Tube Feeding and Transitioning to Oral Feeding

Barbara McElhanon, MD
Assistant Professor, Division of Pediatric Gastroenterology, Hepatology, and Nutrition & Division of Autism and Related Disabilities
Medical Director, Marcus Autism Center Feeding Program
Disclosures

• Nothing to disclose
Objectives

• Describe risk factors associated with feeding disorders
• Recall evidence-based points related to tests and procedures
• Identify practical changes that could be done in the NICU setting to reduce feeding issues and dependence on tube feeds.
When Your Baby Won’t Eat

Our daughter started life on a feeding tube. Then we tried to wean her off it — and began to understand the complexity of how children relate to food.

By VIRGINIA SOLE-SMITH  FEB. 4, 2016
Gut Dysfunction

- Vomiting/spitting is very concerning and occurs with bolus feeds; Possibly unable to PO

Please... just eat everything by mouth so you don’t get a gtube. Well, Maybe a gtube isn’t so bad. Why aren’t you seeing an SLP yet??

Intestines good, but vomiting/spitting is very concerning for whatever reason; Possibly unable to PO

All the Gut works! Still possibly unable to PO
• Safe feeding requires:
  – coordination of sensorimotor function, swallowing, and breathing

• Eating and food plays a central role in the parent-child relationship
Feeding difficulties in the NICU

- are COMPLEX
- Can become apparent at various points
- Measures include
  - delayed acquisition of independent enteral or oral feeding milestones
  - lack of progressive tolerance to increasing feeding volumes
- Related to:
  - immaturity, regurg/emesis/reflux ?? normal
  - suspicious of NEC
  - GI dysmotility/post surgical situations
  - ALTEs
  - Aspiration syndromes
Feeding difficulties in the NICU

• Major challenge in sick premature infants at large tertiary care hospitals
• Increasing rates of survival including those with complex aerodigestive issues
• Feeding/nutrition issues are on the rise and contribute to LOS and to economic burden
• Variability in care contributes to 26 billion $$ a year in US for premature birth healthcare costs.
Food Neophobia

Food neophobia may increase in old age possibly due to health concerns. More research required.

Dovey et al
Picky Eating

Dovey et al
Picky Eating- Variant of normal

• Picky eating
  – Strong food preferences
  – Behaviors aimed at ending meals prematurely
  – Fluctuating hunger: intake varies up to 30% per day

RESOLVE WITH MINIMAL INTERVENTION
3-10% of all children have true feeding disorders and 40-70% of children with complex medical issues.
DSM-V Avoidant/Restrictive Food Intake Disorder

• An eating or feeding disturbance (e.g., apparent lack of interest in eating or food; avoidance based on the sensory characteristics of food; concern about aversive consequences of eating) as manifested by persistent failure to meet appropriate nutritional and/or energy needs associated with one (or more) of the following:
  – **Significant weight loss** (or failure to achieve expected weight gain or faltering growth in children)
  – Significant **nutritional deficiency**
  – **Dependence on enteral feeding or oral nutritional supplements**
  – **Marked interference with psychosocial functioning**

[disclaimer section]

• The disturbance is not better explained by lack of available food or by an associated culturally sanctioned practice.

• The eating disturbance does not occur exclusively during the course of anorexia nervosa or bulimia nervosa, and there **is no evidence of a disturbance in which one’s body weight or shape is experienced.**

• The eating disturbance is attributable to a concurrent medical condition or better explained by another mental disorder. When the eating disturbance occurs in the context of another condition or disorder, the severity of the eating disturbance exceeds that routinely associated with the condition or disorder and warrants additional clinical attention.
Feeding Disorders-2 flavors

• Flavor #1
  – Restricted types of foods
    • Autism

Sharp et al 2010
Feeding Disorders- 2 flavors

• Flavor #2
  – Restricted volume of foods
  – Infants and children with congenital or acquired respiratory, cardiac, and gastrointestinal (GI) problems

Sharp et al 2010
How does this happen?

• Medical problems promote conditioned food aversion
  – eating is associated with pain, nausea, fatigue

• Once medical condition improves- aversion may not;
  – infants and children will have persistent disruptive mealtime behaviors trying to avoid contact with food.
How does this happen?

• Problem behaviors persist due to negative reinforcement
  – naturally a parent is going to remove a feeding demand and maybe end the meal early if the kids is acting so negatively. Even gagging/vomiting etc.
  – Consequently, child learns to do this even better and these behaviors are inadvertently shaped and strengthened overtime.

• Limited exposure to food leaves out all the key sensory, developmental, physiological, social processes which usually further stresses the parent-child interaction. **Ultimately, child needs major behavioral intervention or ongoing artificial support.**
Ongoing Contributing Barriers

- Aspiration/Dysphagia from any cause

- Developmental Delay/Missed Milestones

- Lack of standardization and evidence from OT/ST, studies, surgeons, dietitians, GI doctors!

- Behavioral/Social issues
  - Multiple caregivers
  - Resources
  - Education
N= 103 kids
38% were born between 24 and 36 weeks
74% had MR or DD
Age and prematurity were NOT related to categorization.

Feeding Category (alone or in combination)
This makes sense

• 11.5% of all US births are <37weeks
• All infants born <32 weeks will require some degree of enteral tube feeds
• Premature infants are at increased risk for tubes for other reasons
  – have more complex medical needs
  – may require more calories than typical kids
  – may have developmental delay
  – At risk for oral aversion
Initial Evaluation in Feeding Clinic at Marcus-Multidisciplinary approach

• Preceded by a thorough screening form
• Behavioral psychologists
• Occupational therapists/SLP eval
• Nutritionist
• Pediatric GI
• Psychology intern
• Data collection
• Video taped feeding session
Video session

- 5 min with “non-preferred foods” provided by family
- 5 min with “preferred foods” provided by family

“During today's behavior observation, Bryden was offered 328 grams of food by his mother over the course of 9.16 minutes (4.16 minutes preferred, 5 minutes non-preferred). The caregivers offered 131 grams of preferred foods and foods included formula in a bottle. The second part of the observation included 197 grams of non-preferred foods and foods included: stage 1 garden vegetables baby food and Gerber banana puffs. Data for Bryden's behaviors during the session are summarized below.”
vegetables baby food and Gerber banana puffs. Data for Bryden's behaviors during the ses

| Child Behaviors | Grams Presented | Grams Consumed | Total Accepted Bites | # Accepted Bites Non-Self | # Accepted Bites Self-Fed | % Clean Mouth | % Expulsions | % Crying | Disruptions Per Min | # Gags/Co
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred</td>
<td>131</td>
<td>22</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>Non-Preferred</td>
<td>172</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>50</td>
<td>0</td>
<td>3.4</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parent Behaviors</th>
<th># of Physically Presented bites</th>
<th>% Bites with Escape</th>
<th># Bites with Verbal Prompts</th>
<th>% Bites Accepted following prompt</th>
<th># Praise Statements</th>
<th># Neutral Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred</td>
<td>3</td>
<td>50</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Non-Preferred</td>
<td>19</td>
<td>89</td>
<td>5</td>
<td>40</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

During the meal, Bryden was laying on a pillow on the floor during the presentation of the pr
Description of the meal with parent

- During the meal, Bryden was laying on a pillow on the floor during the presentation of the preferred bottle and seated in a highchair during the presentation of non-preferred foods. Caregivers sat beside Bryden during the meal. During the presentation of preferred foods, caregivers alternated between presenting the bottle to Bryden and prompting him to hold the bottle and drink. Bryden responded by accepting the bottle three times into his mouth from his mother, and swallowing occurred with all accepted bites. A total of 22 grams were consumed. No expulsions, crying, disruptions, gagging, or coughing were observed. Bryden’s mother issued five verbal prompts to eat, and Bryden was not observed to accept a bite within 5 seconds of each prompt. No praise for eating was issued by caregivers during the observation, and thirteen neutral statements were observed. During the presentation of non-preferred foods, caregivers alternated between presenting bites to Bryden and prompting him to self-feed. A total of 4 bites were accepted, two of which were presented by caregivers. An additional 5 prompts to eat were issued by caregivers, and two bites were accepted in response to these prompts. Bryden expelled all bites. No grams were consumed during the observation. No gags or coughs were observed. No crying or disruptions were noted. No praise for eating was issued by caregivers during the observation. Six neutral statements were observed.

The point is.... They get a thorough feeding and behavior history!
Marcus Autism Center Feeding Programs

• Outpatient twice weekly

• nutrition only visits (trying to wean off tube)

• OT/SLP visits

• Day Treatment
  – $80K multidisciplinary 8 week M-F all day program
Oral Consumption: 74% Improvement
Relevant Research and Guidelines
Studies on feeding practices

- Speech Language Pathology is not a historically evidence-based profession
- Lots of variation between providers and between NICUs
<table>
<thead>
<tr>
<th>Indicators of Aspiration in Infants[^12]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In general</strong></td>
</tr>
<tr>
<td>Congestion, particularly after feedings</td>
</tr>
<tr>
<td>Difficulty managing secretions</td>
</tr>
<tr>
<td>Frequent respiratory illnesses/ inability to wean from oxygen</td>
</tr>
<tr>
<td>Noisy or wet vocal quality, stertor, or stridor</td>
</tr>
<tr>
<td><strong>Weight loss or poor weight gain</strong></td>
</tr>
<tr>
<td><strong>Back arching</strong></td>
</tr>
<tr>
<td>Breathing difficulties that might be signaled by increased respiratory rate</td>
</tr>
<tr>
<td>skin color changes</td>
</tr>
<tr>
<td>apnea</td>
</tr>
<tr>
<td>stopping frequently because of uncoordinated suck-swallow-breathe pattern</td>
</tr>
<tr>
<td>desaturations</td>
</tr>
<tr>
<td>bradycardia/tachycardia</td>
</tr>
<tr>
<td>Coughing and/or choking during or after swallowing</td>
</tr>
<tr>
<td>Crying</td>
</tr>
<tr>
<td>Decreased responsiveness</td>
</tr>
<tr>
<td>Difficulty initiating swallowing</td>
</tr>
<tr>
<td>Disengagement cues, such as facial grimacing, finger splaying, or head turning away from bottle/breast</td>
</tr>
<tr>
<td>Gagging</td>
</tr>
<tr>
<td>Loss of liquid anteriorly</td>
</tr>
<tr>
<td>Multiple swallows</td>
</tr>
<tr>
<td>Neurobehavioral stress cues</td>
</tr>
<tr>
<td>Prolonged feeding times</td>
</tr>
<tr>
<td><strong>Raised eyebrows</strong></td>
</tr>
<tr>
<td>Refusal</td>
</tr>
<tr>
<td>Taking small volumes</td>
</tr>
<tr>
<td>Vomiting (more than typical “spit up”)</td>
</tr>
</tbody>
</table>

[^12]: Table adapted from [source](https://www.ncbi.nlm.nih.gov/books/NBK497513/)
Evidence-Based Systematic Review: Effects of Oral Motor Interventions on Feeding and Swallowing in Preterm Infants

Joan Arvedson, Heather Clark, Cathy Lazarus, Tracy Schooling, and Tobi Frymark

History: Received July 27, 2009; Revised January 13, 2010; Accepted July 6, 2010
Evidence-based Systematic Review of Oral Motor Interventions in the NICU

• 1960 to 2007 - 12 studies!
• Goal was to see if feeding/swallowing* and pulmonary health improved
• methods varied greatly
• none reported on pulmonary health
• Evaluated:
  – Non-nutritive sucking
  – Oral/perioral stimulation
  – NNS + OPS
• NNS + OPS showed some improvement in feeding/swallowing physiology and reduce time to oral feed
OPMS (VFSS)

• Not much pediatric data
• Used for 30 years
• Gold Standard
• great for evaluating swallowing and making recommendations on this (eg needs to thicken feeds, concerning for laryngeal cleft)
  — shouldn’t be thought of as pass/fail
Aspiration

• Is it ever normal?

  – Normal adults have physiologic aspiration during sleep (Huxley et al; Gleeson et al)

  – 220 adults had OPMS with no known organic pharyngeal or esophageal disease
    • 38% had some alteration of oral and/or pharyngeal swallowing
    • 8% had aspiration into the airway! (Barbiera et al)
Feeding Immaturity in Preterm Neonates: Risk Factors for Oropharyngeal Aspiration and Timing of Maturation

*Natalie L. Davis, †Ann Liu, and †Lawrence Rhein

ABSTRACT
Of 148 infants* → 101 infants (68%) were found to aspirate thin liquids and failed their initial OPMS (median age 31 weeks at birth, 41 week cGA at time of test).

85% passed by 36 weeks after initial fail.
GRADE system of assessing research

• Level of Evidence A - A for Awesome
  – tons of research shows consistent results
  – unlikely for further research to change the estimate of effect

• B-
  – one high level study
  – further research would be great and enhance estimate of effect

• C
  – one or more studies with severe limitations

• D
  – expert opinion
  – very uncertain
Relevant Highlights

• Considering Long-term Enteral access

1. Patients with persistent dysphagia should have a long term enteral access device placed (B)

2. Long-term feeding devices should be considered when the need for enteral feeding is at least 4 weeks in adults, children, and infants after term age.(C)

3. Premature infants who do NOT have anomalies associated with inability to eat by mouth at the normal time for development of oral feeding skills should not have a long-term device considered before the usual age of development of independent oral feeding.(C)
3. Evaluation by a multidisciplinary team is indicated prior to insertion of a long-term feeding device to establish whether:
   a. benefit outweighs risk
   b. if insertion near end of life is warranted
   c. if insertion is indicated where patients are close to achieving oral feeding (B)

4. Abdominal imaging should be performed prior to permanent feeding device placement if possible anatomic difficulty exists (C)

5. G-tube placement does not mandate fundoplication. The possible exception is children with neurological abnormalities who also have abnormal pH probe/impedance findings. (B)
Initiation of Feedings after Placement of a Long-Term Enteral Access Device

1. Enteral Feeding should be started post-op in surgical patients without waiting for flatus or a BM. The current literature indicates that these feedings can be initiated within 24-48 hours (A)

2. A PEG tube may be utilized for feedings within several hours of placement: current literature supports within 2 hours in adults and 6 hours in infants and children. (B)
Relevant Highlights

• Initiation and Advancement of feedings

  1. Base enteral delivery method/initiation/advancement of EN depends on patient condition, age, enteral route, nutrition requirements and GI status (C)

  2. Choose full strength, isotonic formulas for initial feeding regimen (C)

  3.

  4. Initiation and advancement of enteral formula in pediatric patients is best done overall several days in hospital setting using a flexible nutrition plan. (C)
Highlights - Special! For the Preterm infant

• Initiation and Advancement of feedings

1. For premature infants weighing < 1500 g and at risk for NEC, it is recommended that mothers be encouraged to supply **breast milk for their infants.** (A)

2. ELBW and VLBW infants may benefit from **minimal enteral feeding starting very slowly at 0.5-1 mL/kg/day and advancing to 20 mL/kg/day.** (B)

3. **Advance nutritive feedings for VLBW and ELBW infants by a rate of 10-20 mL/kg/day.** (C)
Impact of Process Optimization and Quality Improvement Measures on Neonatal Feeding Outcomes at an All-Referral Neonatal Intensive Care Unit

Sudarshan R. Jadcherla, MD, FRCPI, DCH, AGAF<sup>1,2,3,4</sup>; James Dail, MBA, LSSBB<sup>5</sup>; Manish B. Malkar, MD, MPH<sup>1,2,3,4</sup>; Richard McClead, MD, MHA<sup>4,5</sup>; Kelly Kelleher, MD, MPH<sup>4,6</sup>; and Leif Nelin, MD<sup>2,4</sup>
Context of this study

• Nationwide NICU level IV- all referral unit 42 level IV beds, 28 chronic, 16 step-down, 55 neonatologist, 40 NPs and many more!
• Providers determine timing of trophic feeds, advances in feeds, transition to oral feed, establishing full oral feeds
• They examined institutional practices, physiological and pathophysiological evidence, theories, literature — little data for established benchmark feeding outcomes
• Approach was intended to improve their baseline data
Objectives of this study

• All-inclusive provider and infant-driven feeding program
• Evaluate the impact of a simplified, individualized, milestone-targeted, pragmatic, longitudinal, and educational SIMPLE feeding strategy
• Targeted:
  – progression to enteral feeding
  – transition to oral feeding
  – oral feeding to discharge process
• Measuring
  – LOS
  – growth
  – morbidity/mortality
Methods

• Collection of retrospective data for baseline
• Used surveys and iterative processes to design intervention
• Lots of statistics to make sure groups were the same
Patients included

• Inclusion criteria: ≤32 weeks of gestational age

• Exclusion: NEC, NAS, genetic/chromosomal defects, and congenital birth defects or if they had undergone any form of gastrointestinal or neurologic surgery.
Figure 1. Smart aim and key drivers encompassing simplified, individualized, milestone-targeted, pragmatic, longitudinal, and educational (SIMPLE) feeding strategy. SIMPLE feeding strategy © Sudarshan R. Jadcherla.
Methods cont.

- Dedicated Core group of “feeding champions” designated task force
- Milestone definitions and targets determined by best evidence available and expert opinion
- Patients followed by focused physician-led multidisciplinary feeding rounds
  - neonatology, neonatal NPs, RNs, Dietitians, lactation consultants, OT, parents/caregivers
- Targeted milestones personalized for each neonate and displayed at crib-side
Feeding Milestones

• Start trophic feeding as 10-20ml/kg/d within 3 days of admission and continued 3 to 14 days overall
  – provisions around age, sickness, level of acuity
• Progression to enteral feeds: 120mL/kg/d by DOL 14-28
• First oral feeding by 33 to 34 weeks GA
• Attainment of oral feeds, 120ml/k/d by 36 to 38 weeks GA
• PO AL oral feeding at discharge
Results on LOS

Figure 3. Control chart showing consistent and sustained decrease in monthly average length of hospital stay from April 2011
Results

- Feeding program SIMPLE improved
  - # getting trophic feeds
  - duration of trophic feeds
  - time to oral feeding
  - time from oral feeds to ad lib feeds
  - weight gain velocity
  - LOS

- No change in mortality, readmissions, and comorbidities.

- This plan is generalizable- per them. Probably could needs proof of concept and with even the more complicated kids.
Last thoughts

- Feeding is important
- Not much benchmark feeding data in NICU
- Work on processes (eg. Set milestones for enteral and oral feeds)
- Consider how OPMS will help before ordering
- Ask for help from other disciplines!
Sources