PEDIATRIC ICU ENTERAL FEEDING PROTEIN INTAKE: QUALITY IMPROVEMENT PROJECT

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BACKGROUND

- Quality Improvement Programs (QIP) offer an opportunity for systematic review and continuous actions that can lead to measurable improvements in a targeted patient population.
- Protein requirements in the critically ill child are higher in order to maintain protein balance and prevent lean body mass depletion[1].
- Protein intake has been found to be insufficient in the pediatric intensive care unit (PICU) [1-3].
- Optimizing protein intake in the PICU is a priority along with addressing barriers to achieving full feeds, including fluid restriction, feeding intolerance and interruption of feeds due to procedures.

OBJECTIVES

- Primary aim of this QIP was to address suboptimal protein delivery in critically ill children in pediatric intensive care units (PICU) and to provide a solution to better meet protein needs.
- Secondary aims included summarizing demographics, admitting diagnosis, formula choice rational, ventilator dependence, enteral nutrition targets and delivery (up to 5 days), gastrointestinal (GI) intolerance (diarrhea, vomiting, elevated gastric residuals and abdominal distension) and feeding interruptions.

METHODS

- Multi-center QIP in critically ill children 1-13 years old, admitted to a PICU, with higher protein needs, requiring tube feeding (EN) for at least 5 days.
- Conducted at 2 sites (University of Chicago, Chicago, IL; Le Bonheur Children's Hospital, Memphis, TN) from July 2018 to June 2019.
- Both sites included 10 patients from the PICU with EN use within the previous 6 months in a retrospective cohort (RC) (data obtained from medical records).
- Sites also enrolled a prospective cohort (PF) fed a 1.2 kcals/mL, 16% protein (whey hydrolysate) formula [Peptamen Junior® HP, Nestlé Health Science, Bridgewater, NJ, USA].
- Daily protein and calorie intake delivery as a percentage of prescribed daily goals, feeding intolerance, and feeding interruptions were collected for 5 days, in both cohorts.

References: 1) Mehta NM, et al. *JPEN.* 2009;33:336-344; 2) Mehta NM, et al. *Crit Care Med* 2012;40(7):2204-2211; 3) Kyle UG, et al. *JAND 2012;112(12):1987-1992*

RESULTS

- Data from medical records of 20 subjects in the RC and 8 subjects in the PF were collected.
- Mean age was 5.1 vs 6.2 yrs. old; 70% male vs 13%; in RC and PF, respectively. **(Table 1)**
- Main diagnosis was trauma (40%) for RC and respiratory diagnoses (87.5%) for PF. **(Table 1)**
- Peptide-based (55%) and standard intact (35%) protein enteral formulas were most used in RC.
- Over 90% of protein goal was achieved in 46% (95%CI: 32%-60%) of days in RC and 53% (95%CI: 24%-81%) of days in PF (p=0.62). **(Table 2)**
- PF cohort consumed more daily grams of protein in less formula volume; Mean formula intake volume was 655 ml/day (71% of goal) in RC vs 581 ml/day (69% of goal) in PF, with mean daily protein intake of 25g (95%CI:17-34) vs 31g (95%CI:16-46), respectively. **(Table 2)**
- Both cohorts met their highest percentage of nutrition goals on feeding Day 2.
- The most common feeding interruption reported in both RC and PF was due to 'procedures' (40% and 75%, respectively, p=0.21). **(Figure 2)**
- PF cohort had no reports of feeding intolerance interruptions compared to a mean of 13% (95%CI: 3%-23%) of days in the RC [p=0.01]. **(Figure 2)**
- PF had no reports of abdominal distention vs RC mean of 8% (95%CI: 0.3%-16%) of days [p=0.04]. No statistical difference in diarrhea or vomiting was observed.

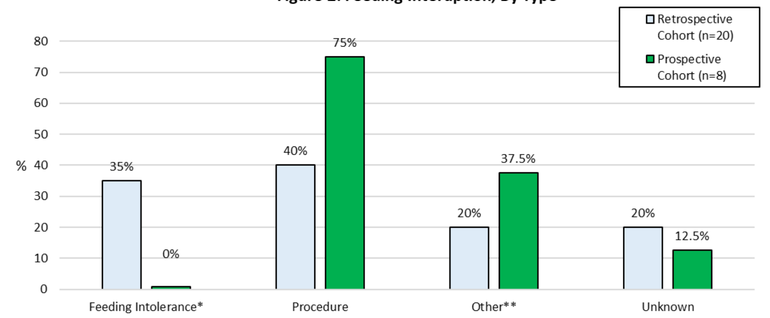
Table 1. Subject Demographics

	Retrospective (RC) n=20	Prospective (PF) n=8
Female	6 (30%)	7 (87.5%)
Male	14 (70%)	1 (12.5%)
	Mean [Std]	**Mean [Std]**
Age at enrollment (years)	5.11 [3.62]	6.19 [2.89]
Ventilator Dependent	85%	87.5%
Mean weight (kg)	20.5	30
Mean weight-for-age z-scores	0.24	0.68
Mean weight-for-age percentiles	55	64
Admitting Diagnosis	**N (%)**	**N (%)**
Cardiac	2 (10%)	n/a
Trauma	8 (40%)	n/a
Respiratory	6 (30%)	7 (87.5%)
Other: *(Encephalitis, caustic ingestion, acute encephalopathy/neurogenic shock, esophageal perforation, compartment syndrome)*	4 (20%)	1 (12.5%)

Table 2: Volume & Protein Goals

	Retrospective (n=20)	Prospective (n=8)
	Mean % of Goal or CI	**Mean % of Goal or CI**
Formula Volume (mL/d)	655 (71%)	581 (69%)
Protein (g/d)	25 95%CI:17-34	31 95%CI:16-46
Total Protein (g/kg/d)	1.32	1.33
% of Days with 90%+ of Protein Goals Met	46% 95%CI: 31-60%	53% 95%CI: 24-81%

Figure 2: Feeding Interuption, By Type



* Prospective cohort with no reports and retrospective cohort with a mean of 13% of days with feeding intolerance **(p=0.01)**

** change in clinical status, cisatracurium, accidentally turned off, oral intake, respiratory distress, status epilepticus

'Fluid restriction' not reported as a feeding interuptions in either cohort

CONCLUSION

In this QIP, the retrospective PICU control cohort met over 90% of protein requirements on 46% of days

In the prospective cohort, critically ill pediatric patients fed a 1.2 kcal/mL, higher protein (16% of kcals from protein) pediatric formula:

- **Achieved a higher % of days in meeting 90+% of protein goal compared to RC (53% vs 46%, p=0.62)**
- **Consumed more daily grams protein delivered in less formula volume**
- **Reported no feeding interruptions due to feeding intolerance**

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