MY CHILD WON’T EAT

How to help a child with a feeding disorder

Richard J Noel, MD, PhD

Disclosure

In the past 12 months, I have had no relevant financial relationships with the manufacturer(s) of any commercial product(s) and/or provider(s) of commercial services discussed in this CME activity.

How to help a child with a feeding disorder

1. Utilize your skills as a pediatrician
2. Utilize your skills as gastroenterologist
3. Utilize the skills of others
1. Be a pediatrician
- Assess for appropriate growth
- Monitor advancement of the diet
- Understand and optimize the mealtime setting

Assessment of growth
- Critically important for infants and young toddlers
- Utilize appropriate growth standards to assess overall growth
  - WHO Child Growth Standard for children 0-2 years of age
  - CDC 2000 revised charts for children 2-20 years of age
- Estimate measures of body mass
  - Weight for length for children 0-2 years of age
  - BMI for 2-20
- Understand the growth trend over a time interval

Monitor dietary advancement

<table>
<thead>
<tr>
<th>Diet Type</th>
<th>Age Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast / Bottle only</td>
<td>0-4 mos</td>
</tr>
<tr>
<td>Smooth puree by spoon</td>
<td>4-6 mos</td>
</tr>
<tr>
<td>Soft chewables and cup</td>
<td>6-8 mos</td>
</tr>
<tr>
<td>Mashed table food</td>
<td>8-12 mos</td>
</tr>
<tr>
<td>Chopped table food</td>
<td>12-18 mos</td>
</tr>
</tbody>
</table>

Development of Swallowing and Feeding: Prenatal through First Year of Life
Oral Phase:

<table>
<thead>
<tr>
<th>Afferent</th>
<th>Touch</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigeminal (V)</td>
<td>Oral cavity, anterior 2/3 of tongue</td>
<td>None</td>
</tr>
<tr>
<td>Facial (VII)</td>
<td>None</td>
<td>Anterior 2/3 of tongue</td>
</tr>
<tr>
<td>Glossopharyngeal (IX)</td>
<td>Posterior 1/3 of tongue</td>
<td>Posterior 1/3 of tongue</td>
</tr>
<tr>
<td>Efferent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigeminal (V)</td>
<td>Muscles of mastication</td>
<td></td>
</tr>
<tr>
<td>Facial (VII)</td>
<td>Lips and face</td>
<td></td>
</tr>
<tr>
<td>Vagus (X)</td>
<td></td>
<td>Tongue</td>
</tr>
<tr>
<td>Hypoglossal (XII) C1 &amp; C2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pharyngeal Phase:

<table>
<thead>
<tr>
<th>Afferent</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glossopharyngeal (IX)</td>
<td>Pharynx</td>
</tr>
<tr>
<td>Vagus (X)</td>
<td>Larynx and Esophagus</td>
</tr>
<tr>
<td>Efferent</td>
<td></td>
</tr>
<tr>
<td>Trigeminal (V)</td>
<td>Tensor vel palatini</td>
</tr>
<tr>
<td>Glossopharyngeal (IX)</td>
<td>Palate, pharynx, larynx</td>
</tr>
<tr>
<td>Vagus (X)</td>
<td></td>
</tr>
<tr>
<td>Trigeminal (V) Facial (VII) C1 &amp; C2</td>
<td>Hyoid and laryngeal movement</td>
</tr>
</tbody>
</table>

Monitor dietary advancement

<table>
<thead>
<tr>
<th>Diet</th>
<th>Age (mos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast / Bottle only</td>
<td>0-4</td>
</tr>
<tr>
<td>Smooth puree by spoon</td>
<td>4-6</td>
</tr>
<tr>
<td>Soft chewables and cup</td>
<td>6-8</td>
</tr>
<tr>
<td>Mashed table food</td>
<td>8-12</td>
</tr>
<tr>
<td>Chopped table food</td>
<td>12-18</td>
</tr>
</tbody>
</table>

Development of Swallowing and Feeding: Prenatal through First Year of Life
Optimize the mealtime setting

- Eating in between meals will spoil your appetite...
- On-demand feeding of toddlers results in lower energy intake when compared to scheduled feeding.
  - Ciampolini et al. IJGM, 2013.
  - Children with normal weight will decrease energy intake at meal to compensate for calories given as a snack 25 minutes prior to the meal.
- Parental interaction and modeling during mealtimes influence subsequent feeding patterns
  - Direct testimony regarding palatability of foods influences children’s acceptance of foods.
  - Parenting, social influences, and the food environment influence the development of eating behavior.
- choosemyplate.gov

2. Be a gastroenterologist

- Consider mucosal disease
- Consider aerodigestive problems
- Drive appetite as needed
- Consider supplemental tube feeding when appropriate
### Presenting EoE Symptoms Vary by Age

<table>
<thead>
<tr>
<th>Presenting Symptoms</th>
<th>Age (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding Disorder</td>
<td>0-4</td>
</tr>
<tr>
<td>Vomiting</td>
<td>4-8</td>
</tr>
<tr>
<td>Abdominal Pain</td>
<td>8-12</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>12-16</td>
</tr>
<tr>
<td>Food Impaction</td>
<td>16-20</td>
</tr>
</tbody>
</table>

**Noel et al., NEJM, 2004**

**Pentiuk et al., Dysphagia, 2007**

**Makkiota et al., Pediatrics, 2010**

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### Therapy Options for EoE

<table>
<thead>
<tr>
<th>Therapy Options</th>
<th>Elemental Diet</th>
<th>Empiric Elimination</th>
<th>Guided Elimination</th>
<th>Topical Steroids</th>
<th>Systemic Steroids</th>
<th>Biologics</th>
<th>Dilatation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mucosal Healing</td>
<td>&gt;95%</td>
<td>&gt;90%</td>
<td>Variable, up to 70%</td>
<td>&gt;90%</td>
<td>&gt;80%</td>
<td>?</td>
<td>0%</td>
</tr>
<tr>
<td>Cost</td>
<td>High</td>
<td>High</td>
<td>Low-Moderate</td>
<td>Low</td>
<td>Low</td>
<td>High (?)</td>
<td>High</td>
</tr>
<tr>
<td>Side Effects (Psychosocial)</td>
<td>High*</td>
<td>High*</td>
<td>Variable</td>
<td>Low-Moderate</td>
<td>Low</td>
<td>?</td>
<td>Moderate</td>
</tr>
<tr>
<td>Side Effects (Medical)</td>
<td>None</td>
<td>Low*</td>
<td>None</td>
<td>High</td>
<td>?</td>
<td>Moderate (?)</td>
<td></td>
</tr>
<tr>
<td>Acceptance by &quot;sick&quot; patients</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High (?)</td>
<td>High</td>
</tr>
<tr>
<td>Acceptance by &quot;well&quot; patients</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

*Depending on patient factors and on difficulty of request*
### Aerodigestive disease

Aerodigestive disease is a condition that affects the interaction between the airway and the digestive tract. It can be caused by swallowing problems, which may lead to aspiration.

#### Upper GI Tract

- **Swallowing**
- **Airway**

#### Should children who aspirate be fed?

- **No adequate trials exist upon which to form evidence-based conclusions:**
  - No evidence to document pulmonary effects of allowing OR restricting drinking water in children who aspirate thin liquids.
- **At issue is balancing the need to acquire feeding skills with the need to maintain pulmonary health.**

### Table: Therapy for Aerodigestive Disease

<table>
<thead>
<tr>
<th>Therapeutic Diet</th>
<th>Empiric Elimination</th>
<th>Guided Elimination</th>
<th>Topical Steroids</th>
<th>Systemic Steroids</th>
<th>Biological Elimination</th>
<th>Side Effects (Psychosocial)</th>
<th>Side Effects (Medical)</th>
<th>Acceptance by “sick” patients</th>
<th>Acceptance by “well” patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental Diet</td>
<td>100%</td>
<td>100%</td>
<td>Variable, up to 70%</td>
<td>≈ 80%</td>
<td>? 0%</td>
<td>High*</td>
<td>None</td>
<td>Low*</td>
<td>Low*</td>
</tr>
<tr>
<td>Diet Effc (Therap)</td>
<td>High*</td>
<td>High*</td>
<td>Variable</td>
<td>Low≥ Moderate</td>
<td>≈ 99% High*</td>
<td>Low ≥ Moderate-High*</td>
<td>None</td>
<td>Low* Low</td>
<td>Low*</td>
</tr>
<tr>
<td>Diet Effc (Medic)</td>
<td>None</td>
<td>Low*</td>
<td>Low≥ Moderate</td>
<td>High≥</td>
<td>? Moderate</td>
<td>Low≥</td>
<td>None</td>
<td>Low*</td>
<td>Low*</td>
</tr>
<tr>
<td>Acceptance by “sick” patients</td>
<td>High*</td>
<td>High*</td>
<td>High≥</td>
<td>High≥</td>
<td>High≥</td>
<td>High≥</td>
<td>None</td>
<td>Low*</td>
<td>Low*</td>
</tr>
<tr>
<td>Acceptance by “well” patients</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>High≥</td>
<td>?</td>
<td>Low≥</td>
<td>None</td>
<td>Low*</td>
<td>Low*</td>
</tr>
</tbody>
</table>

*Depending on patient factors and on difficulty of request.
Balance the need to acquire feeding skills...

- “Hard-wiring” of neural pathways occurs during critical / sensitive periods
- Animal data suggest potential pathways regress in the absence exposure


...with the need to maintain pulmonary health.

- Cadaveric analysis of 36 boys and 20 girls
- Age 6 wks – 14 yrs
- Boys developed more alveoli than girls of similar height
- Number of alveolar units stable after \( \approx \) 18 months of life

Thurlbeck et al, Thorax, 1982

Use of imaging to understand risk

- CT scans of the chest detect pulmonary pathology in patients with CF prior to the onset of abnormalities in physical examination or pulmonary function testing.
- Presence or absence of radiographic findings in children with dysphagia can help formulate oral feeding regimens and goals.
Promotion of appetite

- Aversive effects of force feeding should be avoided; improvement in feeding requires hunger:
  - Innate motivator to feed
  - Resolution of hunger by feeding establishes a positive reinforcement to the feeding
  - Environmental controls of the setting may be insufficient to effectively establish hunger and motivate feeding.
  - Medical enhancement of hunger may be helpful alone, or in concert with therapeutic feeding interventions.

Megestrol acetate

- Progesterone derivative
- Appetite stimulant with indications for the treatment cachexia associated with malignancies and AIDS
  - Central hypothalamic effect?
  - Inhibition of inflammatory cytokine production?
- One study describes a 14-week outpatient tube-weaning protocol the included 6 weeks of megestrol acetate
  - Davis et al, JPGN, 2009
- Use limited by side effects affecting mood and adrenal function
Cyproheptadine

- First-generation antihistamine
  - H1
- Anti-serotonergic effects
  - 5HT3a, 5HT3b, 5HT2c, …, 5HT3
- Anticholinergic effects
  - mACh
- Antiadrenergic effects
  - α1 and α2
- Orexic effect may be mediated via antagonism of 5-HT2c receptors
- Orexic effect equivalent to that of megestrol acetate
  - Coularis et al, JPHO, 2008

- Failure to gain weight?
- Consider causes other than insufficient calories (maldigestion, malabsorption, ↑ demands)
- Caloric supplementation
- Structure meals
- Augmentation of appetite
  - No progress?

Ongoing vomiting or reflux with / without aspiration and / or lung disease?

- Dysphagia / aspiration?
- ENT / SLP evaluation
- Pharyngo-esophageal HRM / Impedance
- Appropriate feeding interventions
- Pulmonary evaluation
  - Concerns with pulmonary health?

- Acute suppression
- Formula / diet changes
- UGI series
- Consider non-GI causes
- EGD with biopsies
- pH / impedance testing
- Inability to control?

- Intestinal feeding
- Fundoplication

3. Utilize the skills of others

- Feeding disorders may be broad and elements may spill into areas that are beyond pediatric GI training and scope of practice.
- May require coordinated input from other specialists:
  - Other medical specialists
  - Specialists in feeding skill acquisition
  - Pediatric psychologists with skills in feeding

- Tube Feeding (NG / GT)

Intestinal feeding
Fundoplication
Behavioral Interventions

- Differential reinforcement techniques
- Negative reinforcement
- Stimulus control procedures
- Shaping
- Appetite manipulation
- Inpatient interventions

Silverman, NCP, 2010

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Demographics

- N=77
- 52% male
- 71.4% White
- 6.4% AA
- 13% Hispanic
- 5.2% Asian
- 3.9% Other

<table>
<thead>
<tr>
<th>Demographics</th>
<th>N=77</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestation (wks)</td>
<td>34.3 ± 5.9</td>
</tr>
<tr>
<td>Age at GT placement (yrs)</td>
<td>0.9 ± 1.1</td>
</tr>
</tbody>
</table>

At Admission:

- Years with tube feedings | 3.7 ± 2.1 |
- Age (years) | 4.5 ± 2.2 |
- Oral percentage of kcal | 13.5 ± 19.8 |

Silverman et al, JPGN, 2013

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85 patients initiated inpatient program

- 4 discharged due to inability to complete protocol.
- 3 discharged before goals met due to acute illness.
- 1 left program against medical advice.

77 patients completed program and were eligible for analysis.

Silverman et al, JPGN, 2013

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Graph showing patient number distribution across various categories:

- Present
- Suspected
- Absent

Silverman et al, JPGN, 2013
Partial List of Feeding Programs

- Baylor Healthcare Children's House
- Children's Hospital Colorado
- Children's Medical Center of Dallas
- Children's Hospital of New Orleans
- Children's Hospital of Orange County
- Children's Hospital of Philadelphia
- Cincinnati Children's Hospital Med Center
- Cleveland Clinic
- Duke University
- Helen Delius Children's Hospital
- Hospital Pereira Rossell (Uruguay)
- Kennedy Krieger Institute
- Marcus Autism Center
- Montreal Children's Hospital
- Mt. Washington Pediatric Hospital
- Nationwide Children's
- Penn State Hershey
- St. Joseph's Healthcare System
- UMass Memorial Medical Center
- University Hospital Graz (Austria)
- University of Iowa
- University of Nebraska
- University of Rochester
- Vanderbilt University
Conclusions:
1. Utilize your skills as a pediatrician
2. Utilize your skills as gastroenterologist
3. Utilize the skills of others