

## 2021 Research Forum Resident School Speakers

### **Using the Model for Improvement to Refine and Improve Resident PICU Rotation orientation**

Gloria Lopez Hernandez MD; Kelsey Fath MD; Rebecca Craig MD; Anjali Subbaswamy, MD

ASubbaswamy@salud.unm.edu

**Purpose:** To better align resident orientation with expectations of performance for their PICU rotation. Resident feedback reflects that they struggle with entering orders, completing notes and with poor fund of knowledge entering the rotation. The orders for antibiotics, sedation and vasoactive agents pose a particular challenge. The presence of a patient care area pharmacist further confuses the issue of what the resident is responsible for.

**Methods:** The Model for Improvement methodology was utilized to refine the existing PICU orientation guide. The primary outcome measure is resident perception of the orientation preparing them for the work and learning of the PICU rotation. A series of Plan-Do-Study-Act (PDSA) cycles were conducted to sequentially revise and update the existing orientation guide document. Resident perceptions were collected via interview and in person feedback to the rotation director.

**Results:** The first revision edited the original 60 page document down to 8 pages. Review by the chief resident suggested further editing that material to focus more on diagnosis specific management and detailed instructions on how to enter orders (1<sup>st</sup> PDSA cycle.) It was reviewed by first year pediatric residents who had recently completed the rotation, who suggested an in person review of the orientation packet with the rotation director (2<sup>nd</sup> PDSA cycle). The next group of first year residents reported the in person orientation was good, but they continued to feel unprepared in the area of ventilator management. The 3<sup>rd</sup> PDSA cycle involved purchasing an easy to read text on Ventilator Basics as a supplemental resource for the orientation. Both first year and senior residents reviewed the orientation guide with the added book on ventilator management and felt that these 4 changes (shorter, more focused, in person and with a book on ventilator basics) made the PICU orientation much more targeted and useful, leaving them better prepared for the work and learning of the rotation.

**Conclusion:** This final version of the orientation (guide, in person review and supplemental text) will be utilized for the next one year. A question will be added to the rotation evaluation specifically asking about the quality of the orientation.

## Improving Electrolyte and Mineral Homeostasis in Extremely Premature Infants

**Authors:** Sofia M. Markee, DO, Janell F. Fuller, MD, Ann-Marie Yaroslaski, RD, LD, Eleni E. Shenk, PharmD, Jessie R. Maxwell, MD

**Contact:** Sofia Markee, DO – smarkee@salud.unm.edu

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**Background:** Infants  $\leq 28$  weeks gestational age (GA) are at increased risk for developing electrolyte and mineral abnormalities due to reduced baseline bone mineral content.  $\sim 80\%$  fetal calcium stores are obtained in the third trimester and  $\sim 54\%$  of extremely preterm infants have metabolic bone disease. These infants rely heavily on early parenteral nutrition (PN) to provide appropriate electrolytes, but there is limited evidence on how to optimize calcium and phosphorus. Our primary outcome is to improve calcium and phosphorus by day of life (DOL)7 in infants  $\leq 28$  weeks GA by optimizing PN. Secondary outcomes include monitoring creatinine and ionized calcium (ical).

**Methods:** An IRB approved prospective cohort study was completed in 14 infants  $\leq 28$  weeks GA. Serum calcium and phosphorus were measured daily during the first postnatal week. Upon review, a custom PN form was designed for the next cohort ( $n=9$ ), introducing calcium and phosphorus to PN earlier. A comparison was made between both cohorts. Grubb's analysis was used followed by a student's t-test.

**Results:** Mean calcium on DOL1 between each cohort were similar ( $6.57 \text{ mg/dL} \pm 0.25 \text{ mg/dL}$  and  $6.74 \text{ mg/dL} \pm 0.12 \text{ mg/dL}$  for cohorts 1 and 2, respectively ( $p=0.6$ )). Interestingly, mean creatinine on DOL1 nearly significantly decreased in cohort 2 ( $0.76 \text{ mg/dL} \pm 0.05 \text{ mg/dL}$ ), compared to cohort 1 ( $0.90 \text{ mg/dL} \pm 0.05 \text{ mg/dL}$ ),  $p=0.07$ . Mean ical decreased in cohort 1 from DOL0-DOL1, but gradually increased in cohort 2.

**Discussion:** The new PN form allowed a more consistent and gradual increase in calcium content. Additionally, creatinine decreased and ical remained in goal range, requiring less therapeutic intervention. Our next intervention is to add calcium gluconate  $0.5 \text{ mEq/dL}$  to stock PN bags for infants  $\leq 28$  weeks GA on DOL0. We hypothesize that significantly improved calcium and phosphorus stabilization will occur during the first postnatal week.

## **Refining a working definition of sepsis for non-neonatal pediatric inpatients**

Joe Lopez, MD; Elizabeth Yakes Jimenez, PhD, RDN, LD; Anjali Subbaswamy, MD

QI project

ASubbaswamy@salud.unm.edu

**Purpose:** Delays in diagnosis of pediatric sepsis are common, and can increase morbidity and mortality. This quality improvement (QI) project aims to ascertain a definition of sepsis that 80% of pediatric residents deem adequate and easy to use within 6 months.

**Methods:** The QI project follows the Model for Improvement methodology. The primary process measure is resident perception of the adequacy and ease of use of a clinical definition of sepsis for non-neonatal pediatric inpatients. A Plan-Do-Study-Act (PDSA) cycle was conducted to begin refining the sepsis definition. Resident perceptions were collected via survey.

**Results:** To plan for the first PDSA cycle, we reviewed the 2020 Surviving Sepsis Guidelines for children, attended meetings of the UNMH Pediatric Sepsis Team, and reviewed the existing Peds Emergency Department (ED) Sepsis Pathway. The positive screen criteria embedded in the ED pathway captures essential elements of the definition of pediatric sepsis. This clinical tool (positive screen criteria, a sepsis pathway visual, and a management section) was selected to be tested with residents. Six residents reviewed the tool, with 66% (n=4) finding it easy to use and 50% (n=3) and 66% (n=4) finding it an adequate definition of sepsis in the ED and inpatient, respectively. The main area of confusion identified was in the management pathway and related to "Additional Medication Recommended Starting Doses." Residents did not provide specific feedback that could be used to improve the sepsis definition.

**Conclusions:** A simplified version of the clinical tool presenting only the positive screen criteria will be tested in the next PDSA cycle. The team will explore alternative ways (beyond surveys) to get more robust feedback, such as through conversations with clinicians and trialing use of the criteria with patients on the floor.

## **Providing high reliability care for PICU patients with pulmonary hypertension: a quality improvement project**

Anjali Subbaswamy, MD; Nicholas Tan, MD; Iric Guthrie, MD; Kelsey Fath MD; Cole Linzmeyer MD; Elizabeth Yakes Jimenez, PhD, RDN, LD

QI Project

ASubbaswamy@salud.unm.edu

**Purpose:** Pediatric patients with pulmonary hypertension (PHTN) are a high acuity, low frequency population. To mitigate the risk of precipitating a potentially life-threatening pulmonary hypertensive crisis, health care staff need to take specific precautions. This quality improvement (QI) project aims to increase the number of inpatient PHTN patients for whom PHTN precautions are applied to 100% by September 2021.

**Methods:** The QI project uses the Model for Improvement methodology. The primary outcome measure will be application of PHTN precautions for patients with PHTN, based on chart audit. A series of Plan-Do-Study-Act (PDSA) cycles were conducted to test ways to increase PICU staff knowledge and application of PHTN precautions.

**Results:** For the first PDSA cycle, a PHTN knowledge test was administered to 25 providers and staff. Most respondents got 13-15 out of 15 questions correct, with questions related to prevention and management of a PHTN crisis being the most frequently missed. Based on these results, the QI team decided to abandon further PDSAs related to didactic teaching, and focus on application of knowledge. Three PDSA cycles followed, testing a visual door prompt designed to remind all clinical team members to apply PHTN precautions. Verbal feedback was sequentially collected from residents, RNs, and a cardiology attending during these PDSAs, and directed changes to the door prompt to (1) include a more directive title (2) emphasize applied physiology and (3) state what to do as well as what not to do. A pathophysiology diagram was minimized and directive instructions were emphasized.

**Conclusion:** The QI team will continue to conduct PDSAs to test and refine the visual door prompt, targeting 100% use in all appropriate patients. Future PDSAs may address consistent identification of all patients who require PHTN precautions, with the goal of providing high reliability care.