the work environment to compassion satisfaction and compassion fatigue (secondary traumatic stress and burnout) in critical care nurses. **Background/Significance:** Because of an increased demand for and high attrition of nurses, a deficit of 260 000 nurses is expected by 2025. In the critical care setting, nurses are exposed to unhealthy work environments and job-related stress that have been linked empirically to attrition. In such environments, the balance between compassion satisfaction and compassion fatigue is threatened. However, little research has addressed the association of the nursing work environment to compassion satisfaction and compassion fatigue. **Method:** We used a correlational, cross-sectional design in this study. Registered nurses providing bedside care 50% of the time in adult, pediatric, or neonatal intensive care units were eligible to participate. Critical care nurses who accessed the AACN website, who received AACN's Critical-Care eNewsline, or who accessed the researcher's Facebook or Twitter accounts were invited to participate. Participants completed a demographic questionnaire, the AACN HWE Assessment Tool, and the Professional Quality of Life Scale, version 5. Data were collected between July and October 2018. Descriptive and inferential analyses, including hierarchical regression analyses, were conducted using SPSS, version 25 (IBM Corp). **Result:** Participants (N = 194) rated their work environment as good and had average scores in the areas of compassion satisfaction, burnout, and secondary traumatic stress. Each HWE standard was positively related to compassion satisfaction and negatively related to burnout and secondary traumatic stress. In regression analysis, skilled communication, meaningful recognition, and age were significant positive predictors of compassion satisfaction. Skilled communication, appropriate staffing, meaningful recognition, age, and nursing education were significant negative predictors of secondary traumatic stress. Skilled communication, age, and nursing education were significant negative predictors of burnout. **Conclusion:** These findings support the Compassion Satisfaction-Compassion Fatigue Model and the AACN HWE standards, and the findings have practice and policy implications. Interventions to promote a HWE in critical care, including educational and mentoring programs, thoughtful recognition programs, and consideration of alternative staffing models, are needed. Regarding policy, these findings can inform the Future of Nursing revision and AACN efforts such as HWE implementation and the AACN Appropriate Staffing Initiative.

### RS7 Defining Predictive Value Between the Glasgow Coma Scale and the Full Outline of Unresponsiveness Score

*Richard Arbour, Alexis Landau; Penn Medicine/Lancaster General Hospital, Lancaster, PA*

**Purpose:** To determine the predictive value of the Full Outline of Unresponsiveness (FOUR) score versus the Glasgow Coma Scale (GCS) score for neurologic outcome, degree of disability, and in-hospital death. The secondary purpose was to determine correlation and compare interrater reliability between FOUR score and GCS score when used by multiple examiners. **Background/Significance:** The GCS is the most widely used neurologic assessment tool for level of consciousness, but it has limitations, including inability to directly assess verbal or brainstem function in an intubated patient and inconsistent application among examiners. The FOUR score incorporates brainstem appraisal, including respiratory drive and protective reflexes, as a stronger assessment tool and outcome predictor. FOUR score application facilitates real-time comprehensive evaluation, directing care in real time. **Method:** For this prospective, observational research study, 159 participants were consecutively enrolled, providing 80% power to detect difference in accuracy for primary outcome of in-hospital death. Patients aged 18 to 84 years with metabolic or structural brain injury who were in critical care or monitored units were enrolled; distributions of age, sex, ethnicity, and admitting diagnosis were included. Demographic information and paired neurologic assessments (GCS and FOUR scores) performed by the clinical nurse specialist and a trained bedside staff nurse were recorded. A second set of paired (blinded) assessments occurred within 72 hours. Data were entered into the Research Electronic Data Capture application (https://www.project-redcap.org/) and analyzed using the Minitab statistical analysis program. **Result:** Data were obtained from 159 patients. Admitting diagnosis counts and frequency included encephalopathy (n = 11; 6.9%), anoxic/ischemic injury (n = 2; 1.3%), ischemic cerebrovascular accident (n = 68; 42.8%), hemorrhagic cerebrovascular accident (n = 41; 25.8%), and traumatic brain injury (n = 37; 23.3%). The majority of patients (90.6%) had structural brain injury. In-hospital death (Glasgow Outcome Scale category 1) was better predicted by the FOUR score (area under the curve, 0.883; 95% CI, 0.7710-0.9949) compared with the GCS (area under the curve, 0.824; 95% CI, 0.6546-0.9935). Fleiss' κ of 0.397531 indicated intermediate to good agreement ($P < .01$) of ratings between appraisers for GCS. A κ value of 0.43031 indicated intermediate to good agreement ($P < .01$) of ratings between appraisers for the FOUR score. **Conclusion:** Brainstem assessment, including respiratory drive, pattern, and

protective reflexes, enhances superiority of FOUR score predictive value. Practice implications include adding structured brainstem assessment and documentation into neurologic assessment flow sheets to improve identification and tracking of neurologic decline and impending herniation syndromes. This enables early discovery of treatment windows for aggressive care and terminal herniation as a clinical trigger for brain-death testing.

**RS8 Effectiveness of the Visually Enlarged Numeric Rating Scale for Pain Management**

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**Purpose:** The effectiveness of the the visually enlarged 0 to 10 numerical rating scale V (NRS-V) was assessed in the pain management of patients receiving mechanical ventilatory support. **Background/Significance:** Pain remains underevaluated and undertreated among patients in intensive care units (ICUs). A recent guideline recommends the use of self-report pain scales to avoid underestimation of the patient's pain. The NRS-V has been reported as the best self-report pain scale for critically ill adults; however, only a few studies have investigated the effectiveness of the NRS-V in pain management. **Method:** This before-and-after study was conducted at a university hospital in Japan (control phase: April 2016 through May 2017; intervention phase: June 2017 through June 2018). The NRS-V was used for each patient during the intervention phase. The study included patients who were receiving mechanical ventilation for at least 48 hours. The pain assessment rates using the NRS and patient outcomes were compared between the control and intervention groups. **Result:** Overall, 196 patients were enrolled (control group, n = 97; intervention group, n = 99). Patients' characteristics were similar between the 2 groups. The pain assessment rate using the NRS was significantly higher during the intervention phase than during the control phase (63.3% vs 36.7%; $P < .001$). The incidence of agitation levels greater than 1, defined by the Richmond Agitation-Sedation Scale, was significantly lower in the intervention group (13% vs 35%; $P < .001$). On multivariate regression analysis, the intervention was associated with a decreased incidence of agitation. **Conclusion:** Use of the NRS-V was associated with an increased pain assessment rate and a decreased agitation incidence in patients receiving mechanical ventilatory support. This simple intervention may improve pain management in the ICU.

**RS9 Family Experiences of Adult Extracorporeal Membrane Oxygenation**

*Krista Knudson, Lois Sadler, Laura Kierol-Andrews, Marjorie Funk; Yale School of Nursing, Orange, CT*

**Purpose:** This investigation was part of a larger qualitative study to understand the overall experience of extracorporeal membrane oxygenation (ECMO) from the perspective of patients and families. Here, we report findings from family members. The aims of this investigation were to describe the experiences of family members of adults treated with ECMO and to identify their short- and long-term needs. **Background/Significance:** ECMO provides cardiopulmonary support for patients with cardiogenic shock or pulmonary failure refractory to conventional therapy and is associated with high rates of morbidity and mortality as well as numerous long-term sequelae. Families are at risk for development of cognitive or mental health impairments after hospitalization of a loved one in a critical care setting. The additional impact of ECMO illnesses on families of adult patients are not well understood. **Method:** Incorporating the qualitative method of interpretive description, we conducted in-depth, semistructured interviews with 17 family members of 14 patients treated with ECMO at 1 of 2 regional ECMO centers in the northeastern United States. Additional data were collected from demographic questionnaires, field notes, and memos. Guided by the Family Management Style Framework, we sought to describe how families define illness, manage family life, and manage a family member's serious illness. Qualitative data were analyzed using thematic analysis techniques. Two investigators inductively coded transcripts and reached consensus by discussion during all data analysis and interpretation decisions. **Result:** Two families (14%) were relatives of nonsurvivors. Three-quarters of participants were female; the mean age of participants was 50 (SD 14) years. Most participants were spouses, but participants also included adult children, siblings, and parents of patients treated with ECMO. Mean duration from hospital discharge to interviews was 49 (SD 26) months. Family members progressed through 3 stages: critical illness, early recovery or acute loss, and long-term adjustment. They described numerous challenges and needs during and after the ECMO experience and were influenced by their own specific situations and support from health care providers. **Conclusion:** The experiences of family members of adults treated with ECMO were fraught with difficulty and uncertainty. They relied heavily on social support and trusting relationships with health care providers. These families benefited from support in decision-making, balancing roles and responsibilities outside the hospital, and accessing resources during and after the hospitalization period. Many were also interested in opportunities for peer support and long-term follow-up services.

**RS10 Higher Daytime-to-Nighttime Sleep Ratio Is Linked to Longer Stay in Older Survivors of the Intensive Care Unit**

*Maya Elias, Zhan Liang, Cindy Munro; University of Miami School of Nursing and Health Studies, University of Miami, Miami, FL*

**Purpose:** We examined the ratio between daytime versus nighttime sleep efficiency (SE) among hospitalized older adults who were recently transferred out of an intensive care unit (ICU). We also explored whether this calculated ratio would be prospectively associated with overall hospital length of stay (LOS). We hypothesized that higher daytime-to-nighttime SE ratios (ie, older ICU survivors who slept substantially during daytime hours) would be associated with longer hospital LOS. **Background/Significance:** Optimal sleep is required for recovery from critical illness. Sleep efficiency is defined as the total time spent asleep divided by total time spent in bed. It has been reported that, among ICU patients, the ratio of daytime sleep to nighttime sleep is abnormally high, indicating irregular sleep distribution over a 24-hour cycle. To our knowledge, this ratio and its association with LOS have not been examined among older ICU survivors in the immediate period after ICU discharge. **Method:** We enrolled 30 patients (aged ≥ 65 years) who were functionally independent before hospitalization and who had received mechanical ventilatory support while in the ICU. Patients were enrolled on medical-surgical units within 24 to 48 hours of ICU discharge. We analyzed daytime SE (between 6 AM and 9:59 PM, for 1 daytime period) and nighttime SE (between 10 PM and 5:59 AM, averaged over 2 consecutive nighttime periods) using wrist actigraphy. The daytime-to-nighttime SE ratio was calculated by dividing the daytime SE by the nighttime SE. Regression analyses explored the associations between the daytime-to-nighttime SE ratio and hospital LOS, with adjustment for potentially confounding variables. **Result:** The mean daytime-to-nighttime SE ratio was 0.71 (SD 0.3). Ratios for 5 patients (16.7%) were greater than 1; these subjects slept proportionally more during the day than at night. The prediction model was significant ($R^2 = 0.633$; $P = .002$). Higher daytime-to-nighttime SE ratios were associated with longer LOS ($\beta = .349$; $P = .04$) after adjusting for covariates (ie, age, severity of illness, sleep and pain medication, pain score, and emotion score). A more complex model was also significant ($R^2 = 0.768$; $P = .001$). Higher ratios were associated with longer LOS ($\beta = .363$; $P = .02$) after adjusting for 2 other covariates (ie, grip strength and cognition, in addition to the aforementioned covariates). **Conclusion:** Among this cohort of older survivors of the ICU, the ratio of daytime-to-nighttime SE was abnormally high, indicating severe alterations of the sleep-wake cycle. Moreover, higher daytime-to-nighttime SE ratios were associated with longer hospital LOS, implying that greater daytime sleep may be linked to poor outcomes. Minimizing daytime sleep and increasing daytime activity, while promoting nighttime sleep consolidation, may indirectly influence length of hospitalization and related discharge outcomes.

**RS11 Identifying Predictors of Airway Complications in Conscious Sedation Procedures**

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**Purpose:** To determine if risk factors for obstructive sleep apnea, assessed using the STOP-Bang questionnaire (University of Toronto, 2012), were predictive of procedural airway complications in 152 patients undergoing endoscopy with conscious sedation. **Background/Significance:** Conscious sedation during endoscopic procedures can be complicated by unanticipated airway compromise and obstruction. The STOP-Bang questionnaire is a validated screening questionnaire for obstructive sleep apnea. In this study, the extent to which the STOP-Bang question variables are reliable predictors of airway compromise and complications during conscious sedation procedures was examined. **Method:** This study was a retrospective review of data from the electronic medical record of patients who had conscious sedation for endoscopy procedures. Answers to the individual questions on the STOP-Bang questionnaire were manually collected and used as independent predictor variables. Data on physiological signs of airway compromise and documented airway maneuvers to relieve airway obstruction were collected as dependent outcome variables. Logistic regression analysis was performed to predict outcome severity on the basis of individual and total scores on the STOP-Bang questionnaire. The data collection and analytics software used was SPSS (IBM Corp). **Result:** A STOP-Bang score greater than 5 (high risk) predicted a procedural 10% change in heart rate ($P = .02$), apnea ($P = .04$), and arousal-relieved airway obstruction ($P = .02$). Every point of increase in body mass index predicted a 10% change in heart rate ($P = .046$), a drop in oxygen saturation ($P = .002$), apnea ($P = .003$), and an increase of 1.212 times the odds of requiring arousal-relieved airway obstruction ($P = .002$). An intermediate-risk STOP-Bang score (3-4) positively correlated to abnormal $CO_2$ values during the procedure ($P = .15$). **Conclusion:** With these findings, proactive safety measures can be instituted for additional airway management for identified at-risk patients. This information has application in the clinical consideration of monitoring protocols,

medication administration, equipment availability, and staffing for patients with a high probability for airway obstruction during conscious sedation.

**RS12 Implementation of a Delirium Education Initiative to Decrease Use of Benzodiazepines in a Pediatric Intensive Care Unit**

*Vicky Ng; AdventHealth Orlando Florida Hospital, Orlando, FL*

**Purpose:** To reduce the overall use of benzodiazepines by implementing a nursing delirium education program. **Background/Significance:** Delirium is an acute cerebral dysfunction that results in increased length of stay, mortality rate, mechanical ventilation days, and cost. Studies continue to show that benzodiazepines are associated with an increased risk of delirium developing in the pediatric population; despite this, a survey conducted in our pediatric intensive care unit (PICU) revealed that 68% of our bedside nurses believed benzodiazepines are an effective treatment for pediatric delirium. **Method:** A standardized delirium education module was developed and provided to all bedside nurses either 1-on-1 or in a small group session by the author or a delirium champion trained by the author. Using the validated Cornell Assessment of Pediatric Delirium tool, delirium screening was performed for 6 months. A retrospective chart review was conducted to determine the overall use of benzodiazepines 6 months before and after the educational module was implemented. We excluded patients who received benzodiazepines for status epilepticus or procedural sedation. **Result:** $\chi^2$ testing was used to compare the total number of intermittent doses of benzodiazepines administered per total number of PICU admissions; the number of patients prescribed continuous infusions while intubated also was compared. An overall decrease in intermittent benzodiazepine use was seen in the 6 months after delirium education from 199 doses per 700 admissions before implementing the education program to 135 doses per 729 admissions afterward ($P<.001$). Similarly, the total number of patients prescribed continuous infusions decreased from 23 of 53 intubated patients to 14 of 54 intubated patients; however, this difference was not statistically significant ($P=.07$). **Conclusion:** Implementing an education program that highlights the contribution of benzodiazepine use to the incidence of delirium significantly reduced the overall use of benzodiazepines in the PICU. In addition, the overall use of benzodiazepine infusions in intubated patients decreased. With continued education and awareness, a significant reduction in benzodiazepine use should continue and could potentially result in a reduction in the overall incidence of delirium.

**RS13 It's Black and White: Reducing Medication Delivery Errors Using Standardized Labels**

*Jessica Smith, Marlene Cook; Sutter Health Sacramento, Sacramento, CA*

**Purpose:** To determine if the use of standardized medication labels on all intravenous tubing and pump setups would decrease the incidence of medication delivery errors in the cardiac surgery intensive care unit (CVSICU). Most research on labeling of intravenous catheters focuses on color-coded high-risk medications and date-change labels. This study looked at the safety and effectiveness of an innovative approach that could easily be standardized across multiple hospitals. **Background/Significance:** As ICU treatment protocols become more complex, the number of intravenous infusions administered to patients continues to increase. With an average daily census of 13 patients, the CVSICU has approximately 280 new administrations of continuous intravenous medications each month. This translates to a multitude of intravenous catheter tubes that often are tangled and interconnected, with infusions occurring together through shared ports. To avoid medication delivery errors, a safety improvement study was initiated. **Method:** This prospective cohort study began after determination by a root cause analysis that wrong-drug intravenous administrations occurred in patients with 4 or more infusions. Staff collaborated with a manufacturer to create custom labels with a simple, black, capitalized font on a white background. The preimplementation group included 1946 patient-days spanning January through June 2018. The postimplementation evaluation period (July through December 2018) included 1921 patient-days. Quantitative administration error data were collected via the hospital's reporting system and analyzed by the pharmacy. An evaluation survey assessed CVSICU staff members' perception of improved safety and efficacy of the new labeling system. **Result:** Before implementation of standardized medication labels, 2 incidents of wrong-drug intravenous infusions occurred in 1946 patient-days. After the labeling intervention, there were no incidents in 1921 patient-days. After implementation, 100% of ICU staff nurses surveyed reported an increase in perceived safety and accuracy in medication delivery. The interdisciplinary team reported widespread satisfaction with the new labeling procedure, and other hospital departments became interested in implementation. Standardized intravenous tubing labeling is a positive improvement to mitigate the risk of human error and acts as an added layer of safe medication delivery. **Conclusion:** Use of standardized medication labels on all intravenous infusion

setups is a simple intervention that decreases medication delivery errors. Nurses report that labels on the proximal tubing above the pump, distal tubing close to the infusion port, and the intravenous pump itself improve medication identification and decrease the risk of human error. The reduction in errors from these improvements led to implementation of this labeling technique throughout 16 Sutter hospital affiliates in California.

**RS14 Nurses and Physicians Collaborate to Use Research to Improve Postprocedural Care for Patients**

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**Purpose:** To learn if patient satisfaction and the rate of vascular or bleeding complications differ when comparing the use of a vascular closure device (VCD; Perclose, Abbott International), a figure of 8 (FO8) stitch, and manual compression (MC) for closure of venous access sites after cardiac ablation. Another goal was to determine which method would lead to early ambulation and reduced use of nursing resources. **Background/Significance:** Management of venous access sites after atrial fibrillation/flutter catheter ablation traditionally consists of closure by MC with 3 to 6 hours of bed rest after hemostasis. Patients often complain of discomfort or pain due to long bed rest times, resulting in decreased satisfaction and additional nursing resources. Physicians and nurses combined their efforts in this research study to determine which closure methods most effectively reduced bed rest time and bed rest discomfort or pain. **Method:** A registry was used to compare patient outcomes for 3 vascular closure methods: VCD, FO8, and MC. The closure method applied to patients was at the discretion of each electrophysiologist. Patients in the MC group were on bed rest until activated clotting time was between 165 and 190 seconds, then they underwent MC for sheath removal, with 3 additional hours of bed rest before ambulating. Patients in the FO8 and VCD groups were on bed rest for 1 hour and then allowed to ambulate if recovered from anesthesia. Patients were surveyed about their expectation and actual experience of pain or discomfort during their bed rest time. Analysis was conducted to compare bed rest time to ambulation and patient satisfaction. **Result:** In 18 months, data were collected on 436 consented patients: 157 patients received MC, 205 received F08 stitch, and 74 received a VCD. The median time from procedure end to first ambulation was 6.5 hours for MC, 2.2 hours for FO8, and 2.3 hours for VCD. The rate of same-day discharges was higher in the FO8 (11.8%) and VCD (17.6%) groups than in the MC group (3.3%). No major complications were observed with FO8 or VCD and only 1 major complication was observed in the MC group. Minor complications occurred in 1.5% of the FO8 group, 4% of the VCD group, and 2.6% of the MC group. Patient satisfaction and perception of pain did not differ among the groups. **Conclusion:** We compared 3 different methods of vascular closure after electrophysiology procedures. This registry demonstrates the safety and feasibility of both FO8 and VCD as alternatives to MC for hemostasis. No difference was seen in patients' perception of pain or discomfort while on bed rest. The results have implications for decreasing nursing workflow and resources by increasing early ambulation and same-day discharges.

**RS15 Postorientation Case Study Program for Registered Nurses in the Pediatric Intensive Care Unit**

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**Purpose:** First-year retention of new-graduate registered nurses (RNs) is a challenge for many hospitals. Retention rates of new-graduate RNs range from a low of 25% to a high of 64%. The intent for this research was to support and retain new-graduate RNs in the pediatric intensive care unit (PICU) through the use of a 12-week case-study program including weekly 1-on-1 check-ins with a PICU clinical advisor. **Background/Significance:** Specialized and supportive orientation programs result in increased first-year RN retention and decreased turnover in critical care areas, such as the PICU. Similarly, enhanced peer communication, mentoring, and the empowerment of new nurses are all effective techniques to decrease first-year turnover and increase nurse satisfaction and productivity. **Method:** The case-study program focuses on new-graduate PICU nurses who have completed orientation. At the final evaluation of orientation, the nurse receives a welcome letter to the case-study program, a hard copy of the actual case study, and a pretest to complete. Then, during week 4 after orientation, a clinical advisor has a 1-on-1 meeting with the nurse to discuss week 1 of the case study and to be available for support, discussion, or to address any needs the nurse may have. This continues once a week for 12 weeks. The nurses then complete a postsurvey and posttest (the same as the pretest) to measure unit socialization and learning retention. **Result:** In 2 years of conducting the case-study program, the PICU has decreased the first-year turnover rate by more than half. In 2017, the first-year turnover rate decreased to 22% from 50% in 2016. In 2018, the first-year turnover rate decreased to 13%. This result is based on a minimum of 20 new-graduate hires in these years. The results from the pretest versus posttest data show that 24 of 29 participants scored higher on the posttest. The postsurvey results were positive

(agree or strongly agree) 85% of the time. This was based on 21 participant responses to 7 Likert-style 5-point scale questions and 1 open-response question. **Conclusion:** From the findings, it can be concluded that there are positive correlations between the case-study program and new graduate PICU nurse retention. The data also indicate a positive relationship with the case-study program and learning retention based on the pretest and posttest results. Last, the survey findings are indicative of unit socialization for the majority of the new graduate PICU nurses.

**RS16 Readmission, Death, Cost, and Clinical Outcomes of Patients With Hospital-Acquired Pressure Injury, by Stage**

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**Purpose:** To provide definitive evidence on the burden of, and outcomes associated with, hospital-acquired pressure injuries (HAPIs) by stage from a large hospital data set. **Background/Significance:** Data confirm that HAPIs are costly and often preventable, and the burden associated with the management of HAPIs is substantial. Limited data exist on the impact of HAPI stage on cost, in-hospital death, readmission, and other hospital-acquired clinical outcomes. **Method:** In this observational, retrospective study of the Premier Healthcare Database, we evaluated adult inpatients with HAPI between October 1, 2009, and September 30, 2014, with 6 months' follow-up through March 31, 2015. Relative risk regression with robust standard errors was used to examine the associations of HAPI stages with readmissions, in-hospital death, and other clinical outcomes; generalized linear models were used to study costs and length of stay (LOS). All models were adjusted for propensity scores (generated with logistic regression models), provider area, and discharge status. **Result:** There were 9 630 953 patients with no HAPI and 46 108 patients with HAPI: stage 1, n = 7503; stage 2, n = 18 901; stage 3, n = 3242; stage 4, n = 1310; unstageable, n = 3358; unspecified, n = 6754; and missing, n = 5040. All stages were significantly associated with higher relative risk of 30-, 90-, and 180-day all-cause readmission. Patients with stage 4 HAPIs had 5.75 times higher (95% CI, 4.86-6.80; $P < .001$) risk of in-hospital death. Increasing risk was also observed across HAPI stages for pneumonia, urinary tract infection, and venous thromboembolism. Total cost of care for the hospitalization and LOS were significantly different, with the stage 4 HAPIs costing a mean of $67 198 and associated with a mean LOS of 30.14 days versus a mean total cost of $20 684 and a mean LOS of 7.43 days for patients without HAPIs ($P < .001$ for both). **Conclusion:** HAPIs are a significant burden to our health care system, with patients suffering significantly higher total cost, increased LOS, and higher risks of death, readmission, and other hospital-acquired conditions and outcomes.

**RS17 Reducing Tracheostomy Site Complications With and Without Sutures**

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**Purpose:** To assess a new tracheostomy dressing for patients in the cardiothoracic intensive care unit (ICU) with tracheostomies and to try dressings with and without sutures at the tracheostomy site. The new dressing has a hydrophilic polyurethane matrix, with a mild, tissue-friendly wound cleanser; a soothing moisturizer; and a superabsorbent semipermeable film backing. Another goal was to see if not using sutures at the tracheostomy site would lead to greater rates of airway loss. **Background/Significance:** Pressure injuries related to the flange on a tracheostomy are complications of concern to patients in the ICU and their nurses. The tracheostomy tube may be sutured to the skin to maintain a secure airway, but the sutures make care of the tracheostomy site difficult. Previous initiatives with a foam tracheostomy-site dressing did not reduce pressure ulcers and led to occasional losses of the airways. Tracheostomy care protocols help ensure consistent practice and promote airway safety. **Method:** In phase 1 (August 2017 to January 2018) of the study, the new dressing was used at all sutured tracheostomy sites. Data collection included the type of tracheostomy tube, number of suture-days, airway loss, skin site assessment until discharge, and tracheostomy-site status at discharge. In phase 2 (February 2018 to August 2019) of the study, a different foam tracheostomy dressing was used and the physicians did not suture the tracheostomy flanges unless they considered the patient to be at high risk for airway loss. The physicians opted to use longer tracheostomy tubes in certain patients as an additional measure to prevent airway loss. A $\chi^2$ analysis was done to compare frequency of pressure injuries for sutured versus nonsutured tracheostomy tubes. **Result:** In phase 1, 47 patients with sutured tracheostomy tubes had a mean duration of sutures of 7.78 (SD 1.99) days. In phase 2, device-related pressure injuries developed at the tracheostomy site in 4 patients. None had an airway loss. Phase 2 of the study included 167 patients—149 without sutures and 18 with sutures at their tracheostomy sites. The mean duration of sutures in patients in phase 2 of the study was 7.17 (SD 2.06) days. In phase 2, a pressure injury developed in 1 of the 149 patients without sutures at the tracheostomy

site and airway displacement occurred in 1 patient without sutures, but the airway was replaced easily. Pressure injury rates were significantly lower in patients without sutures ($P = .01$). **Conclusion:** The absence of sutures at the tracheostomy site and use of a polyurethane tracheostomy dressing significantly decreased pressure injuries at the tracheostomy site. A new tracheostomy care protocol was established in the cardiothoracic ICU to ensure consistent practice and promote airway safety.

**RS18 Ultrasound-Guided Peripheral Intravenous Catheter Dwell Time and Placement**

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**Purpose:** To determine if the dwell time of percutaneous intravenous catheters (PIVs) placed with ultrasound guidance (USGPIV) could be extended to 7 days without increased complications related to the USGPIV. Insertion location, vein size, and needle angle were analyzed to provide the longest dwell times. Preexisting illness, present diagnosis, medications, and the use of USGPIV for obtaining blood samples also were studied for possible effects of catheter dwell time. **Background/Significance:** Before this study, the policy of West Virginia University Hospital (WVUH) was to change PIVs every 96 hours. In 2015, the Cochrane Library published an article regarding clinically indicated replacement versus routine replacement of PIVs. Could the policy at WVUH be changed? A randomized, controlled study was conducted. Additional data on placement location, vein size, depth of vein, needle angle, preexisting illness, present diagnosis, intravenous medications, and PIV use for obtaining blood samples were collected. **Method:** This was a randomized, controlled study of dwell time of 7 days compared with 4 days for USGPIVs as well as best placement practices. Informed consent was obtained. Randomization was done using an online randomization generator. Patients were entered into the 7-day (intervention) or the 4-day (control) group. Vein size and depth data were collected before catheter insertion guided by the ultrasound machine. Data were collected from the patient's chart regarding age, sex, race, body mass index, preexisting illness, present diagnosis, intravenous medications, and USGPIV removal reasons. Dwell-time hours were from the time of catheter insertion until it was removed. Variable relationships and correlation matrices were statistically analyzed. **Result:** The study encompassed 400 patients. The intervention group had 203 participants and the control group had 197. Both groups were similar in terms of age, sex, race, and body mass index. In both groups, the most common cause of USGPIV failure was infiltration, followed by leaking. We calculated the rate of failures per 1000 hours of dwell time. The control group had 2.2 failures per 1000 hours and the intervention group had 2.37 failures per 1000 hours. Most failures occurred in the second 24-hour period regardless of group. USGPIVs were analyzed with respect to meeting the goal of lasting 4 or 7 days. "Good" PIVs lasted, "bad" PIVs were removed before reaching the 4 or 7 days. **Conclusion:** Depth of vein and placement of the catheter in the vein were similar in the good and bad PIV groups. Vein diameter was slightly larger in the good PIV group. Chronic conditions and vesication were more prominent in the bad PIV group. The intervention group had more PIV catheter failures. This increase in the number of failures was expected because of the longer dwell time. On the basis of our study findings, WVUH changed its USGPIV policy to state "change when clinically indicated."