Problem Solving: Health Complications & Clinical Feeding Evaluation

Disclosure

- I have the following financial relationships relevant to the content of my presentation:
  - Royalties: Northern Speech Services
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  - Travel & Honorarium: NSSLHA Chapter
- I have no relevant non-financial relationships to disclose

Learner Outcomes

- At culmination of the session participants will be able to:
  - Identify physiologic components of multiple systems that affect or are affected by swallowing & feeding disorders
  - Analyze oral sensorimotor function/swallowing in the context of health, medical, and developmental factors

Education is the greatest need of the people, but first they must be fed

(Danton’s Memorial, Paris)

Primary Needs for All Humans

- Respiration/Airway
- Nutrition/Hydration

Prevalence of Feeding Problems

- 25% - 45% in children with normal development
- 33%-80% in children with developmental delays or chronic disease
- Up to 80% of children with cognitive disabilities

Estimates from various sources
**Dysphagia: Health Considerations**
- Pulmonary/airway issues
- Nutrition/hydration & undernutrition
- Neurologic & neurodevelopmental issues
- Gastrointestinal (GI) tract issues
- Medication effects

**Airway/Pulmonary Focuses**
- Upper airway factors
  - Aspiration focuses later
- Airway evaluation by non-physicians
- Upper airway etiologies
  - Diagnostic categories
  - Assessment
  - Intervention strategies

**Bedside Airway Examination**
- Respiratory rate: at rest & feeding
- Respiratory effort:
  - Stridor
  - Stertor
  - Retractions: suprasternal, substernal

**Upper Airway Etiologies - Examples**
- Choanal atresia/stenosis
- Laryngomalacia
- Midface & mandibular hypoplasia
- Vocal fold paralysis/paresis
- Laryngeal cleft

**Bedside Airway Examination**
- Vocal quality variables
  - Strong, clear phonation, appropriate pitch
  - Weak, breathy, husky to hoarse
  - Gurgly, wet
  - Velopharyngeal function inferences (e.g., hypernasality, hyponasality)
- Pharyngonasal backflow or reflux
- Frequent burping or hiccups?

**Airway Stability for PO Feeding**
- Airway stability is prerequisite for successful PO
- If airway concerns are noted during physical exam, possible next steps:
  - Otolaryngology airway exam (FFL, DLB)
  - Bedside/clinical oral feeding evaluation
  - Combined FFL & FEES with ORL & SLP
  - Videofluoroscopic swallow study (VFSS)
  - Monitor status for a few days
**Nutrition Principles**

- All children require same nutrients for adequate growth, development, & health
- Children with special needs may require more or less of specific nutrients
- Nutrients can be adequately provided with a variety of feeding plans
- Focus on "key" nutrients to decrease risk of nutrition-related problems

**Nutrition Principles**

- Key Nutrients
  - Calories
  - Protein
  - Fat
  - Calcium
  - Iron
  - Zinc
  - Fluid
  - Fiber

**Identifying “Red Flags”**

- Growth Concerns
- Altered nutrition related labs
- Clinical signs in physical exam
- Feeding history concerns

**Growth Assessment**

- Obtain accurate measurements; serial best
- Plot all measurements on appropriate growth charts
- Length or height, weight, weight/length, BMI
- CDC growth charts: standard of care
- WHO charts: Birth to 2 years & beyond
- Specialty growth charts: Down Syndrome, Turner Syndrome, spastic CP, Achondroplasia, etc
- Use height age to establish weight & nutrition goals

**Establish Nutrition Goals**

- Improve growth
  - Achieve weight at ≥90% IBW/length or height
  - Improve growth velocity
- Increase nutrient intake
  - Target limiting nutrient(s)
    - Calories  ✔ Protein  ✔ Fat  ✔ Iron
    - Calcium  ✔ Zinc  ✔ Fluid  ✔ Fiber
- Improve nutrient balance
  - Redistribute calories from carbohydrate, protein, fat
- Avoid harmful foods/supplements

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**Value of Serial Measurements**

Comparison of growth charts for two girls with same length & weight at 18 months

- Normal growth rate
- Deceleration of growth rate
Nutrition Interventions

- Optimizing intake: 5 Fs
  - Fortifiers
  - Formula(s)
  - Frequency
  - Fluid
  - Fiber
- Avoiding harmful foods/supplements
  - Allergens & toxic levels of supplements

GER Prevalence & Epidemiology

- Highest < 2 years of age
  - Preterm infants: 63%
  - CP: 92% with GI symptoms & signs
  - Healthy infants pH probe: esophageal acidification common
- 21% of all peds pts to GI clinic present with signs/symptoms suggestive of GER

GER Prevalence & Epidemiology

- Children at greater risk may have
  - Neurologic impairment
  - Anatomic abnormalities (e.g., tracheo-esophageal fistula, hiatal hernia)
  - Motility disorders
  - Hyperactive airways

GERD can be a major detriment to adequate nutrition

Neurologic Etiologies of Dysphagia

- Central nervous system (CNS)
  - Acute (e.g., HIE, infections, drug withdrawal
  - Chronic
    - Static (e.g., Arnold Chiari, genetic, CP)
    - Progressive (e.g., tumor, Rett syndrome, Leukodystrophy, Tay-Sachs)
- Anterior horn cell (Infantile Spinal Muscular Atrophy)
- PNS (polyneuropathies)

Etiologies of Dysphagia (cont.)

- Neuromuscular junction (e.g., Myasthenia gravis, Hypermagnesemia)
- Muscles (e.g., congenital myopathies, muscular dystrophy)
- Respiratory tract (e.g., Chronic Lung Disease)
- Cardiovascular disorders (e.g., Congenital Heart Disease)
- Gastrointestinal tract (GI)
- Psychological (anxiety, caregiver-child interaction)
Neuromuscular Disorders

Generalized
- Myasthenia Gravis
- Muscular Dystrophy
- Congenital Myopathies
- Cerebral Palsy
- Polymyositis or Dermatomyositis
- Infant Botulism
- Guillan-Barre

Oropharyngeal
- Arnold-Chiari Malformation
- Bulbar Atresia
- Ocular-Pharyngeal Dystrophy
- Brain Stem Tumor
- Drug-Tardive Dyskinesia
- Moebius Syndrome
- Cricopharyngeal Achalasia

Acquired Brain Injury
- Traumatic brain injury
- Non-accidental head injury (Shaken baby syndrome)
- Motor vehicle accident, etc
- Seizure disorder
- Tumor
- Stroke

Other Disorders Associated with Feeding Difficulties
- Familial Dysautonomia
- Prader-Willi
- Hypothyroidism
- Trisomy 18 & 21
- Velocardiofacial Syndrome (22q11.2 deletion, DiGeorge)

Presentations of Feeding Disorders
- Inadequate growth due to inadequate intake
- Prolonged time for feedings (with or without adequate calories for growth)
- Delayed progression of oral feeding skills (textures, variety, etc)
- Recurrent respiratory disease (question of aspiration from above or below)
- Complicating factors: behavior, sensory, relationship, social

Cranial Nerve Deficits Associated with Dysphagia
- Supranuclear
  - V – mandible movements preserved, tonic bite reflex
  - VII – paralysis of lower half of face, usually unilateral
  - IX & X – normal strength in soft palate, vocal fold movement preserved
  - XII – Tongue movements present, dysfunctional; protrusion reflex may be exaggerated

- Nuclear or Peripheral
  - V – Mandible movements minimal, absent tonic bite reflex
  - VII – Paralysis of upper & lower half of face – can be unilateral or bilateral
  - IX & X – Weakness of soft palate, vocal fold paralysis
  - XII – Unilateral or bilateral absence of tongue movements, fasciculations, atrophy
Chronic Aspiration: Pathophysiology
- May be more insidious than acute aspiration
  - Direct (primary, from above)
  - Indirect (secondary, from below)
- Swallow dysfunction & neuromuscular disease: most prone

Key Questions to Ask Parents
- How long does it take to feed your child?
  - Longer than 30 minutes, tip-off for problem
- Are meal times stressful to child &/or parent?
  - Neurologic based skill & safety issues?
  - Behavior and/or sensory issues?
- Is your child gaining weight OK?
  - If no weight gain for 2-3 months, sign of problem
- Are there signs of respiratory problems?
  - e.g., congestion ↑ during feeding; gurgly voice

Work in Progress
- Meetings sponsored by Nutricia in Vienna
- Nov. 2015 & May 2016
- Pediatric neurologists, gastroenterologists, dietitians, speech-language pathologists primarily from varied countries in Europe
- Arvedson’s 4 key questions basis
- Added 5th related to GI tract
- Now in validation research in Australia

Red Flags: Key Questions to Parents (by all professionals)
- 1. Signs of airway/respiratory problems?
- 2. Feeding duration?
- 3. Weight loss or lack of weight gain?
- 4. GI retching or vomiting?
- 5. Stress at mealtimes for child &/or parent?

1. Airway/Respiratory Concerns?
- Signs – gurgly voice, upper respiratory infections, chest retractions, noisy breathing, mouth breathing, “wet respiration”….. may be due to food/fluid entering the trachea (or retrograde?)
- Benfer (2015) reported that gurgly voice, coughing, & multiple swallows were the best predictors of dysphagia

1. Airway/Respiratory Concerns?
- Data suggest that repeated chest infections & hospitalizations are common signs of unsafe swallowing (Peterson et al 2006)
- Respiratory status utmost importance as respiratory-related factors are leading cause of early mortality (CP/other neurologic) (Benfer 2015)
- Combined with prolonged mealtimes, lack of weight gain, & stress – high priority for follow up feeding/swallowing evaluation?
2. Feeding Duration?

Longer than 30 minutes (or >2.5 hours/day): tip off
- Sullivan et al (2004) showed that parents were feeding their children >2.5 hrs/day prior to G-tube
- Taking >45-60 minutes/meal can lead to malnutrition (Hals et al 1996; Ramage et al 1997)
- Small volumes, prolonged meal times regularly - greater probability for nutrition risk & stress

3. Weight Gain or Lack of?

- Lack of weight gain for just 2-3 months in child less than 2 years – like weight loss in older child or adult
- Hydration important consideration
- Feeding problems commonly associated with poor linear growth
- Oral sensorimotor impairment may also potentially affect functional capacity of children & health quality of life (Liu et al 2009)

4. GI Retching/Vomiting?

- Children with feeding/swallowing disorders are more likely to have frequent vomiting/retching
  - Avitsland (2006) reported 77% frequent vomiting/retching (>1/week)
  - PEG insertion did not lead to more reflux in CP children (Kakade et al 2015)

5. Stress at Mealtimes?

- Battles not likely to get child to eat more
  - Poor feeding ability: major stress for parents (parent interview, Sullivan 2004)
  - Stress may be more prominent in parents or child or both

Red Flags Research Article


Global Feeding Evaluation Goal

- To determine safest & most efficient consistencies for a child to eat orally (to whatever extent possible) while maintaining adequate nutrition & hydration
Specific Feeding Evaluation Goals

- Identify nature & extent of problem
- Formulate hypotheses
- Establish baseline of behaviors
- Make therapeutic modifications

Goals of Clinical Evaluation

CAN'T versus WON'T

Development in Typical Child

- Liquid by nipple first 4-6 months
  - Breast milk
  - Formula
- Strained smooth food by spoon (6 months)
  - Sitting with minimal support
- Lumpy foods by 10-11 months
  - Difficult if delayed until 14-16 months
- Cup drinking before 12 months

Critical Period for Solids

Illingworth & Lister, 1964

- Spoon feeding by 6 months (developmental levels)
- Trunk support for sitting
- A-P tongue action reduced
- Hand-to-mouth skills
- NO mixed textures per bite

Age of Introduction to Solids

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Type of Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-6</td>
<td>Smooth puree (SP)</td>
</tr>
<tr>
<td>6-9</td>
<td>SP; Textured puree; Easily dissolvable solids</td>
</tr>
<tr>
<td>9-12</td>
<td>Soft, mashed, &amp; diced solids</td>
</tr>
<tr>
<td>12-18</td>
<td>Toddler diet of chopped table food</td>
</tr>
</tbody>
</table>

Feeding/Swallow Evaluation

- History
- Physical examination
- Observation of typical feeding or mealtime
- Referral for additional examinations
  - Instrumental swallow study
  - Medical/surgical specialists
  - Nutrition
  - Psychology/Social Work
  - OT/PT
WHO Classification - ICF

- First: Level of participation in various mealtime environments is considered

Holistic Approach To Evaluation

- Assists evaluators in decision making during treatment planning
- Focuses on overall goal of promoting a meaningful & functional mealtime experience for children & families

Additional Criteria for Referral

- Drooling persisting beyond age 5 years
- Pharyngonasal backflow/reflux during feeding
- Delay in feeding developmental milestones
  - Not spoon feeding by 9 months (dev. age)
  - Not chewing table food or self-feeding finger food by 18 months
  - Not drinking from a cup by 24 months
- Craniofacial anomalies

Steps in Clinical Evaluation

- Consultation received ➔ Initial Assessment
- Possible next step depends on airway status
  - If respiration normal, clinical feeding evaluation
  - If respiration abnormal, airway evaluation (may hold oral feeds until airway is clear)

Clinical Evaluation: Airway Concerns?

- If none: Develop plan in context of global needs
  - Oral sensorimotor intervention
  - Nutrition guidelines
  - Behavioral therapy
  - Monitor status & alter plan as needed
- If yes: Instrumental swallow examination or further medical workup

Feeding History Factors

- Positions/posture/seating (gross/fine motor)
- Duration of meal times (average & range)
- Intervals between meal times
- Types of food (preferred, non-preferred)
- Assistance/independence of feeding
- Tube feeding (e.g. type, timing)
- Food record: 2-3 days
### Feeding History Factors
- Respiratory status
- Signs of stress & distress
- Test results & medications
- Sleep patterns (waking, snoring, mouth breathing)
- Cognition & communication
- Behavior during meals & apart from meals
- Therapeutic intervention (developmental/feeding)

![Feeding History Factors](image)

### Nervous System Exam
- Muscle tone
- Reflexes
- Cognition & language
- Visual tracking
- Gross & fine motor skills
- Sensory function

![Nervous System Exam](image)

### Infant Evaluation
- State & overall posture/positioning
- Respiratory status (rate, patterns, voice)
- Resting heart rate
- Exam of oral peripheral mechanism
- Non-nutritive sucking (NNS)
- Nutritive suck/swallow/breathe sequencing

![Infant Evaluation](image)

### Evaluation of Transition Feeder & Older Child
- General observations
- Posture, alertness, direction following
- Oral sensorimotor function
- Bolus formation & oral transit
- Pharyngeal phase inferences
- Therapeutic trials

![Evaluation of Transition Feeder & Older Child](image)

### Postural Control Evaluation
- Muscle tone (hypotonia or hypertonia)
- Central alignment relates directly to oral sensorimotor system
  - Presence of primitive reflexes
  - Level of physical activity
  - Self oral stimulation
  - Use of eye contact, head turning, & touch

![Postural Control Evaluation](image)

### Optimal Sitting Posture
- Neutral head position
- Neck elongation (No chin tuck for infants)
- Symmetrical shoulder girdle stability & depression
- Pelvis stability, hips symmetrical in neutral
- Hips, knees, & ankles at 90 degrees
- Feet in neutral with slight dorsiflexion (never plantar flexed), supported by firm surface

![Optimal Sitting Posture](image)
### Cranial Nerve Evaluation for Feeding/Swallowing

- Lack of chewing: CN V  
- Facial asymmetry & lack of lip movement: CN VII  
- Delayed swallow & pharyngonasal penetration/backflow/reflux: CN IX & X  
- Tongue thrust or atrophy: CN XII

### Gag Reflex

- Independent of swallow
- Sensory: CN IX
- Motor output: CN X, XII, & V
- Elicited by touching posterior pharyngeal mucosa (standard testing)
- Difficult to assess importance of changes in absence of other findings

### Phasic Bite Reflex

- Rhythmic jaw opening & closing
- Response to pressure on gums
- Present by 28 weeks gestation
- Cranial Nerve V
- Disappears by 3-5 months
- May persist with neurologic deficit

### Tonic Bite Reflex

- Jaw moves up into clenched position on presentation of spoon or other object
- Response to contact to biting surfaces of side gums (molar tables)
- Persistence with neurologic deficit – should disappear by 9-12 months
- Cranial Nerve V

### Oral Sensory vs Motor Disorders

<table>
<thead>
<tr>
<th>(Primarily) Oral Sensory</th>
<th>(Primarily) Motor Disorders</th>
</tr>
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<tbody>
<tr>
<td>Nipple confusion</td>
<td>Inefficient suck breast &amp; bottle</td>
</tr>
<tr>
<td>Not differentiate tastes in bottle even with intact suck</td>
<td>Differentiates tastes in bottle</td>
</tr>
<tr>
<td>Manages liquids better than solid foods</td>
<td>Oral-motor inefficiency or incoordination for all textures</td>
</tr>
<tr>
<td>Sorts food in mixed texture</td>
<td>Swallows food whole when given mixed textures</td>
</tr>
<tr>
<td></td>
<td>Unable to hold &amp; manipulate bolus on tongue, food falls out</td>
</tr>
<tr>
<td></td>
<td>Vomiting not texture specific</td>
</tr>
<tr>
<td></td>
<td>Gags when food approaches or touches lip</td>
</tr>
<tr>
<td></td>
<td>Gags after food moves through oral cavity</td>
</tr>
<tr>
<td></td>
<td>Hypersensitive gag with solids, normal liquid swallow</td>
</tr>
<tr>
<td></td>
<td>Gags after swallow is triggered with liquid &amp; solid</td>
</tr>
</tbody>
</table>
Oral Sensory vs Motor Disorders

- Tolerates own fingers in mouth, but not accept others
- Does not mouth toys
- Refuses tooth brushing

Family & Child Interactions

- By direct observation & caregiver reports
  - Appetite, hunger, interest in eating
  - Regular meal times or snacks/grazing
  - Duration of meal times
  - Distractions?
  - Rewards for eating?

Immature vs Abnormal Patterns

- Children with immature oral skills are easier to manage than those with abnormal patterns
- Common for children to have both types

Immature vs Abnormal Patterns

- Patterns are likely to be distinguishable in
  - Suck-swallow-breathe sequencing
  - Jaw control or stability
  - Tongue mobility
  - Lip closure
  - Dissociation of tongue, jaw, & cheek movements while drinking & chewing

Food Refusal

- Hyperextending head & neck
- Turning head away
- Spitting food out of the mouth
- Closing mouth tightly so food can't get in
- Pushing at sides of neck (pharyngeal residue?)

Next Steps?

- Nutrition analysis
- Medical workup (Genetics, GI, ENT, etc)
- Behavioral psychology
- Occupational Therapy/Physical Therapy
- Instrumental Swallowing Study
  - Need to define oral, pharyngeal, & upper esophageal components for management
- Oral sensorimotor intervention
Neurologic Swallow Deficits

- Spastic quadriplegia - most severe
  - Non-walkers
  - Non-talkers
- CNS based deficits: incoordination
- PNS/neuromuscular deficits: weakness

Neurologic Problems: Summary

- Airway & nutrition highest priorities
- Often cannot depend on clinic observations alone with suspicion of pharyngeal problem
- Effort expenditure must be considered
  - Developmental skill levels critical
  - Functional techniques/processes

Neurologic Problems: Summary

- Children with neurologically based feeding and swallowing problems are COMPLEX
- Feeding/swallowing status changes over time
- Realistic goals are critical & must be established with parents & professionals working closely together with mutual respect & coordination/collaboration
- Instrumental evaluation in many instances

Clinical Evaluation Summary

- Comprehensive evaluation is vital
- Holistic approach is advocated for decision making (Functioning, Disability, Health)
- Social & physical mealtime environments considered along with oral skills & safety
- Goal is adequate health status; total oral feeding is not always a realistic goal