The Practical Aspects of Feeding and how they affect Nutrition and Growth in the VLBW

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Or…. more ways nursing effects outcomes!

Disclosures and Conflicts
I have no conflicts of interest to report
Bias to report
I am a nurse
We will discuss products

Nutrition vs Feeding vs Growth
- Calories lost
  - Early nutrition: moving fluids thru tubes
  - What you order is what they get, right?
  - IV: How the pump decreases calories
  - Enteral: nutrient losses to tubings
- The limits of technology: and plumbing
- Residuals and recycling
- Feeding is not just about nutrition
  - Feeding as a skill
  - Feeding as a social construct
  - Feeding as a neurodevelopmental measure and outcome
- Nutrition after discharge
  - Sprinkles
  - Breast milk comes from breasts
- Safety
  - Feeding intolerance, nec, contamination, perforation
  - The microbiome

Nutrition and growth
- Ordered Nutrition ≠ Growth
- An they are certainly not the same as feeding
Calories Lost

- Honors student project: to look at nutrition ordered versus nutrition received
- She estimated that infants only receive about 90% of what we order (unpublished and unconfirmed data)

Calories lost

- Parenteral nutrition
  - Calories lost to KVO
  - Calories lost to the limits of physics

Reference Adult 125lb female
(By Marsha Dunn, RD)

- 4 glasses orange juice
- 3 bowls cheerios with whole milk
- 3 hard boiled eggs
- 4 slices toast with butter
- 3 turkey sandwiches
- 3 servings winter squash
- 8 spinach salads
- 8 servings spaghetti with meat sauce
- 10 servings of broccoli
- 9 servings cantalope
- 2 glasses of milk
- 4 cartons of yogurt
- 6900 kcal, 200 gm protein

Calories Lost

- Early nutrition is all about moving fluids thru tubes (physics)
Nutrient loss to tubing and containers

Potential strategies to limit nutrient loss

- Reduce need for tube feeding
  - Our colleagues in other countries transition children to oral feeding very differently than we in the U.S. do
    - Early direct breast feeding
    - Syringe, cup or paladai feeding
- Optimize pre-exposure manipulation
- Improvement in administration techniques
  ~ Rayyan, Rommel, Allegaert, 2015

Strategies to minimize nutrient loss

- Bolus vs continuous feeds
  - shorten time and tubing exposure
  - In piglet model bolus feeding enhances protein synthesis and promotes protein deposition
    ~ Davis, Fiorotto, and Suryawan 2015
  - Most recent Cochrane review could not demonstrate difference in outcomes
    ~ Premji, Chessell, 2011
- Fat loss greater in vertical feeding bag than in horizontal syringe
  ~ Rayyan, Rommel, Allegaert, 2015

Fat delivery: optimize your system

Nutrient loss to feeding intolerance... Define feeding intolerance...

That’s seriously all you’ve got?

Nutrient loss to recycling

- How many of us still check residuals?
- How many of us refeed residuals and subtract from feeding? Does you I&O show this?
- Recycling food?
Nutrient loss to emesis

Feeding is not just about nutrition

- Feeding as a skill
- Feeding as a social construct
- Feeding as a neurodevelopmental outcome and a determinant of developmental outcomes (Jadcherla, et al 2017)
- Feeding as a determinate of parental competence

Feeding

- Care that has been demonstrated to improve feeding outcomes:
  - Non nutritive sucking (Foster, Psaila, Patterson, Cochrane review 2016)
  - Feeding opportunities
  - Consistency ?
    - Cochrane review: use of instruments, no studies met inclusion criteria Crowe, Chang, Wallace 2016
    - A quality improvement project
  - Parents

Missed care in the NICU: Sins of Omission

- 52% of certified NICU nurses reported missed care in their last shift worked
- 35 possible items
  - #1 Attendance at rounds
  - #2 Medication effectiveness reassessment
  - #3 Feedings offered to infants who exhibited feeding readiness behaviors

So what? .......

- With each 1% increase in the proportion of missed oral feeding opportunities the time to reach oral feeds increased by 1.45 days ($p=0.007$) and time to discharge 1.36 days ($p=0.047$)

A Quality Project: Feeding

Example of Nurse led quality improvement

- 36 bed level 3 NICU in a high risk center. Feeding frequently delayed discharge and caused parental distress
- Team created: Nursing, speech, OT, management, parents
- Measures: gestation at first po feed, number of people that fed infant in 24 hours, number of nipple changes, feeding at breast, days til full po feeds, LOS
- Went to literature on feeding: created and implemented a nurse driven protocol for feeding
- Decreased LOS by 5 days
• "Reducing variation in feeding practices across NICUs is increasingly recognized as a potential mechanism for reducing NICU length of stay and overall hospitalization costs related to prematurity." (Tubbs-Cooley et al 2015, p 6)

Parental Involvement

81 infants < 32 weeks, tertiary care center. The earlier they started kangaroo care and the earlier parents fed their infants, the lower PMA at which infants achieved full oral feeds. (Gamm et al 2016) (a measure of degree of illness?)

Discharge Nutrition

• Sprinkles
• Breast milk comes from Breasts
  – Breast milk feeding is what we measure
    • At home this means the “triple feed”
  – Breast feeding is what maintains BM availability

To Sprinkle or not to Sprinkle

• “The common practice of sprinkling preterm discharge formula powder into expressed human milk as a method of fortification at NICU discharge is discouraged” (Groh-Wargo, Thompson 2014)
• Alternating breast milk with preterm formula improves nutrient intake.
  – Improves protein intake from 1.9 gm to 2.6 gm/kg, improves Ca intake from 55 mg to 91 mg (Groh-Wargo, Thompson 2014)

Maintaining Breast Milk after Discharge

• Integrative review of 24 articles
  – NICU factors, feeding methods, maternal characteristics, maternal experiences and support programs
• Risk factors for stopping
  – Low socioeconomic status, smoking, low maternal supply
• Factors that improved likelihood of BF
  – Kangaroo care, support in the NICU and after discharge
  Briere, McGrath, Cusson 2014
Breast feeding after discharge

- At one month post discharge, mothers who were provided >1 direct breastfeed per day in the NICU were more likely to still be providing breastmilk for their infants (p < 0.01) and had prior breastfeeding experience. This finding persisted at 4 months post discharge. (Briere, McGrath, Cong, Brownell, Cusson, 2016)

Opinion!

- It does not matter if a nurse can feed the baby
- It matters only that the infant’s caregivers can feed the baby and that it is safe, there is social interaction, and that it is a positive experience for both feeder and feedee.

Safety

- We spend a lot of time in the NICU talking about the safety of central lines and parenteral nutrition.
- We spend a lot of time worrying about the big complications of enteral feeding
  - NEC
- But what about the other problems

Questions

- What size tubes should we be using? How often should we change them?
- How long should a gavage feed take and how do we control the rate of feeding?
- Are feedings on pumps safe?
- What should the tube be made of?
- How far should we place the tube and how should we check placement?
- Should we place OG’s or NG’s?
  - What about when the infant begins to PO?

Complications associated with tube feeding

- Misplacement of tubes
- Feeding and tube contamination
  - Alteration of the microbiome
  - Feeding intolerance
- Perforations

Placement of Feeding Tubes

- Multiple studies have shown that feeding tubes are frequently malpositioned. The rate of malpositioned feeding tubes in newborns may be as high as 54% (Wallace, Sessler, 2014)
Measuring for feeding tubes

<table>
<thead>
<tr>
<th>Step</th>
<th>Task</th>
<th>Measuring for feeding tubes date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Select feeding method of measuring inserting depth.</td>
<td><img src="image1" alt="" /></td>
</tr>
<tr>
<td>2</td>
<td>Determine feeding tube length by subtracting the distance from the mouth to the xiphoid process.</td>
<td><img src="image2" alt="" /></td>
</tr>
<tr>
<td>3</td>
<td>Mark the desired length on the feeding tube.</td>
<td><img src="image3" alt="" /></td>
</tr>
<tr>
<td>4</td>
<td>The feeding tube should be placed directly into the stomach.</td>
<td><img src="image4" alt="" /></td>
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</tbody>
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Verification of tube placement

- Injection of air with auscultation is still widely used and known to be unreliable
- Current recommendations:
  - Staged assessment
    - Aspirate for residual (> volume of tube)
    - Reposition and try again
  - Check pH
  - Xray
- The future
  - Capnography or electromagnetic

Wallace, Steward 2014

The feeding tube and pathogens

- 125 feeding tube from 50 preterm infants were cultured, only 8 were sterile. 94% colonized with bacteria, 57% > 1000 CFU per tube. Preterm infants with contaminated tubes were more likely to experience feeding intolerance and develop NEC. (Mehall et al, 2002)
- Antibiotic resistant pathogens found in feeding tubes (Mehall et al, 2002)
- A study of duodenal aspirates demonstrated that colonization increased with age and molecular typing suggested that bacteria were not maternal, but nosocomial. (Brooks et al, 2014)

For 35 years I have been a Neonatal Nurse

- If….
  - I worked full time staff for 10-12 years
  - 3, 12 hours shifts per week x 50 weeks per year x 12 years and I gave an average of 8 gavage feeds per day
  - I have given 14,400 gavage feedings ...
- And, I still don’t know how to safely feed a baby

References:


- Wallace T, Steward D. Gastric Tube Use and Care in the NICU. (2014), http://dx.doi.org/10.1053/j.nainr.2014.06.011