INTRAVENOUS KETAMINE INFUSION FOR TREATMENT OF REFRACTORY MIGRAINES: A CASE SERIES
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**Background:** Chronic and refractory migraine disorders are a challenge for healthcare providers and patients alike. Limited options currently exist for the treatment of refractory migraines. Recent data from case studies have suggested that ketamine, an NMDA receptor antagonist, may have potential analgesic properties in these patients at subanesthetic doses. The objective of our study is to characterize the use of intravenous ketamine infusions for refractory migraine and report the effect on patient reported pain scales. **Methods:** A retrospective chart review was conducted for all patients admitted to the intensive care unit at Virginia Commonwealth University Medical Center from 2018 to 2019 with continuous intravenous (IV) ketamine ordered for the treatment of refractory migraines. Six patient encounters from four unique patients were identified. Pain scale scores were reported using the Adult Numerical Pain Scale.

**Results:** The median patient age was 45 years old with 50% being female and all patients were Caucasian. Patients had a range of 2-6 comorbid conditions, failed between 7-10 other migraine treatments prior to admission, and were admitted with a median pain score of 6.5. Fifty percent of patient encounters achieved the goal pain score of ≤3 for ≥8 hours and all encounters were acute responders (a decrease in pain score of ≥2 during infusion). Three encounters had follow-up data available and only one of those had a sustained pain decrease of ≥2 in the first follow-up visit. Patients’ pain scales decreased by an average of 3.83 points from admission to discharge. The average rate of infusion was 0.36 mg/kg/hour (range: 0.09-0.69 mg/kg/hour) with an average duration of 69 hours (2.86 days). One patient’s infusion was discontinued after 1.8 days due to an episode of respiratory failure resulting in intubation. No other major side effects or adverse events were documented.

**Conclusions:** Although only a small patient population was available, these data provide valuable insight into the safety and efficacy of subanesthetic IV ketamine continuous infusions in patients with treatment refractory migraines. The infusions were associated with short-term improvement in 5 of 6 encounters and long-lasting improvement in 1 of 6 encounters demonstrating IV ketamine may be beneficial as a last-line option in some refractory migraine patients. Randomized, controlled studies will be necessary to further elucidate and generalize these findings.

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DIFFERENCE IN PERCEIVED SCOPE OF PRACTICE FOR ADVANCED PRACTICE PROVIDERS
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Background/Purpose: In 2003, the Accreditation Council for Graduate Medical Education (ACGME) significantly restricted resident work hours. Restricted resident work hours along with an aging population which required an increased number of intensive care providers has led to the use of advanced practice providers (NP/PA) as an alternative to additional intensivists. Even with increased numbers of advanced practice providers (APPs) working within intensive care units, there is still a lack of generalized understanding from APPs/MDs regarding scope of practice for these healthcare practitioners. The purpose of this study was to understand the difference in perception of Advanced Practice from APPs versus physicians. Our institution is a large health system in rural eastern North Carolina. This 990 bed academic tertiary facility employs 360 APPs of which 150 are CRNAs and 35 APPs are employed in the ICUs.

Methodology: A descriptive, cross-sectional study design utilizing anonymous Survey Monkey tool was sent to all APPs and Physicians employed within the organization. The data was analyzed using a Mann-Whitney U Test with a statistically significant p-value less than 0.05.

Results: There were a total of 115 respondents, 79% were APPs and 21% were Physicians. There was a statically significant difference in perceived level of supervision for APPs between APPs and physicians regarding the following areas of practice: conducting patient/family care meetings, Perform/document physical exam, formulate active diagnoses, place orders, formulate overall plan of care, and discuss plan of care with discharge planner and other allied health. The only survey question that did not achieve significant statistically difference in perceived level of supervision was the ability to collaborate with other specialties in coordinating patient care. All respondents agreed that they would recommend an APP to care for themselves or a family member. The majority of respondents (73%) agreed the organization allows APPs to practice to the fullest extent of their license as allowed by state and federal statutes.

Themes that emerged from qualitative responses included: Independent practice, communication among the team, lack of knowledge regarding scope of practice and compensation.

Discussion: The culture at the organization supports component quality care from APPs. However, APPs feel like they could provide better care if practice limitations were lifted, allowing independent practice. Limitations of this study include limited response to survey especially from physicians within the organization.
Title: DEVELOPMENT AND IMPLEMENTATION OF AN ADVANCED PRACTICE PROVIDER CRITICAL CARE FELLOWSHIP PROGRAM

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Introduction/background
Emerging research suggests Advanced Practice Provider (APP) Fellowship programs provide the structured experience necessary to improve role transition, job satisfaction, and minimize turnover (1). Fellowship programs have demonstrated enhanced career opportunities for their graduates and greater employee engagement, as well as more satisfied managers, administrators and physician leaders (2, 3). We created an APP Critical Care Fellowship Program to achieve supportive, safe, and thorough transition to clinical practice for novice critical care providers at a large academic medical center.

Methods
After a needs-assessment and review of institutional resources, we created a conceptual design and performed financial analysis of program implementation. Key stakeholders were identified, including executive and director level hospital leadership, senior APPs, and physician leaders; engagement of these stakeholders secured institutional approval and program endorsement.

A hospital-wide structure was developed to support two APPs in the inaugural fellowship class. Identification of a fellowship director streamlined program systematization, while the fellowship coordinator was tasked with implementation and oversight. A competency-based curriculum was refined using recognized best practices in both clinical and didactic frameworks. With guidance from a multidisciplinary steering committee comprised of senior APPs, physician colleagues, executive leadership, human resources, and marketing support, a fellowship job posting was created followed by outreach and recruitment measures to identify qualified candidates.

Outcomes data will be collected utilizing a comprehensive return-on-investment tool to provide insight on program quality, goals achievement, and financial impact.

Results
Successful implementation of our fellowship program is underway with the first class of two APPs pending matriculation in late summer 2020. Based on planned comprehensive post-hoc evaluation and outcomes assessment to deliver return-on-investment data to our key stakeholders, it is anticipated that APP role transition and retention will improve in a large academic medical center.
Conclusion

Available evidence suggests APP fellowship programs increase job satisfaction, employee engagement, and retention. Our model demonstrates the essential stages necessary to optimize stakeholder engagement and create a comprehensive program with outcomes assessment and program accreditation at the forefront of the design. While this fellowship was designed specifically for the critical care needs of our institution, a similar model can easily be implemented for any practice environment.

References


PALIPERIDONE-INDUCED HYPOTHERMIA
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Introduction
Hypothermia is associated with poor neurological outcomes, including delirium and possibly coma leading to death. Temperature-raising effects of serotonin and lowering effects of dopamine are balanced under normal conditions, thereby enabling proper metabolic function. Considering that both the hypothalamus and dopaminergic neurotransmission play vital roles in thermoregulation, it is plausible that antipsychotic medications may contribute to alterations in body temperature. If left undetected, antipsychotic-induced hypothermia could be life-threatening. Here we report a case of hypothermia associated with paliperidone.

Description
JS, a 29-year-old male with a history of neurocognitive disorder secondary to traumatic brain injury (TBI) was brought to the emergency department due to altered mental status, agitation and combativeness. Neurologic status was unable to be assessed due to nonverbal status and intravenous midazolam administration. JS was hypothermic with an initial rectal temperature of 33.7˚C (92.6˚F), which fell as low as 33.0˚C (91.4˚F) two hours later. Other vital signs included blood pressure of 105/67 mmHg, heart rate of 65 BPM and respiratory rate of 9 BPM. JS was admitted to the intensive care unit and reached normothermia approximately 6 hours later, after the application of a forced-air warming blanket and warm fluids. His mental status returned to baseline the following morning. Infectious and adrenal causes of hypothermia were ruled out. Throughout his 34-day hospitalization, JS was transitioned to risperidone 3mg daily and there were no further episodes of hypothermia.

One week prior to admission, he was evaluated by psychiatry at his long-term care facility and his antipsychotic regimen was changed from quetiapine to paliperidone. He subsequently received oral, extended release paliperidone 6mg daily for 7 days.

Discussion
To our knowledge, published case reports regarding hypothermia secondary to oral paliperidone are scarce. Paliperidone, an active metabolite of risperidone, is an atypical antipsychotic that demonstrates serotonergic, dopaminergic and peripheral alpha-2 antagonism. Specifically through paliperidone’s serotonin antagonism, it can cause hypothermia as serotonin’s temperature-raising potential is blunted. Conversely, risperidone has higher affinity for serotonin and lower affinity for dopamine receptors lending to greater potential for causing hypothermia when compared to paliperidone. However, we theorize that differences in drug dosing contributed. JS was transitioned to a risperidone dose equivalent to half of his paliperidone dose, which would influence degree of receptor activity leading to less potential for risperidone-induced hypothermia. In this patient case, an alternative cause for hypothermia, aside from paliperidone therapy in the setting of TBI, was unable to be identified.

References
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Introduction: Lung herniation is a rare phenomenon in which the lung parenchyma projects through a fascial defect of the chest wall (1). The detection of such herniations is critical to prevent increased morbidity and mortality, and unwanted complications such as respiratory insufficiency, strangulation, incarceration, and dyspnea (2,4). This case describes a chronic, asymptomatic lung herniation extending to a subcutaneous automatic implantable cardioverter and defibrillator (AICD) pocket.

Case Description: An 83-year-old female was admitted by the trauma service for an acute T5 compression fracture following a ground-level fall. Past medical history included chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF) with AICD placement, breast cancer treated with a total mastectomy, and hypertension. A chest Computed Tomography (CT) scan noted a chronic left, anterolateral chest wall pleural herniation. No external deformities were noted, and the patient maintained symmetric chest wall expansion without respiratory compromise.

On day 2 of admission, the patient fell again, resulting in a subdural hematoma with midline shift. She acutely declined resulting in intubation and emergent craniotomy. While intubated, paradoxical chest motion was observed. A repeat CT demonstrated worsening of the herniation through the third intercostal space (Fig. 1). Thoracic surgery opted for conservative management due to improvement in the patient’s clinical status. Unfortunately, the patient neurologically worsened and died 17 days post trauma due to the intracranial bleed.

Discussion: Intercostal lung herniations occur infrequently and often arise secondary to trauma or prior surgery (3). In this case, the patient’s AICD was implanted in 2008 with replacement in 2011. The trauma from biventricular leads’ insertion through the chest wall potentially weakened the fascia. That trauma combined with increased pressure from hyperinflation of the lungs (COPD), cardiomegaly (CHF), and obesity, contributed to intercostal herniation development. CT imaging from 2017 demonstrated the first evidence of intercostal pleural herniation (Fig. 2). The herniation remained clinically insignificant until mechanical ventilation further increased intrathoracic pressure, likely expanding the existing herniation.

Some literature suggests surgical correction of asymptomatic herniations would improve patient morbidity and mortality (4). This case represents a patient with a chronic asymptomatic herniation that worsened after mechanical ventilation during a hospital stay for unrelated causes. In retrospect, this added complication could have been mitigated if the herniation was detected and surgically corrected prior to the admission. Lung herniation extending to an AICD pocket, though rare, should be considered as a potential complication of mechanical ventilation in patients with similar comorbidities.
Figure 1. CT Chest Axial (A) and Coronal (B) views from April 2019.
Images A and B taken after the patient was placed on mechanical positive pressure ventilation. The images reveal worsening of the left-sided intercostal lung herniation at the location where the biventricular leads enter the thoracic cavity. It shows the herniation extending to the AICD device. Herniation is indicated by the yellow arrows and the AICD is indicated by the green arrows.

Figure 2. CT Chest Axial (A) and Coronal (B) views from March 2017.
The early state of left-sided intercostal lung herniation is shown without full extension to AICD device as indicated by the yellow arrows. The CT images were recorded two months prior to the patient’s left total mastectomy. A false-negative reading of the study had occurred at the time. Herniation is indicated by the yellow arrows and the AICD is indicated by the green arrows.
References:


TITLE: EVALUATION OF PHYTONADIONE PRESCRIBING PRACTICES

BACKGROUND: The American College of Chest Physicians and Surgical Critical Care recommend the use of phytonadione for the reversal of oral vitamin-K antagonists. The dose and route are dependent on the presence of bleeding, time to surgical intervention, and the patient’s international normalized ratio (INR). The purpose of this study was to assess the safety and effectiveness of the phytonadione dosing strategies utilized in practice.

METHODS: Institutional review board review was not required for this retrospective quality improvement study. Adult patients that received phytonadione between April 1 to June 30, 2019, were screened for inclusion. Protected patient populations were excluded. The dose, route, and frequency of phytonadione, duration of therapy, location of bleed or type of procedure, if applicable, were collected to assess appropriateness of the phytonadione regimen. Repeat INR values were collected to assess INR reduction post-phytonadione. Any adverse events relate to phytonadione administration were recorded. Descriptive statistics were used to analyze all endpoints.

RESULTS: Eighty-one of ninety patients met inclusion criteria. Forty-five patients received phytonadione for reversal and thirty-six for hepatic disease. Indications included active bleeding (n 18), INR reversal for emergent surgery (n 15) and supratherapeutic INR without bleeding (n 12). Patients were 73 (SD 11) years, taking warfarin (93.3%) for atrial fibrillation (68.9%) and had a baseline hemoglobin of 10.6 (SD 2.3) grams per deciliter. Active bleed patients had an average baseline INR of 6.1 (SD 4.4). Majority of bleeds were intracranial (22.2%), gastrointestinal (44.4%), and nasal (16.7%). Fifty-five percent of bleeding patients received 10 mg intravenously and 27.8% orally with an average INR at 24hr of 1.7 (SD 0.8). Eighty-seven percent of surgery patients were on warfarin and received 10 mg intravenously (26.7%), 2.5 to 10 mg orally (66.7%), and 10 mg subcutaneously (6.7%). Average 24 hr INR was below 1.5 in 50% of patients. Patients with supratherapeutic INRs were taking warfarin (91.6%) with 66.7% having an INR greater than 10. Phytonadione regimens were appropriate in 80% and 50% of patients in surgical and supratherapeutic INR groups, respectively. Only two patients had adverse reactions after administration.

CONCLUSIONS: Phytonadione seemed to be safe and effective for reversal of anticoagulation. Results of this study prompted a review of the current anticoagulant reversal order set and identified a potential need for an order panel for INR reversal without bleeding. Opportunities for education have been identified to ensure appropriate prescribing of phytonadione.

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