Redefining “Successful” Feedings in the NICU Population

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Objectives

• Describe a comprehensive approach to feeding in the NICU.
• Identify high risk feeders and strategies used to optimize oral feeding safety.

Our Journey

• Since 2005 “NICU Feeding Task Force” established (nurses & ST)
• Initial protocol revision focused on nursing autonomy with nipple feeding vs. physician driven
• Gavage feedings were administered predominately via intermittent tube placement and gravity bolus
• Indwelling feeding tubes and pump feedings were only used if physician ordered
• Protocol was published in Neonatal Network


Year 2010 – Research Question?

Is there evidence available to support a practice change from intermittent OG/NG bolus gavage to indwelling OG/NG with pump delivery?

“Sip or Slam” Campaign

Average Weight of An Adult Male

190lbs.

Full feedings for our neonates = 100cc/kg/day
Adult male would need to consume 1 L + 750mL, Q3

Would you rather SIP or SLAM all that water Q3 around the clock?

This is what we have been asking our babies to do since most gavage feedings are completed within approx. 3-5 minutes.

2005 and 2010

2005
• Support from ST at the time was not there, strong opposition to indwelling tubes
• Difficulty developing evidence for such a practice change that was convincing

2010
• New ST team open to seeing what the research had to offer and supportive of the idea
• More thorough investigation of initiative with compelling findings and a lot of persistence!
Purpose

- Improve feeding tolerance and help infants achieve advancement to full feedings sooner.
- Promote more opportunities to nipple feed.

Expected Outcomes Based on Protocol Change

- ↓ in days to full feedings (100cc/kg/day)
- ↓ in PCVL days
- ↓ in days to all nipple
- ↓ in length of stay

Literature Review

- BOLUS FEEDING = Q3 hours over 20 minutes
- No scientific literature exists to support the use of one particular method of tube feeding premature babies
- Because no clinical differences were found, the type of tube placement chosen may be based on economics
- Methods are rooted in tradition and preferences

Expert Opinion

- No problem with indwelling tubes as erosion
- Consider G-tube for long term placement
- Pyloric sphincter should not be affected, volume and speed of bolus will have a greater impact on GERD and less of an alteration of pyloric function
- Tube can ↑ chances of GERD, however forceful GERD from a full stomach would have a greater negative influence

National Zoomerang Survey

- 33 electronic surveys were sent out to Level III Vermont-Oxford NICU’s across the nation
- 30% response rate

Survey Responses

1. Standard placement practice for gavage feedings?
   - 100% indwelling feeding tube
2. When is tube removed?
   - 43% - once so many nipple feeds. Have been achieved (i.e. 4x/day, 6x/day) 57% - all apple
3. Standard rate of infusion?
   - 14% - 20 minutes
   - 14% - 30 minutes
   - 71% - other - one hour - gravity - ordered per patient
4. Who determines flow rate ↑ or ↓?
   - 57% RN
   - 43% MD
Next Steps

• Research findings presented at staff and multidiscipline meetings
• Approval granted by NICU Medical Director
• Create indwelling feeding tube protocol
• Make revisions to nipple feeding protocol as a result of gavage feeding change

Naso-oral Gastric Tube Feeding Guidelines

Go Live May 1, 2011

Guidelines for Our Unit

Indwelling bolus pump feeding is the preferred method for gavage feedings. The feeding tube is inserted when feedings are initiated and remains in place unless made NPO or until all nipple feedings are achieved. The standard delivery time is 30 minutes.

Details

• Only enteral feeding system (tubes and syringes) are to be used
• Always use smallest tube size (5Fr.), when stomach needs to be vented post feeding use 8Fr. Tube
• Nasal placement preferred
• Use NEMU (bridge of nose → earlobe → to the point midway between the xiphoid process and the umbilicus) method to measure for tube depth
• Placement confirmed by gastric residual or 1-2cc air insufflation and auscultation
• Standard pump time 30”, RN may缩短 time to as low as 15” once infant achieves more nipple feeding attempts and is able to prove tolerance over shorter periods of time. MD order needed to increase pump time to >30”
• Flush feeding tube with 0.5cc sterile water post-feed
• Change syringe and tubing every feeding
• Correct placement is verified and documented Qshift
• Nare is rotated weekly

Nourish and Nurture

Fostering the advancement of enteral nutrition and the decrease of parenteral nutrition without losing the personal patient contact and nurturing care environment.

• Observe, understand and appropriately respond to infant cues
• Offer non-nutritive sucking on pacifier while feeding is infusing
• Hold stable convalescing infants during gavage infusions to promote face to face contact and interaction
• Allow breastfed infants to suckle at breast during gavage infusions
• Offer facial expression, affect

Nipple Feeding Guidelines

Go Live May 1, 2011
Guidelines

Research supports the use of “demand” or “self regulatory” behaviors as indicators for nipple feeding. Therefore, once Behavioral/Development Indicators are met, infants may be offered a nipple feeding anytime Oral Feeding Readiness Cues are observed.

“If the QUALITY of a feeding takes priority over the QUANTITY ingested, feeding skill develops pleasurably and at the infant’s own pace.”

(Ross & Philbin 2011)

Evidence

• “Demand” or “self regulatory” feeding is shown to have positive effects on long term developmental outcomes of the infant.

• Early introduction of oral feeding accelerates the transition time from tube to all oral feeds and also provides practice opportunities that enhance the oral skill necessary for safe successful feeding.

Behavioral/Developmental Indicators For Nipple Feeding

• Tolerating enteral feedings with minimal residuals, emesis or abdominal distention
• Airway should be stable
• Breathing comfortably at rest
• RR ideally <60bpm, otherwise health term or post-term infant
  RR ≤ 70bpm
• Waking for feeds on own and able to sustain a quiet alert state
• Emerging active head/neck control
• Swallowing and non-nutritive suck present
• 28 weeks PCA (to put to breast) and 32 weeks PCA (to attempt bottle)

Oral Feeding Readiness Cues

• Demonstrate energy for feeding

• Have the ability to…
  • Remain engaged in the feeding
  • Organize oral/motor functioning
  • Safely swallow and breath
  • Maintain physiologic stability

Self Regulatory Feeding of the NICU Infant

• Every feeding time offer the infant the ability to non-nutritively suck.
• After 5-10 minutes of non-nutritive sucking assess and evaluate behavioral state and readiness cues. Optimal behavioral states for successful feeding: awake, fussy, crying.
• If infant too drowsy continue finishing cares and then reassess. If drowsiness continues gavage the feeding.
• If infant is alert/restless you may offer nipple feeding every 3 hours as long as readiness cues are present prior to initiation of nipple attempt.
• Whatever volume is not completed, finish via feeding tube.
• Once infant has achieved all nipple (and completing prescribed volumes) in a 24 hour period, feeding tube may be removed
Changing the “Culture” of Oral Feeding

QUALITY is “KEY” for Long Term Feeding Success:

<table>
<thead>
<tr>
<th>Previous discharge qualifiers related to feeding:</th>
<th>NOW…Discharge qualifiers related to Quality that are considered:</th>
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</thead>
<tbody>
<tr>
<td>• Volume</td>
<td>• Infant skill</td>
</tr>
<tr>
<td>• Rate of feeding intake</td>
<td>• Physiologic stability</td>
</tr>
<tr>
<td>• Weight gain</td>
<td>• Motor stability</td>
</tr>
<tr>
<td>• Full oral feeds</td>
<td>• State stability</td>
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<tr>
<td></td>
<td>• Parental competence and confidence</td>
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Language shift

• Talk about quality of feeding rather than just numbers.
• Language to use: talk about infant state, organization, physiology (RR, HR) and/or coordination.
• Language to avoid: Use of volume intake and/or frequency of nippling (in isolation) to describe feeding.

Speech Therapy’s Role:

In helping change the oral feeding “culture” to optimize long-term feeding success

Oral Feeding Readiness: Let’s Break it Down

• Physiological stability
  – Maintain stable heart rate
  – Respiratory rates (>70 not safe for feeding)
  – Oxygen saturations
  – Nasal Cannula flow rate at <2.0 liters

• State
  – Quiet/alert
  – Calm
  – Drowsy/alert

• Behavioral Readiness cues
  – Rooting
  – Hands to mouth

Cue-Based Feeding: Stress Cues

Physiological
– Heart rate too high or low
  • (Tachycardia vs. Bradycardia)
– Color change/O2 desaturation
– Tachypneic (RR>70) / Apnea
– Increased Work of breathing
  • retracting
  • head bob
  • nasal flaring
  • Purse lips
  • Raised/furrowed brow
Cue-Based Feeding: Stress Cues, cont.
State Regulation
- Fatigue/asleep
- Shut down
- Frantic/disorganized
- Rapid state transitions

General
- Aversive oral response (gag, grimace, purse lips)
- Coughing/choking
- Multiple swallows
- Gulping
- Drooling
- Stridor/sterter
- Disorganized suck

Additional Information May Be Needed…
- Video Swallow Study:
  ➢ Offers objective information regarding the physiology of the swallow to optimize feeding/swallowing careplan.

Phases of the Swallow
- Oral Preparation Phase
- Oral Phase
- Pharyngeal Phase
- Esophageal Phase

Interventions/Strategies
- Nipples/Bottle Systems
- Positioning and Pacing
- Thickening
- Non-nutritive Experience
- Oxygen use

Interventions/Strategies: Nipples/Bottle Systems
- Shape
  - Straight vs. Orthodontic
    - Bottle shape
- Size
  - Needs to match oral cavity
- Flow
  - Slow
  - Medium
  - Fast
  - Variable
- Special Needs Feeder
### Interventions/Strategies: Positioning and Pacing

- **Positioning/Swaddling**
  - Swaddling: how and why
  - Semi-upright
  - Sidelying
    - Right vs. Left

- **Pacing**
  - Why pacing? Breathing or Swallowing
  - How many sucks before a break?
  - Keep contact between nipple and lip/tongue to maintain organization

### Interventions/Strategies: Thickening

- Thickening of formula to optimize safety of swallow
- Only indicated post completion of video swallow study.
- Typically not able to thicken expressed breast milk.
- Thickening for safety of swallowing is DIFFERENT than thickening for GERD.

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### Interventions/Strategies: Non-nutritive Experience

**When/Why?**

- Not stable for nipple feeding
  - Physiologic instability
- Positive oral input
  - Vent dependent
  - Aversive/disinterested
- Help organize prior to nipple feeding
- Silent aspiration

### Interventions/Strategies: Oxygen Use

- May benefit for increased Oxygen and/or flow rate for “work” of nipple feeding.
- May need Oxygen only during nipple feeding for period after weaned at rest.
- Use of 1.5 -2.0 liters flow may facilitate increased patency of airway with diagnosis of laryngomalacia.

### Statistics 1 Year Post Protocol Changes

Averages compiled for babies ranging 23-41 weeks PCA

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Empower Parents/Caregivers:

- Involve parents/caregivers in feeding from the start to support parent/infant relationship.
- Discuss “quality” of feeding across experiences.
- Encourage hands-on feeding experience.
- Discuss feeding as a “journey”…to optimize long-term success.
‘BEFORE’ & ‘AFTER’

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<tbody>
<tr>
<td>Days to Full PO</td>
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Areas for Improvement

- Chart audits to track compliance with protocols
- More staff educational offerings to improve understanding and compliance particularly with nipple feeding portion of protocol
- Improve collaboration with ST team
- Expand feeding task force to include NICU lactation consultant (recent position added to our NICU team)

Looking ahead

Research Areas For the Future

Best Practice for Predicting Feeding Tube Insertion Depth?

- Currently NEMU method has been published as best practice
- ARHB (age-related height based) and weight based methods are emerging, however there are limitations
  - wide variety of mathematical equations being trialed
  - Some are non-specific to NICU population
  - Small sample sizes
  - Measuring of infants can be difficult, inaccurate and user-dependent
- What is needed is a comparison study of the proposed methods

Emerging Concepts

- Non-invasive magnetic imaging techniques for visualizing placement of feeding tubes w/o radiographs
- Improve design of the tubes so that pores are limited to a very small interval at the tip
- Re-engineered to prevent coiling in the pharynx or esophagus on insertion
- Include a mechanism above the pore span that can detect the distal LES
- Contain an extendable conduit for pH screening
- Contain mechanisms in the tip that can detect a high malposition in the esophagus (by sensing the wave pattern in the esophagus on swallowing) or in the lung (by sensing rhythmic variation in CO2 & O2 concentrations or breathing velocities)
Standardized Feeding Regimes

“Implementation of a standardized feeding regime for premature infants minimizes variations in feeding practices, may improve early detection and management of feeding intolerance, and is associated with a significantly lower incidence of NEC.”

Perinatal Quality Collaborative of North Carolina (PQCCNC)

References


References cont’d

Acknowledgements

Feeding Task Force Members

Amy Woida RN
Renee Burkhardt RN
Erin LeSage SLP
Carolyn Scuptr RN
Lynn Barlow RN
Roseann Link RN
Deb Wojcik RN

References cont’d

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Toomey and Associates, LLC as stated on powerpoint. Kay Toomey, PhD is a Clinical Psychologist and Feeding Intensive care specialist, who at the time of the conversation was practicing in Colorado.

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