Implementing Nutrition Support Protocols in a Pediatric Intensive Care Unit

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Objectives

- Discuss current evidence for early enteral nutrition (EEN) in PICU
- Review barriers to achieving EEN
- Discuss how feeding protocols can advance current practices and improve EEN support
- Identify strategies to develop, implement, and maintain feeding protocols

http://journal.texaschildrens.org/issue1/24-hours-of-critical-care/

Background

Malnutrition → poor clinical outcomes → future complications & quality of life

Children ↑ risk

- Fewer reserves
- Growth

PICU ↑ risk

- Inflammatory response
- Nutrient delivery barriers

Skillman H and Mehta N. Nutrition therapy in the critically ill child. *Curr Opin Crit Care 2012; 18:192-198.*

Benefits of EEN

- Initiating enteral nutrition within 48 hours of ICU admission
  - Nutrients for protein synthesis
    - Reduces protein catabolism
  - Nutrients for immune response
  - Preserves intestinal integrity
    - GI atrophy
    - Bacterial translocation
    - Gut associated lymphoid tissue

Skillman H and Mehta N. Nutrition therapy in the critically ill child. *Curr Opin Crit Care 2012; 18:192-198.*

Mikhailov, T., Kuhn, E., Manzi, J., Christensen, M., Collins, M., Brown, A., Dechert, R., Scanlon, M., Wakeham, M. & Goday, P. (2014). Early enteral nutrition is associated with lower mortality in critically ill children. *Journal of Parenteral and Enteral Nutrition, 38: 459-466.*

Outcomes of EEN

- Initiating enteral nutrition within 48 hours of ICU admission
  - Nutrients for protein synthesis
    - Reduces protein catabolism
  - Nutrients for immune response
  - Preserves intestinal integrity
    - GI atrophy
    - Bacterial translocation
    - Gut associated lymphoid tissue

→ ↓ days on mechanical ventilation
→ ↓ infection rates
→ ↓ length of stay
→ ↓ wounds
→ ↓ TPN use
→ ↓ hospital mortality
→ ↓ healthcare resource use

Algorithm at Miller Children's PICU

- Order set build in 2011
- Components
  - Formula selection by age
  - Initiation and advancement by age
  - Bowel regimen
  - Nursing care orders
    - Fluid management
    - MD notification (possible intolerance)
    - Tube placement verification X-ray order
  - RD referral
- Physician driven

Outcomes at Miller Children's

Retrospective chart review: 1/01/11 to 8/01/13

Inclusion:

- 37 weeks gestation to 21 years
- LOS >48 hours
- MV
- EN

Exclusion

- Parenteral nutrition (PN)
- Oral nutrition (ON)
- Nutrition support at time of admission
- Chronically ventilated patients

Outcomes at Miller Children's

Nutrient prescriptions

- Calories: WHO or indirect calorimetry
- Protein: ASPEN critical care guidelines (1.5-2 x RDA)

Risk of mortality

- PRISM 3

MV parameters

- Mean airway pressure (MAP)
- Positive end expiratory pressure (PEEP)
- Fi02
- Arterial blood gas
- Pulse oximetry

Mehta N, Compher C and A.S.P.E.N. Board of Directors. Nutrition support of the critically ill child. *JPEN J Parenter Enter Nutr 2009; 33*:260-276.
Pollack MM, Patel KM, Ruttimann UE. PRISM III: an updated Pediatric Risk of Mortality score. Crit Care Med. 1996; 24:743-52.
Thomas NJ, Shaffer ML, Wilson DF, et al. Defining Acute Lung Injury in Children with Oxygenation Saturation Index. *Pediatr Crit Care Med 2010*;11:12-17.

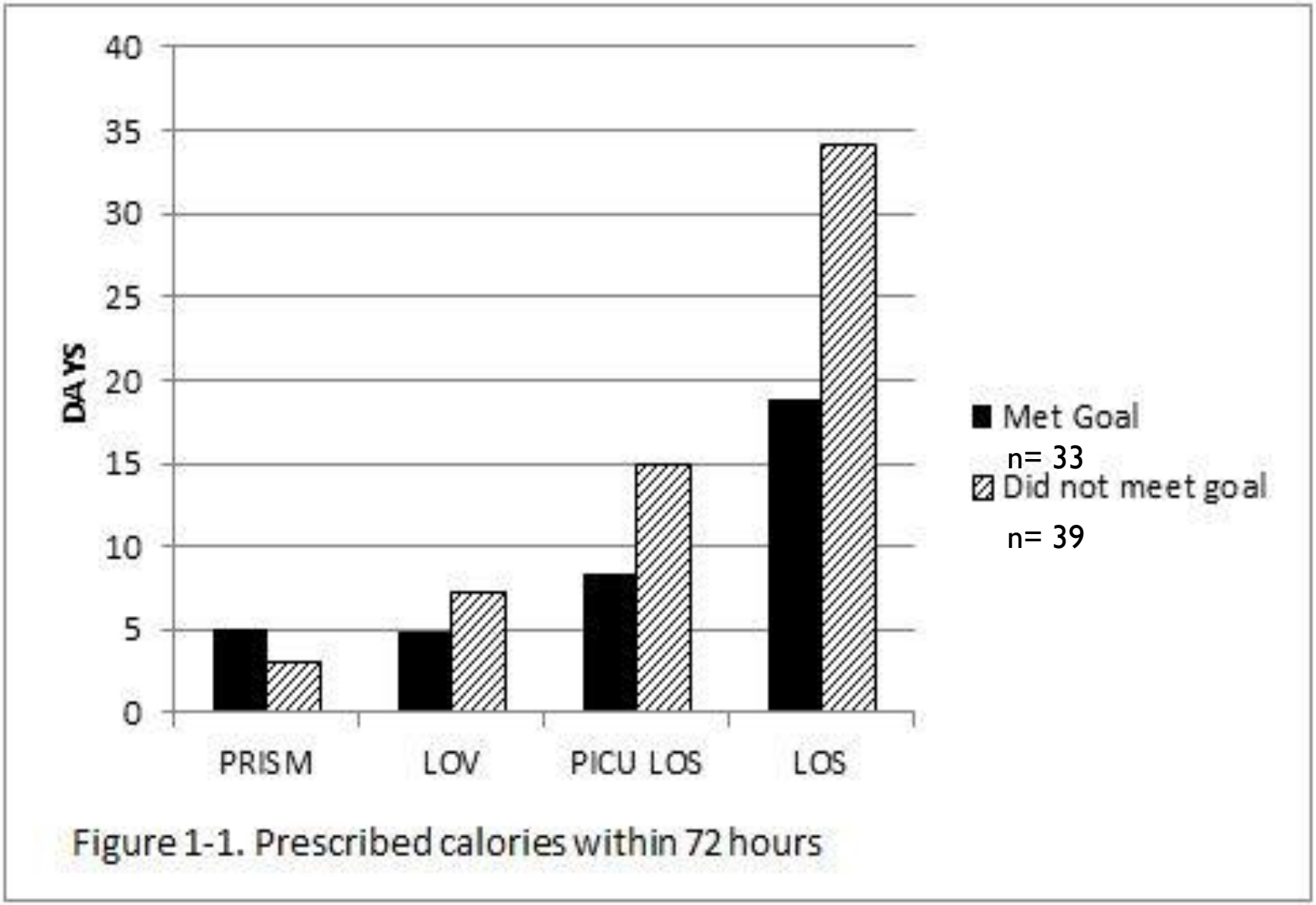


Figure 1-1. Prescribed calories within 72 hours

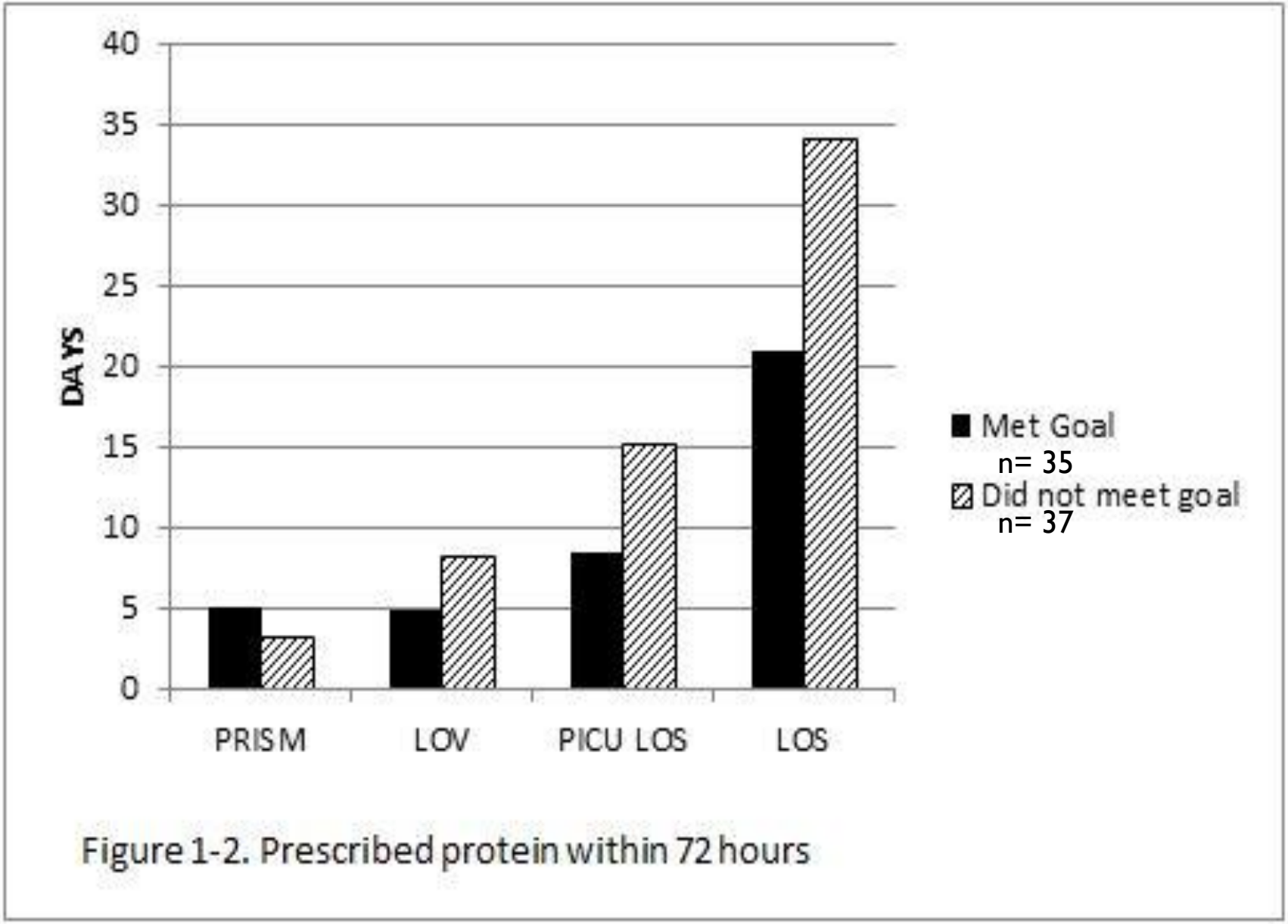


Figure 1-2. Prescribed protein within 72 hours


48%

Algorithms in PICU's

- Time to energy goals
- TPN usage
- Hospital costs
- LOS
- Mortality

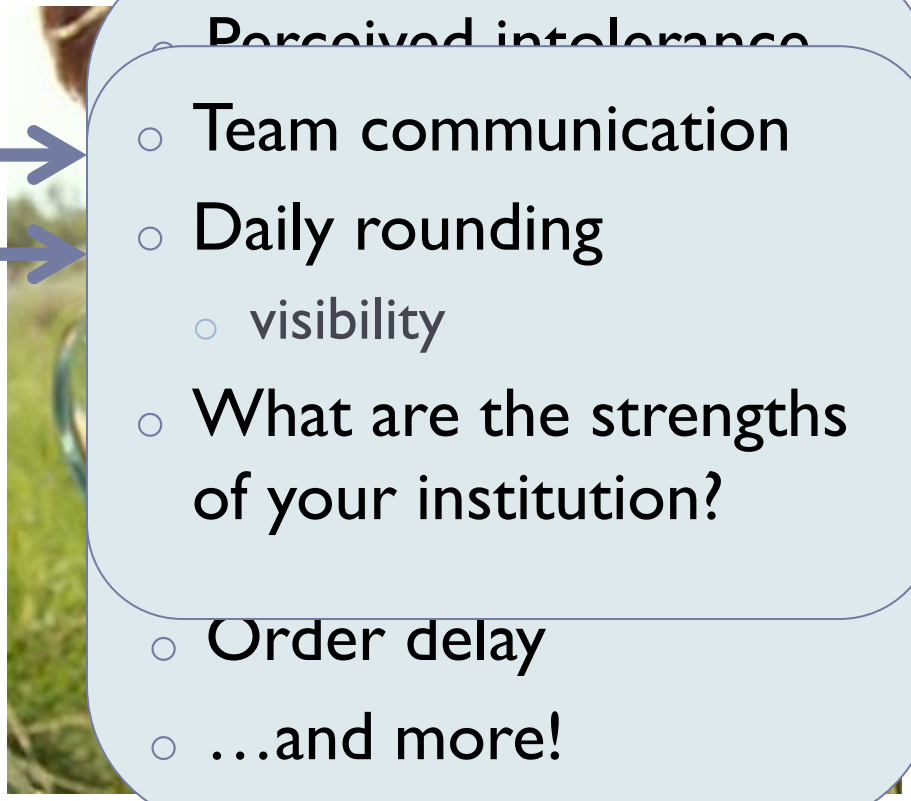
Hamilton, S., McAleer, D., Ariagno, K., Barrett, M., Stenquist, N., Duggan, C. & Mehta, N. (2014). A Stepwise Enteral Nutrition Algorithm for Critically Ill Children Helps Achieve Nutrient Delivery Goals. *Pediatric Critical Care Medicine*, 15: 583-589.

Develop an Algorithm

- Create a team
  - Nutrition champions
  - Key stakeholders
  - Changemakers
    - Physicians

Develop an Algorithm

- Create a team
- Examine current practice
  - Barriers
  - Strengths
  - Areas to improve



- Perceived intolerance
- Team communication
- Daily rounding
  - visibility
- What are the strengths of your institution?
- Order delay
- …and more!

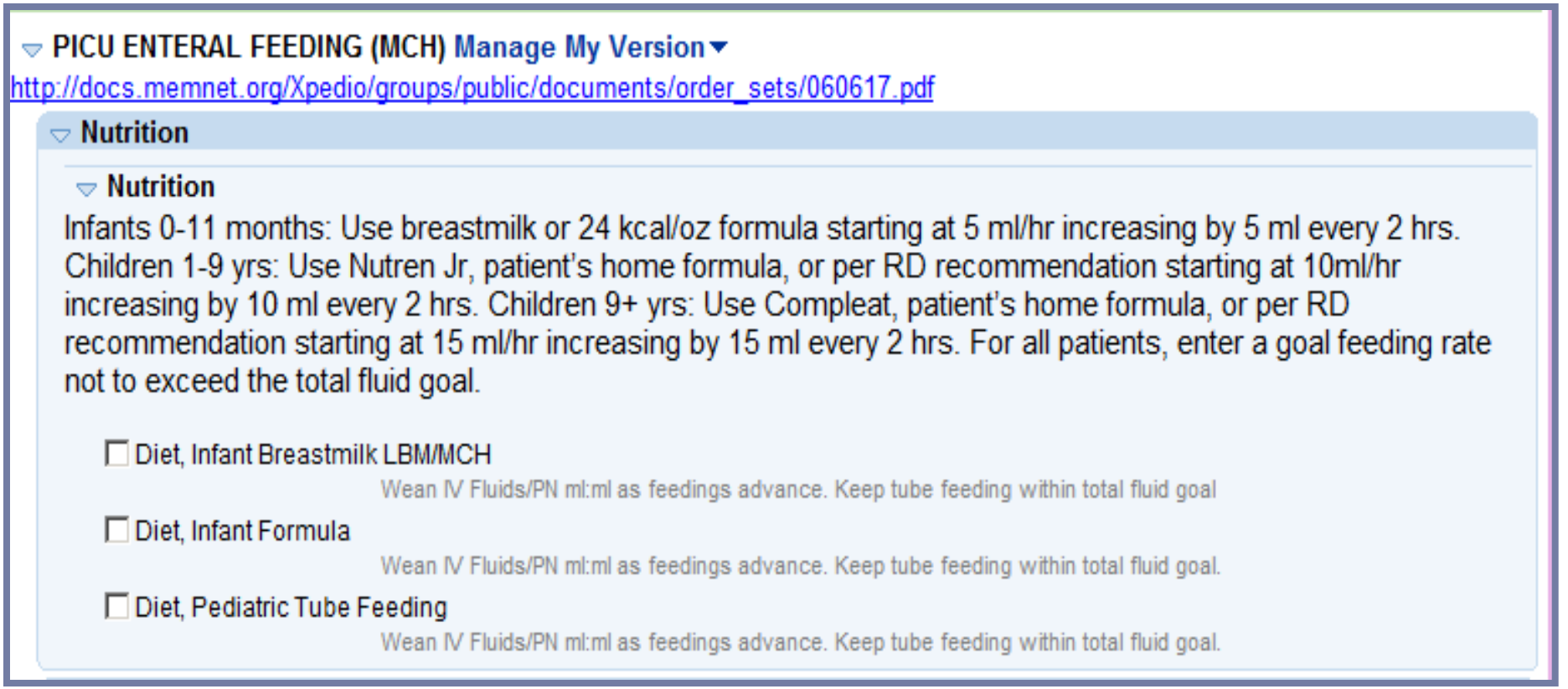
Develop an Algorithm

- Create a team
- Examine current practice
- Define priorities
  - Determine components
  - Review literature

- Nutrition Assessment
- NPO times
- Intolerance parameters
- Escalation plans
- Initiation/advancement
- Calorie Goal
  - IC or estimate
- Bowel regimen
- Nursing care
  - Head of bed elevation
  - Placement verification

Mehta, N. (2009). Approach to enteral feeding in the PICU. *Nutrition in Clinical Practice, 24: 377-387.*

Initiation and Advancement



PICU ENTERAL FEEDING (MCH) Manage My Version

http://docs.memnet.org/Xpedio/groups/public/documents/order_sets/060617.pdf

Nutrition

Nutrition

Infants 0-11 months: Use breastmilk or 24 kcal/oz formula starting at 5 ml/hr increasing by 5 ml every 2 hrs. Children 1-9 yrs: Use Nutren Jr, patient's home formula, or per RD recommendation starting at 10ml/hr increasing by 10 ml every 2 hrs. Children 9+ yrs: Use Compleat, patient's home formula, or per RD recommendation starting at 15 ml/hr increasing by 15 ml every 2 hrs. For all patients, enter a goal feeding rate not to exceed the total fluid goal.

- ☐ Diet, Infant Breastmilk LBM/MCH
  Wean IV Fluids/PN ml:ml as feedings advance. Keep tube feeding within total fluid goal
- ☐ Diet, Infant Formula
  Wean IV Fluids/PN ml:ml as feedings advance. Keep tube feeding within total fluid goal.
- ☐ Diet, Pediatric Tube Feeding
  Wean IV Fluids/PN ml:ml as feedings advance. Keep tube feeding within total fluid goal.

Hamilton, S., McAleer, D., Ariagno, K., Barrett, M., Stenquist, N., Duggan, C. & Mehta, N. (2014). A stepwise enteral nutrition algorithm for critically ill children helps achieve nutrient delivery goals. *Pediatric Critical Care Medicine*, 15: 583-589.

Briassoulis, G., Zavras, N. & Hatzis, T. (2001) Effectiveness and safety of a protocol for promotion of early intragastric feeding in critically ill children. *Pediatric Critical Care Medicine*, 2: 113-121.

NPO Times

NPO Time

Long Beach Memorial
Miller Children's & Women's Hospital Long Beach
MemorialCare Health System

NPO Reason	Time (hrs)	
	Gastric feeds	Post-pyloric feeds
Surgical Procedure under GA (OR)		
Clear liquids	2	0
Breastmilk	4	0
Formula	6*	0
Nonhuman Milk	6*	0
Solid food/meal	6*	0
GI Surgical Procedure under GA	6*	6*
Endotracheal Extubation/elective intubation	6*	0
Radiologic/IR procedure under GA	6*	0
Radiologic/IR procedure NOT under GA	4	0
Bedside procedures under sedation intubated	4	0
Bedside procedures under sedation extubated	8	0

*AN320 Anesthesia P&P states 8 hrs

Intolerance and Escalation Plan

- High Risk
  - Bilious emesis
  - hematemesis
- Moderate Risk
  - Nausea/emesis
  - Abdominal distension
  - Abdominal pain
  - Diarrhea
  - Heme + stools
  - Reflux/aspiration
- Low Risk
  - Constipation

1. RN hold feed for 1 hr
2. RN restart feeds at previously tolerated volume; reassess for signs/symptoms of intolerance
3. If patient continues to have s/sx of intolerance, then hold for 4 hrs, notify MD
4.
   1. Do not hold feeds, notify MD
      a) Determine reason for intolerance
      b) Consider recommendations below

CHOP feeding guideline
Boston Children's Guideline
Monitoring Enteral Nutrition Support Tolerance in Infants and Children (NCP

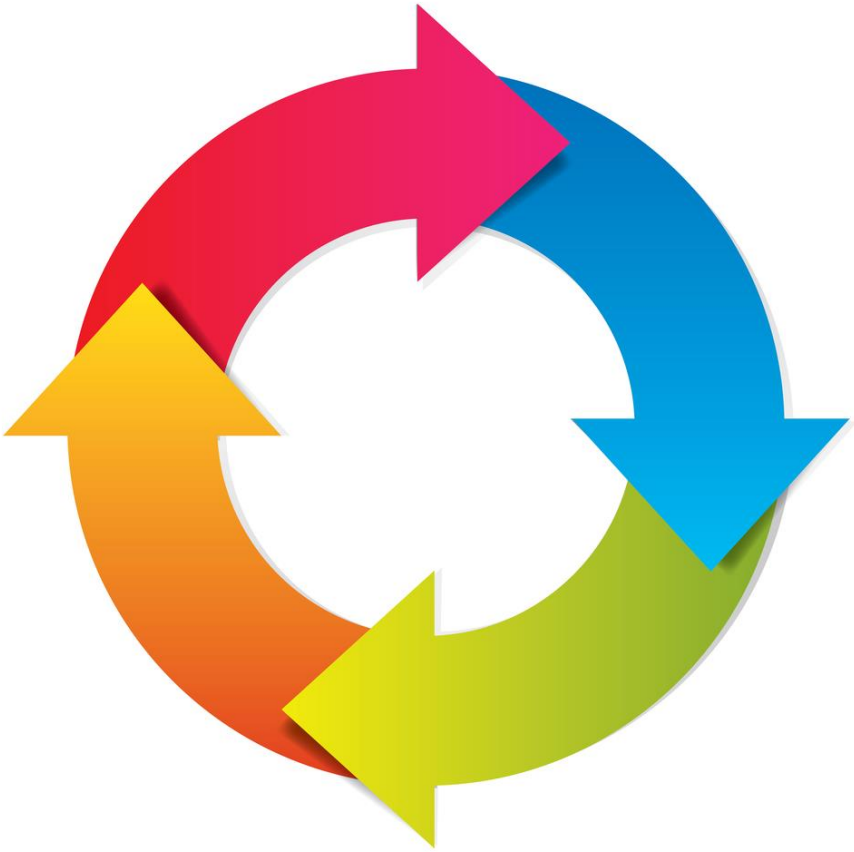
Symptom	Definition	Interventions to Consider
Nausea/Emesis	• ≥ 2 episodes in 24hrs (associated with feeding versus medical Dx [i.e., chemotherapy]) • Forceful ejection of stomach contents	• Assess enteral tube position • Correct any electrolyte imbalance • Check medication (volume/osmolality) • Administer formula at room temperature • Anti-emetic agent • Pro-kinetic agent • Reduce, discontinue, or change narcotic medications • Decrease enteral infusion rate by 25% • Change bolus feeding to continuous feeding • Change formula ○ Peptide based ○ Lower fat content ○ 100% free amino acid • Post-pyloric tube for feeding • Diagnostic studies to evaluate for obstruction, ileus, or other surgical etiologies • Evaluate other etiologies (ie: pancreatitis, neurologic, medication side effects, etc.)

Implementation

- Education
- Champion algorithm
  - Daily rounds
- Audit compliance
- Measure outcomes

Keep It Going!

Audits/outcomes



Examine current practice

Define priorities

Implement

Thank you

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